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THE

MECHANICS' MAGAZINE,

AND

JOURNAL OF ENGINEERING, AGRICULTURAL MACHINERY, MANUFACTURES, AND SHIPBUILDING.

VOL. I.

(NEW SERIES.)

JANUARY TO JUNE, 1859.

EDITED BY R. A. BROOMAN AND E. J. REED.

"No manner of demonstration, or form of interpreting nature, however excellent for defending and sustaining the mind from error and failure, can also provide and supply it with the material of knowledge. But by all who would not guess and divine, but would discover and know, and who desire not to invent buffooneries and fables about worlds, but to inspect, and as it were dissect, the nature of this real world, all knowledge must be sought from *things* themselves. Nor can any substitution or compensation of wit, or meditation, or augmentation, suffice in the stead of this labour, and inquisition, and perambulation of the world; not if all the wit of all men were to combine for the purpose. The labour, therefore, must be undergone, or the undertaking for ever abandoned."—BACON.

"Nearly all the inventions which we now hear of no more were monstrously ingenious, whilst the inventions which are actually in use are those which appear to have got rid of all the ingenuity, and to have retained one or two plain, simple, common-sense elements."—J. SCOTT RUSSELL.

LONDON:

ROBERTSON, BROOMAN, & CO., "MECHANICS' MAGAZINE" & PATENT OFFICES,

166 FLEET STREET, E.C.

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PREFACE.

In sending forth the First Volume of our New Series we are disposed to address to our readers a few familiar words, which we trust will be received by them with favour.

In the first place, we have to acknowledge the support which many New Subscribers have accorded to us since January last; and this we do with the more satisfaction because it has been rendered without solicitation on our part. We have not, we confess, either the time or the disposition to make those appeals to the public—by way of ingenious advertisements and otherwise—which contribute so greatly to the success of many publications; and, we doubt not, we suffer, to a certain extent, for our inactivity in this respect. But we are happy to say that, notwithstanding this drawback, the number of our subscribers and friends has steadily and largely increased. Nor is our constituency (if we may so speak) extending itself among mechanical men only: we find that the officers of Her Majesty's Navy and Army are continually swelling the list of our supporters. This fact affords us much pleasure, both on account of the natural regard which we all feel for the classes to whose skill and gallantry our national honour is committed, and on account of the importance which must of necessity be attached to the acquisition of scientific knowledge by our naval and military men. We earnestly hope to find our acquaintance with them still increasing; and to this end we make bold to request our present naval and military subscribers and readers to aid in extending our circulation among their professional brethren.

If we had any desire whatever to mention with complacency our own labours during the last six months, we might refer to our efforts in connection with the Armstrong Gun, the ships of the Navy, the Coinage, the Mediterranean Telegraph, the Patent Laws, and several other topics which we have discussed elaborately, and with some visible, and more invisible, results. But this subject we leave to others. We could wish, however, that our readers should discriminate between the management of this Magazine and that of some other journals which have lately started into existence, ostensibly in the interests of popular science, and which are maintained (where they have not already ceased to appear) by a system of piracy that is most disgraceful. The staple literary material of such publications as those to which we here refer is obtained by sheer plunder, and by that alone. Articles from our own Magazine, and even the contents of expensive volumes, are reproduced in them without the least acknowledgment of the sources whence they are derived. It is in this way that such periodicals are, in some instances, forced into a tolerably wide circulation—only, of course, to disappear when their character becomes understood. Now, we may fairly and confidently say that our columns afford no example of this kind of deception or fraud. All that we publish either proceeds directly from the pens of ourselves and our colleagues, or else has its origin plainly authenticated. Nor do we, as Editors, aim at anything like mere literary display. What we value, and what we believe others value, are facts, and these it is our constant endeavour to provide. The extent to which many of our articles are reprinted in the leading journals of this and other countries, and the influence which those articles are openly admitted to exert, assure us that we are far from unsuccessful in our efforts.

In conclusion we will only say that, while conscious of many defects which have marked our course during the issue of the present volume, we nevertheless hope we have done enough to ensure the permanent support of that large and cultivated body whom it is our privilege to address from week to week.

THE EDITORS.

June, 1859.

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THE
MECHANICS' MAGAZINE.
LONDON, FRIDAY, DECEMBER 31, 1858.

EDITORIAL ADDRESS.

MORE than thirty-five years have passed since the First Number of the MECHANICS' MAGAZINE appeared, with its memoir of JAMES WATT—its diagram of two solemn bricklayers in a diving-bell—its portrait of a winged enthusiast flying in the air, (downwards, of course)—its cure for a cold—its Tantalus's cup, with a despairing Tantalus in it—and its poetical Address to a Blacksmith on his birthday! Very small and very crude was that first threepenny sheet, with its sixteen pages only, poetry included. But small and crude as it was, it proved to be the beginning of a publication which has unquestionably exerted great influences upon modern science—has formed the model for scientific journalists throughout the world—and has now taken a novel form, only that it may give a fuller development to the energy which belongs to it. Nor was that first number the precursor of great literary influences alone. For in its pages Mr. ROBERTSON, its founder and editor, took the lead in the establishment of the London Mechanics' Institution, and virtually of all those kindred institutions which now abound in the land.

We, the present editors of the Magazine, refer unhesitatingly to these early triumphs, since we had, of course, no personal participation in them. It was our pleasure to succeed to its control after it had grown in stature and come into favour. Nay, favour is a word that very imperfectly expresses the regard—we may even say the affection—which many hundreds of readers feel for the MECHANICS' MAGAZINE. To some few it is like an adopted child, to many more it is as an old and favourite friend; and we should be unworthy of the position we hold were we insensible to the interest which such persons feel in it. We are, however, fully sensible of it; and it is upon the solid basis of their esteem that we build our expectations of the future.

All the friends of the Magazine were of late, however, agreed in believing that the time had come when a change in its form and size was eminently desirable. Its page was too contracted for the engravings of many modern machines, and its literary department afforded insufficient scope for all the demands of modern science. A want of a weekly scientific paper, handy in size, copious in information, and sound and reliable in its teachings was felt; and we were looked to as the most proper persons to supply the want. We have undertaken the task cheerfully, and the mere preliminary announcement of our intention in the matter has brought us so much support that our success is already assured. We hope and believe that this first number of our New Series will confirm our present friends in their friendship for us, and bring us many new ones.

It will be observed that to our title of MECHANICS' MAGAZINE, which is not, in the present day, a perfectly definite designation, we have appended a sub-title, viz.: "Journal of Engineering, Agricultural Machinery, Manufactures and Shipbuilding." This has been done with a clear and settled purpose, which, though it may not be evident to some readers, we need not here mention. Some gentlemen have, however, predicted our want of success because of the number of the branches of practical science which we thus embrace. But very close observation has shown us that this prediction is based upon a fallacy. It is a very great mistake to suppose that intelligent men wish to confine their scientific reading exclusively to subjects connected immediately with their own vocations. We need not go back to the days of WATT and ARKWRIGHT to prove this. Every day men are now studying and inventing things which lie more or less apart from their personal pursuits. The best steam-plough yet produced, which is described on another page of this number, was invented by an engineer and farmer together. The late electrician of the Atlantic Telegraph Company was a doctor in Brighton. The most effective cannon which the military man has yet had given him, is the invention of Mr. W. G. ARMSTRONG, an hydraulic engineer of Newcastle. The standard work on Naval Gunnery, was written by a general. One of the latest schemes for draining London was propounded by a Judge. A novel mode of ship-construction is about to be produced by an eminent constructor of marine steam-engines. It is undoubtedly true that professional men require to be informed of what is new in their own professions; but it is not less true that, for the most part, they desire also to be advised of what is being done in the professions of others. And it is well for the world that they do; for many of the greatest improvements made in the arts and manufactures are produced by men who step aside from their own occupations to make them. We have no apprehensions on this subject. On the contrary, we know that the engineer will value us the more for our agricultural machinery; the agricultural machinist for our manufactures; the manufacturer for our ship-building; and men of science generally for all of these.

We have a word to add upon the management of the Magazine in its new form. We intend to fully maintain our independence, and with it, we trust, our consistency. For some cause or other, the scientific journals which do this are exceedingly scarce. We look to most of them in vain for a predominant unity of thought and purpose, from which alone the reader can derive any real culture—any abiding advantage. Such journals appear to be edited by a staff of writers who are void of nearly all faculties but that of mutual contradiction. The laws of science are repealed, perverted, restored, and abolished at will by them. We find the Atlantic Cable crack at the bottom of the sea one week because of the intense cold, and melt there the next because of the boiling heat. This week a plough answers admirably on account of its lightness—next week it is superior to all others on account of its great weight. In one number a ship steams at 15 knots because she is down at the head—in the next she steams at the same rate because she is by the stern. Now all this—or rather, all of which this is a disguised representation—is exceedingly absurd and injurious. The laws of science are fixed, and those who undertake to expound them should not prevaricate. We know that perfection is not possible of attainment in dealing with the varied facts to which experience daily gives rise; but we shall, on our own parts, feel it due to the public to prefer even silence to false and doubtful comment.

We have another word to add to correspondents. From these we shall be most happy to receive whatever they may please to send us, but we shall exercise our right of rejection more severely than heretofore. It unfortunately happens that some of our best men write very little, and some of our worst very much. This is an evil to be deplored; but our duty, as editors, is plain. We cannot sacrifice the patience of thousands of readers for the sake of gratifying one frivolous or mistaken writer. On the other hand, for really useful communications we shall at all times tender our best thanks.

We have introduced several improvements in the details of the Magazine, chiefly in connection with the classification of the abridged specifications of Patents, &c., which will be severally explained in their respective places. The price of the Magazine is raised from 3d. to 4d., but we do not for a moment anticipate that the slight increase will, by any reader, be deemed a serious drawback, or an unreasonable accompaniment of our enlarged efforts and expenditure. In conclusion, we wish our readers a Happy New Year, and request them to contribute to the happiness of ours by aiding us in circulating this Magazine as widely as possible, that, as it flourished before many of them were born, so it may still flourish for the public benefit till they and we are no more.

STEAM BOILER CONSTRUCTION.

BACON hoped for an organ which should enable all men to construct scientific truths as a pair of compasses enables all men to construct circles. But, great as the progress of science has of late been, we see no promise of any such organ. The chief part of those scientific truths which are essential to the advancement of the useful arts, have to be produced by that cumbrous and clumsy instrument—experiment.

"Science moves, but slowly, slowly, creeping on from point to point."

And yet we have but little cause for complaint of this instrument. How much has it not done for us even during the present century, in bringing steam, electricity, and a thousand natural products under our control, and subservient to our uses! Steam-ships, railroads, iron bridges, and crystal palaces, are but a few of the results attained by aid of it. And it is daily giving us new and valuable advantages.

No man has laboured more usefully, or more incessantly, on experimental subjects than Mr. FAIRBAIRN, and considering the awful destruction of life which boiler explosions have occasioned, he never, perhaps, laboured to better purpose than when he made his late experiments on the resistance of tubes to collapse. The complete results of these experiments, in so far as they were contributed to the Royal Society during the present year, are now, by the courtesy of the author, before us. On another page we have given, in his own language, the practical application of these results to the construction of boilers. The article needs no commendation to practical men. The experiments were instituted for the purpose of improving our knowledge respecting the forms of construction best calculated to sustain those high pressures of steam which have lately been rendered necessary by the general desire to economise fuel, and to extend the expansive principle; the resort to these pressures having been followed by numerous and aggravated explosions. The worst of these have resulted from the collapsing of the *internal flues*, which have been largely adopted, and the number of which late experiments at Sheerness Dockyard will tend to increase. It has been the habit of engineers to form these flues of boiler plate, riveted with simple lap-joints into cylinders; and these were considered to be of equal strength—when of the same material, diameter, and thickness—whatever their lengths. It is perfectly reasonable to suppose this, if the cylinders be unsupported at their ends; but, it is equally reasonable to suppose that where their lengths are short and variable, and their extremities held by rigid supports, their strengths would vary materially. In some experimental tests to prove the efficiency of some certain boilers, Mr. FAIRBAIRN had some misgivings as to the strength of the internal flues to resist a force tending to collapse them. In these experiments it was found that flues 35 feet long were distended with considerable less force than others of similar con-

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struction 25 feet long. This anomalous result led to further inquiry, and this being far from satisfactory, the late experiments were fortunately undertaken.

Mr. FAIRBAIRN has not only performed the experiments with his accustomed care and judgment, but has also deduced from them practical improvements of very great importance. His results, though by no means singular, or adverse to what might have been anticipated by a scientific mind, will render a change in the construction of boiler flues inevitable. They prove that the resistance to collapse of such tubes from a uniform external pressure, varies inversely as their lengths in all ordinary cases—say, for lengths not exceeding fifteen diameters. They further show that in boilers of ordinary construction, the external shell is three or four times more capable of resisting the forces which tend to burst it than the flues are to resist the forces which tend to collapse them. This amply explains the causes of the many disastrous accidents that have been occasioned by the collapse of internal flues. The maximum strength of the structure, as a whole, is, of course, that of its weakest part only, and consequently the excessive strength of the outer case is valueless. The strength of the flues may, however, it is found, be increased nearly threefold, by the mere addition of a couple of strong angle-iron ribs to each of them. By further forming such flues with double-riveted *butt-joints*, and longitudinal covering plates over the joints, their circular form may be preserved, and another great source of weakness thus got rid of. These improvements, though extremely simple, are of immense value, and their general adoption will add much to our security in the use of steam boilers.

NAVAL ARCHITECTURE.

OUR ship-building readers must not be disappointed when they observe how small a portion of our present number is addressed primarily to themselves. In the article on "Naval Warfare with Steam," they will find a few questions of special interest discussed; but on the whole they may with fairness be disposed to complain of the meagreness of the information afforded them this week on subjects of a professional nature. Without entering into the causes of the deficiency, we may state that they are of a transient character, and the defect will not again exist. We have already completed arrangements for a series of articles upon the theory and practice of ship-building, and are also making provision for frequent papers on the actual works in progress in the various Dockyards of the kingdom.

To the contemplated articles on the theory and practice of ship-building—in which we include the Laying Off of Ships—we attach very great importance. We shall mis-represent no one when we say that a great and pressing want of comprehensive treatises upon these subjects unquestionably exists. In the Royal Dockyards there are hundreds of shipwright apprentices in training, and in the private yards thousands. And beside these, there are many thousands of other young men, who have completed their apprenticeship, but who are, nevertheless, earnestly desirous of gaining a sound knowledge of their profession. But to all these—young men "serving their time," and young men "out of their time"—how little sound and useful professional literature is accessible! Now, we propose to supply precisely what they need. Apart from such information as we may from time to time furnish respecting the mechanical building, or putting together of the parts of the ship, we intend publishing two distinct classes of papers, in which we hope to combine sound science with good practical instruction.

The first of these will treat of all that relates to the calculations which require to be made by a scientific constructor of ships; and our aim will be to give numerous and useful illustrations of the several problems which he has to solve. For example, instead of confining our investigations to one particular water-line—as is always the case in books, but hardly ever the case in practice—we shall give a ship several water-lines, and discover what qualities she possesses when immersed to each of them. It is not possible to treat the whole, or even many, of these problems without assuming some knowledge of the higher mathematics on the part of the student. But we shall carefully demonstrate them in the most elementary manner possible, and afterwards give the rules deduced from the demonstrations; so that even those whose mathematical attainments are but slight, may still be able to solve the problems practically—in the same manner as questions in Practical Geometry are solved without a knowledge of Euclid's Elements. We would, nevertheless, earnestly recommend those of our young readers who aspire to become naval architects, to extend their mathematical knowledge as fully as possible, by which means alone they can attain to a proper understanding, and a true enjoyment of their art. There are a few invaluable works on Naval Architecture, which it is next to impossible for the general reader to obtain; and upon these we shall fall back as occasion may require, in order that we may omit nothing of importance to the Naval Architect from our papers. We shall also give several entirely new forms for conducting the necessary calculations, together with the solutions of many questions which arise in the investigation of a ship's qualities, and of which solutions have never yet been published for the guidance of those who have to make the calculations, but who are unable to solve the problems on which they depend.

The aim of our second class of papers—on Laying Off—will be no less ambitious than that of our first class. We propose to adopt an entirely new and, we believe, a highly-improved method of teaching this somewhat difficult and repulsive subject. While the only treatises that have hitherto taught Laying Off are of a purely technical character, and dissociated from those geometrical principles upon which the draughtsman's art is based, we shall make those principles our starting points, and proceed from them to the actual operations of the mould-loft floor. This is unquestionably the only truly scientific method of teaching Laying Off, and we are persuaded that it will tend, more than any existing system, to thoroughly instruct the student who gives his attention to the subject.

We hope to commence the publication of one, at least, of our series of articles on Naval Architecture next week, and to continue the same, with little or no intermission, until they are completed.

THE NEW FOREIGN OFFICES.

THERE was a time in England's history when the ministers made laws, and either trusted to, or cared not for, the approval of the community. But of late years, the wisest proposition gets no sanction or open patronage from those in office until it has been well agitated and ventilated out of doors. The law is then granted as a graceful concession to the wishes of the majority; and, should it prove less operative for good than was expected, the minister stands beyond the reach of censure, and the country patiently submits to its operations as the parent submits to a wayward child.

Some such operation is now going on in regard to the project for the new Foreign Offices. No *official* announcement that a selection of the plans of any one architect has been arrived at has yet been made, but, while there may exist a disposition to confer the honour upon some especial one of the competitors, the enlightened portion of the public are first to be probed to see how far it would stand so flagrant a breach of the proprieties. If the pseudo-announcement which fairly stunned the profession, properly so called, had been quietly accepted as a fact, then the official order would, perhaps, have followed as a matter of course; but no such thing up to the present moment has taken place.

We are aware that in taking this view of the affair we go beyond the inferences drawn from the announcement by many able and far-seeing men, who will not accept even so much as would imply that there ever existed one tittle of authority for the announcement at all. With these gentlemen the announcement assumes simply the nature of a "canard." They say, that professional capital is to be made out of it, whether the affair is true or false; and, indeed, they go farther than this, and affect to see in the apparently hostile letters in the *Times* and other journals, the artful jobber firing his pellets to provoke a war of words which cannot do other than render popular the individual who is the cause of it. We should not call attention to this phase of the case, did we not feel that there is much to justify such a conclusion. We have no proof, however, that such is the fact; but its existence would not surprise us after what has occurred upon similar occasions of public competition.

Under any circumstances it is now high time that Lord JOHN MANNERS should take some notice of the rumour. Let that nobleman confirm it if it be true; let him deny it if it be false. If, however, he should be made to continue silent by the requirements of official dignity, what could be easier than for some one of the competitors to ask the question of his lordship? Surely they are most interested in the decision, and it would need no very great space in their note to be devoted to apologies for so suggestive a course.

Whatever may be the result, the public are indebted to the "announcement" for awakening a large amount of dormant feeling for Art amongst a class of intellectual men which is becoming every day more and more conversant with the elegancies and requirements of an enlightened society. These men possess a cool judgment, allied to an independent and logical mode of thought. They are, moreover, lovers of a rational and vigorous progress, and from them we may hope that at no distant time we may be able to "announce" the advent of a movement which will at once and for ever place the whole phalanx of copyists and pattern manufacturers in the position they naturally and necessarily occupy in every profession, excepting the great and noble one of architecture. Then may arise some great genius, modestly impressed with the importance of his mission, and endowed with power to advance the art upon which ages and nations almost wholly rest the glory and perpetuation of their worldly fame.

In a commercial point of view, we unfortunately at this moment permit our money to be squandered on the whim or fancy of any well-connected mortal, who may be in his dotage, and never have the opportunity of seeing the coming generation look with sovereign contempt upon the works held *in terrorem* over suffering "Taste." The system of filching from old German and Flanders examples may be all very well for a little while, but the constant borrowers of ideas, like the fitful customers of

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the usurer, can never permanently benefit themselves or their immediate friends.

All honour to the inventive genius who shall arise through the present debasing atmosphere of false sentiment, and redeem once and for ever our really liberal country from the burden of mediocrity under which it now labours! And all honour to those men who, though not thus gifted, may hail the advent of such a leader, and secure for themselves a position by falling into the ranks of their general as befits true and faithful soldiers of Art!

THE SMITHFIELD CLUB SHOW.

EVERY year adds to the importance of our great agricultural gatherings, not the least of which are the exhibitions of cattle and implements at the Baker-street Bazaar, which are looked forward to by some hundred thousand persons with almost the same interest as the good old Christmas pantomime, without which London at this season would no longer be itself. Notwithstanding the additions which have from time to time been made to the area devoted to the Christmas show at the Baker-street bazaar, it has grown less and less compared with the number and variety of things exhibited, until upon the last occasion the "standings" only measured two feet nine inches in width instead of ten feet, which was their extent about eight years ago. This diminution of space, for which, by the way, the same charge is made as formerly, has arisen from the increased number of applications made year by year; the principle adopted being that of dividing the area into as many standings as are applied for, so that if the same building be used, a few years will suffice to reduce each standing to as many inches as it formerly reckoned feet. This has necessarily greatly increased the cost of exhibiting implements, and no doubt presses severely upon small makers, a few of whom, we noticed, had contented themselves with just room enough for a man to stand upright in, and whose occupation was simply that of distributing catalogues or hand-bills, necessarily borrowing from his next door neighbours the elbow room required in the discharge of his duties, or when he desired to put his hands in his pockets. Those exhibitors, on the other hand, to whom a few pounds are no object monopolise as many as ten, twenty, thirty, or in one case as many as forty standings, and were consequently enabled to make a considerable display. All this will doubtless be shortly remedied, as it is scarcely possible that the premises hitherto used for the purposes of the show, can very much longer suffice, considering the increased accommodation now so imperatively called for. We understand that so great were the inconveniences acknowledged to be on the last occasion, for want of space, that a committee has actually been appointed to inquire into the possibility of finding more suitable quarters. The Crystal Palace has not been overlooked by those who have given any thought to the subject, but its distance from town is a very serious objection, especially as in order to retain the popularity of the Christmas show, it must be open in the evening as well as in the day time. Another plan has been suggested of holding the shows in some accessible spot under some temporary erection which could be contracted for in the same way as the canvas sheds adopted by the Royal Agricultural Society; but to this, there is some considerable objection on account of the season of the year, which requires the cattle to be well protected from the weather. Perhaps this objection might be overcome by artificially heating the cattle department; a few thousand feet of iron hot-water piping accomplishes wonders in the way of warming long ranges of buildings, or those which are separated by considerable distances. We have no doubt that many of our hot-water apparatus makers would readily undertake to maintain a uniform temperature in a length of canvas-covered and timber-sided shedding, amply sufficient to hold all the bullocks, sheep, and pigs which the breeders and rearers of England could desire should be brought together. The real difficulty is, doubtless, to find the ground space, but this it is possible the committee referred to may succeed in doing, if they heartily set to work, as we trust they may do. Before concluding these introductory remarks, we should, perhaps, offer some apology for the late appearance of our notice of the Smithfield Club Show, which is simply this: That, until our present number (the first of the enlarged series) and only with difficulty even now, has it been possible to afford it space in our columns. A careful record of the great improvements in agricultural machinery continually being made, and yet to be made, can, however, be hardly better inaugurated than by a short, yet systematic account of what we noticed at the late show; and this consideration, added to the fact that no detail statement has as yet been published, has determined us, even thus late, to draw the attention of our readers to those matters which most interested us in our ramble through the implement department. In our notices of machines or implements exhibited, it must be carefully borne in mind that we profess to do little more than refer to such as were exhibited for the first time at any show of implements, or at any rate which had not before been shown at the Smithfield Club Meetings. This will, of course, account for the absence of mention of a vast number of well known names as exhibitors, and as well known machines and implements of those whose names do appear in reference to agricultural machinery recently introduced. We notice the stands in the order in which we examined them.

T. Scott, of Drummond-street, Euston-square, exhibited a new machine—a grass-seed separator, for extracting the seeds of couch, twitch, spear, or hair grass, and other impurities from perennial, or Italian rye-grass, &c., as also a carrot-seed bearding and dressing machine for cleansing the seed of the beard or awn, and rendering it fit for sowing. By a slight modification this machine may be used for milling clover, trefoil, and other similar purposes. It is calculated that 5s. per acre is saved in the cost of seed by the use of this machine. Into the details of this saving we cannot enter, but there is no doubt that great advantage arises from thus preparing seed. These machines are manufactured by Middleton, the well known engineer of Southwark.

Mr. Romaine exhibited a model of his steam cultivator, as intended to be manufactured by Mr. Nash, of Cubitt Town, Isle of Dogs. This machine contains many important improvements over those hitherto constructed for Mr. Romaine. It is in reality a rotary digger, the digging apparatus being a cylinder with spades placed behind the engine. The spades are firmly bolted to the cylinder by three bolts placed triangularly (two of them at the point of greatest strain) and passed through the metal of the cylinder. The cultivator travels slowly over the land, digging a width of eight feet, but has a faster motion, by which, when not digging, it can travel from place to place at about two miles per hour. The cost of the machines will be about £800 each, the working expenses being set down at about 33s. per day, and the quantity of land cultivated about seven acres. The steering apparatus appears well arranged, and the machine is made to turn almost in its own length. So far as we could judge from the model exhibited, Mr. Romaine appears at length to have succeeded in devising the machine so long and earnestly looked for by many, and even by Mr. Fowler, to be forthcoming some day or other, namely, a machine which can work its way into an unprepared field and ont again, having spaded up the soil to any depth required, and that without the spades or forks clogging—the cylinder on which they are fixed preventing any accumulation of earth which would take place were they merely attached to a shaft, instead of to a large cylinder. We hope in a few weeks to give illustrations, and detail description of this interesting implement.

Mr. Unite, of the Edgware-road, exhibited some *gelicw* dressed carriage aprons, which, as far as appearances go, are doubtless preferable to black ones, and which, from the nature of the dressing, are not liable to crack or scale. The specimens shown were exceedingly pliable, exhibiting none of that harshness which renders many aprons as stubborn as sheets of metal laid across the knees, and almost as cold and comfortless.

Messrs. Hornsby and Sons, of Grantham, exhibited their newly-patented plough, manufactured wholly of wrought-iron, with the exception of the slide, name-plate, and wheels. In this plough, the share and turnfurrow, or breast, are attached to the slide or sole plate, instead of to the frames, as usual; thus the beam, handles, and frame, are solid pieces of wrought-iron work, obtaining the greatest possible lightness, with great strength and durability—doing away with the heavy cast-iron frame in ordinary use, and, at the same time, giving to the plough a light, simple, and pleasing appearance. The shares are attached to lever necks of wrought-iron. They are so constructed that no dirt can possibly work into the joint to interfere with its free action, which is capable of universal movement; and being spherical, it is the firmest, and most easily adjusted arrangement that can be introduced for giving it more or less pitch; as also for directing the point of the share more or less to land. The spherical bearing is fixed close to the share, so that giving it more or less pitch or land movement does not raise it above or below the front of the breast. The coulter fastenings are made wholly of wrought-iron; the coulter is very easily adjusted for cutting in-land or furrow, and at a greater or less inclination. Skim coulters, with wrought-iron stems and steel miniature mould boards are attached to these ploughs, by a wrought-iron clip, and also drag-chains when desired. The wheel stems are fastened to slides passing through holes in the beam, and a piece is welded on the underside of the beam, through which they also pass, giving them a firm wide bearing. By this arrangement the land wheel can be expanded or contracted, dispensing with the slide axle at the bottom, and causing the wheels to run nearly opposite to each other. The wheels are constructed so that no soil can adhere to, or be carried round by them, as is the case with the wheels of most ordinary ploughs, the rims being bevelled on the inside.

Messrs. Garrett and Sons exhibited, in addition to their usual collection, a horse hoe with newly arranged steering and elevating apparatus, both operations being effected by means of a single handle. The axletree is made moveable at both ends; thus the width or spread between the wheels can be increased or diminished according to the method of planting, so that the wheels always travel between the rows. Each hoe works on an independent lever, by which means they either rise or fall according to the irregularities of the surface of the land. The steerage, which is in itself very simple, consists of a quadrant gearing into a rack, and affords a ready means of keeping the hoes between the rows of corn or vegetable crops, doing every execution to the weeds without the slightest injury to the crop. The hoes may be varied in distance, to suit all crops, at any given width that may be required. The cutting blades, of different sizes, are made of steel, and attached by screw bolts and nuts to the stalks, which are keyed into the levers, and when worn may readily be replaced by any farm labourer. We should not omit to notice an improvement in what are called the "continental two-horse" thrashing machines, which are known as one-horse machines in this country. The improvement consists in arranging the vertical bevel wheel within the circumference of the horizontal one, which enables the machine to be packed in a square case, thus saving freight.

Whitmore and Co. exhibited several crushing and other mills; the most noteworthy, as being the most recent, were the small mills for splitting beans, peas, Indian corn, &c., capable of splitting four bushels per hour, the cost of each mill being under £3.

Burgess and Key exhibited a new grass mower

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(Allen's American patent). This machine has been thoroughly tested during the last season, and found to answer perfectly—one machine having cut, on the farm of Mr. C. Hall, of Havering, Romford, Essex, 83 acres; and afterwards, on the farm of Mr. Tabrum, Bovis Hall, Brentwood. 100 acres of grass and 20 acres of clover. The work was done better and lower than by the scythe, and at the rate of one acre per hour. They also exhibited a new potatoe-digging plough (Owen's patent), which weighs only eighty-five pounds, is light of draught, and simple in its construction. One man, it is said, with a pair of small horses, will easily dig potatoes as fast as twenty persons can pick them up. The potatoes are turned out and distributed on the ground so that scarcely one per cent are left covered. It works well on hill sides, on rough or stony land, and on all soils. This implement can be used as a cultivator in the early part of the season, it being admirably adapted to run between rows of potatoes, turnips, &c., to eradicate the weeds and lighten the soil. The next thing we should notice is a "post-hole" augur, also invented by Mr. Owen, which combines the advantages of the shovel, spade, and post-spoon, producing a round smooth hole. The augurs are made of convenient size and length for boring holes in the ground suited to any sized post. They lift the dirt from the hole without the use of a spade or spoon; and as no more is removed than is necessary, the work is much more rapidly performed than usual. Messrs. Burgess and Key also exhibited a number of churns similar to the one which gained the prize at Chester, and considerable attention was paid to the celebrated reaper which occupied a prominent place in the exhibition. We understand that the Prince Consort, owing to his having one of the reapers on his farm at Windsor, had a prolonged interview with Mr. Burgess on the merits and capabilities of the machine, which appeared to have entirely realized the Prince's expectations.

Ruston, Proctor, and Co. exhibited one of their portable grinding mills with wooden framing, which lessens its cost about £7. These mills will grind six to ten bushels of meal an hour, according to the fineness of the work. The top stone, being the runner, is driven by an upright shaft, which receives its motion from a pair of bevel wheels at bottom, one of which, to prevent noise, is geared with wood. This firm also exhibited an improved circular sawing bench, which possesses many advantages over those generally in use. It consists of a circular saw fixed in a cast-iron planed table, and is mounted on cross oak soles; turned wrought-iron rollers are fitted to each end of the table, and three sizes of augers to the spindles for boring. It is driven by a double-flanged pulley, and the brasses carrying the spindle are applied in an extra strong manner, and are adjustable by set screws and lock nuts. The fence is an arrangement of screws and pinions, very correct and certain in its action. It has the parallel, transverse, and feather-edged or diagonal cutting motions; may be adjusted to suit any sized saw, and is set to a gauge, marked on the table in eighths of an inch. We must next notice the excellent portable engines of this firm, one of which was exhibited. The most noticeable points of these engines are that the saddle for the fly wheel shaft completely straddles the boiler, thus guarding against any derangement from unequal expansion; and the engine is also fitted with an improved throttle valve, which by means of a governor regulates its motion whether lightly or heavily loaded. The tubes are arranged in vertical rows, leaving a clear half-inch space between them from top to bottom, there being an inch space between the outsides of each pair of tubes. The slide valves are case-hardened. The capability of these engines is considerable, as 8½ square inches of piston area are allowed for each horse power, the pressure of steam being 45 lb. per square inch. We believe one of these engines tried at Chester, with the eight horse brake, made 130 revolutions per minute, with the steam at 24lbs. only. The force pump is fixed vertically at the back end of the boiler, thus avoiding a long eccentric working rod, and an equally long return pipe, both of which are necessary when the pump is inclined in the usual way. A combined thrashing machine was exhibited by this firm at the Gloucester Mews in the neighbourhood of the show. Messrs. Ruston, Proctor, and Co. are the makers of Smith's ploughing apparatus, which was at work during the show at Flemish Farm, near Windsor.

Wallis and Haslam, of Basingstoke, exhibited their self-adjusting spherical bearings, which appear admirably suited to agricultural machinery, the accurate setting of which cannot, from want of good foundations or other causes, be generally depended upon. These bearings are well adapted for shafts or spindles which run at a high speed, or are at all liable to heat, as they adjust themselves to the slightest variation in the line of direction of the shaft, while, at the same time, they are perfectly steady in work, and, as they wear equally throughout their whole length, will no doubt last much longer than the ordinary bearings. The spherical bearings are composed of four parts, viz.: the seat or block, the upper and lower brasses, and the cap. The seat or block and the cap are turned, so that when put together, their interior surfaces form a spherical cavity, with a portion removed on each side of the block, forming openings through which the shaft or spindle passes out, surrounded by the brasses in which it revolves; and the upper and lower brasses, after being bored in the usual manner, are turned externally to the form of a sphere of the same diameter as the cavity in the block, so that on their being placed in the cavity, and the cap adjusted over them in its place, they form a universal joint, which will turn freely in any direction within certain limits. On the under side of the lower brass is cast a nipple, which descends into a socket bored in the bottom of the block to receive it. This socket is considerably larger than the nipple, and will therefore allow sufficient motion for the brasses to adjust themselves to the position of the shaft, while, at the same time, it prevents their rotating along with it, which they might otherwise be liable to do.

We are sorry that our space precludes the possibility of our adding to the above remarks, as certainly not one-third of the matters deserving notice has been as yet touched. We trust, however, to complete our survey of the show next week, when we hope all exhibitors will find their respective claims to notice duly acknowledged. The names of those whose productions we have as yet spoken of appear in the order in which our notes were made, it not being possible, in the crowded state of the building to take any regular course in examining the several stands.

H.M. SCREW STEAM SLOOP "ICARUS."

The trial of the *Icarus*, Screw Steam Sloop, took place down the river on Tuesday, the 21st December last. She left Woolwich Dockyard at 10.25 a.m. and reached Gravesend at 12.12 with a strong tide against her, after which she made several runs with and against tide, at the measured mile, Lower Hope, under the superintendence of the Woolwich authorities and Messrs. Rennie, the constructors of her engines.

The average speed thus obtained was 10¼ knots. The engines indicated above 600 horse power, making from 90 to 94 revolutions per minute. There was no heating in any part, and the trial was highly satisfactory to all concerned.

The dimensions of the *Icarus* are as follows:

	ft.	in.
Length between perpendiculars	151	0
Beam extreme	29	1
Depth	15	10

Tonnage, O. M. ..... 577 $\frac{3\cdot0}{9\cdot4}$

The engines are 150 horse-power collectively, by George Rennie and Sons, on their patent single trunk principle.

We are informed that Messrs. Rennie were little more than four months in constructing these engines, and the engines were tried one month after the vessel was handed over to them by the authorities.

ON IMPROVED MODES OF CONSTRUCTING THE FLUES OF STEAM BOILERS.

By W. FAIRBAIRN, Esq., C.E., F.R.S., F.G.S., &c.

THROUGHOUT the whole of the experiments on the resistance of tubes to collapse, lately undertaken by me at the joint request of the Royal Society and the British Association for the Advancement of Science, it has been proved that the resistance to collapse from a uniform external pressure, in cylindrical tubes, varies in the inverse ratio of the lengths. This law has been tested to lengths not exceeding fifteen diameters of the tube; but the point at which it ceases to hold true is as yet undetermined, and could only be ascertained by a new and laborious series of experiments on tubes of considerably greater length, in which the strength of the material modifies the above law of resistance to collapse. Such experiments are, doubtless, very desirable; but the vessels necessary for the purpose would be most expensive, and the results already obtained appear to supply all the data necessary for calculating the strengths and proportioning the material in all ordinary cases.

If we take a boiler of the ordinary construction, 30 feet long and 7 feet in diameter, with one or more flues 3 feet or 3 feet 6 inches in diameter, we find that the cylindrical external shell is from three to four times stronger in its powers of resistance to the force tending to burst it, than the flues are to resist the same force tending to collapse them. This being the case in boilers of ordinary construction, it is not surprising that so many fatal accidents should have occurred from the collapse of the internal flues, followed immediately by the explosion and rupture of the outer shell. To remedy such evils, and to place the security of vessels so important to the community upon a more certain basis, it is essential that every part should be of *uniform strength* to resist the forces brought to bear upon it. The equalisation of the powers of resistance is the more important, as the increased strength of the outer shell is absolutely of no value, so long as the internal flues remain, as at present, liable to be destroyed by collapse, at a pressure of only one-third of that required to burst the envelope which surrounds them.

The following table, deduced from my own experiments, exhibits the safe working pressure, and the bursting pressure of boilers of different diameters, calculated for an external shell of a thickness of 3·8ths of an inch.

Diameter of Boiler.	Working pressure.	Bursting pressure.
ft. in.	lbs.	lbs.
3 0	118	708½
3 6	101	607
4 0	88½	531
4 6	78½	472
5 0	70½	425
5 6	64½	386½
6 0	59	354
6 6	54½	326½
7 0	50½	303½
7 6	47	283½
8 0	44	265½
8 6	41½	250

Taking from the above table the strength of a boiler 7 feet in diameter, we find its bursting pressure to be 303 lbs. per square inch. For such a boiler the flues would be ordinarily 3 feet in diameter, and of the same thickness of plates as the shell; and by the formula, log P = 1·5265 + 2·19 log 100*k*—log (L.D.), we obtain for their collapsing pressure 87 lbs. per square inch. As, however, the formula does not apply with strictness to tubes of such length, the actual collapsing pressure will be somewhat greater than this. The immense excess of strength in the outer shell is, however, sufficiently apparent; the extra thickness of boiler plate which causes it being so much material thrown away, adding nothing to the strength whilst the flues remain in so dangerously weak a condition.

To meet this disparity of strength, the experiments indicate the necessity of *shorter* flues, and one of them shows how this may be obtained, practically and efficiently, without interfering

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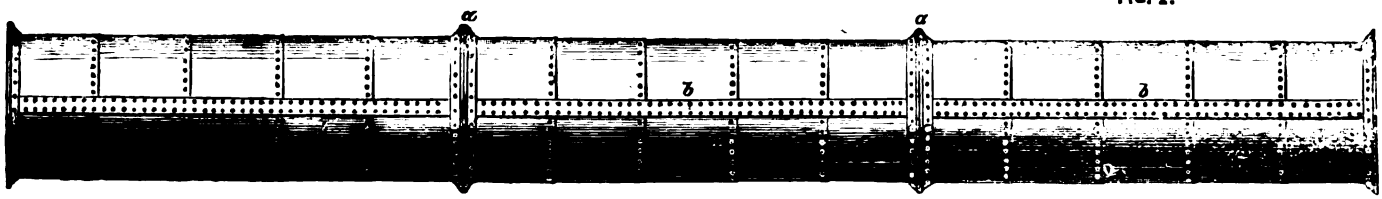
MR. FAIRBAIRN'S IMPROVED BOILER FLUES.

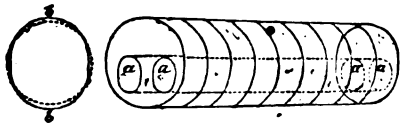
FIG. 1.



With the present construction of boilers. A tube was divided into three parts by two rigid rings soldered upon its exterior, and its powers of resistance were thus increased in the ratio of three to one; *virtually*, the length was reduced in this ratio, and the strength was *actually* increased from 43 to 140 lbs per square inch.

It is proposed to apply a similar construction to the flues of boilers, to equalise their powers of resistance with those of the outer shell, on the supposition that the law of decrease of strength holds true, within no great limits of error, to tubes of much greater length than in the preceding experiments. That this conclusion is not empirical, will be seen by the following experiments upon boilers of full size, where it will be observed that the flues were distorted with one-third the pressure required to rupture the external shell.

These boilers were made for the North-Eastern Division of the London and North-Western Railway Company, and were respectively of 35 and 25 feet in length. They were 7 feet in diameter,

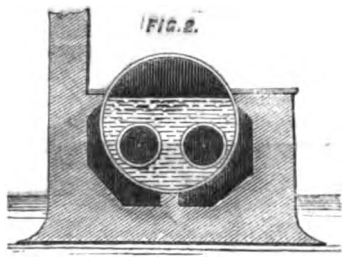


and composed of plates 3-8ths of an inch thick. Each boiler had two cylindrical flues 3 feet 6 inches in diameter, and of the same thickness of plates as the outer shell. They were fixed in the position shown in the annexed diagram, and were intended to resist an ordinary working pressure of only 40 lbs. upon the square inch. In submitting them to the usual test of double pressure, the flues of the first or longest boiler gave way with 97 lbs. upon the square inch; and those of the shorter boiler required 127 lbs. to effect the same distortion. With these large tubes a complete collapse was not accomplished, but the circular form, indicated by the dotted line, was *distorted*, and the flue became elliptical, as shown at *b*, *b*.

The weakness of the flues in the above experiments is so evident as to need no comment. To remedy it, it has been already stated, we need only resort to a construction so simple, and yet so effective, as to meet at a small expense all the requirements of the case. In an ordinary boiler flue, 30 feet long and 2 feet 9 inches in diameter, with simple lap-joints, as hitherto invariably constructed, it will only be necessary to introduce two strong, rigid, angle-iron ribs, as exhibited in fig. 1, at *a*, *a*. This arrangement will increase the strength three-fold, and will not only remove all doubts as to the strength of these flues, by bringing them within the limits to which the formula applies with strictness, but will give to flues 30 feet long, a strength equivalent to that of flues only 10 feet long, and make them uniform in their powers of resistance with the other parts of the boiler.

The reduction of the strength of flues by the lap-joints has already been stated; the deviation from the true cylindrical form which they cause, lessens, in some cases, seriously the strength of the vessels. Hence it is also proposed that flues required to resist an external pressure should be formed with double-riveted *butt-joints*, with longitudinal covering plates, as shown also at *b*, *b*, *b*, fig. 1. Fig. 2 is a sketch showing the positions

FIG. 2.



of the flues which are found preferable in double-flued boilers. It is believed that these alterations will secure ample safety in these important constructions, and in this trust they are commended to the attention of the engineer and the public generally.

CHANDLER AND OLIVER'S STEAM PLOUGH.

STEAM, which was once so restive as to alarm all our peaceful country gentlemen, is now harnessed quietly enough in the field, and will never cease plodding there until something more potent than it is produced. We have not yet finally decided whether the mighty creature is to stand still and do its work by winding endless ropes, or to march about with a train of ploughs behind it. But that it is henceforth in one way or the other to do our ploughing for us is indubitable. The grave question is now, in what form can we construct and combine our ploughs to best suit its peculiar nature. Mr. Fowler has laboured long, and with much success, in endeavouring to solve this question; but other Richmonds are fast flocking to the field, and, the genius of Progress being no respector of persons, he runs a risk of being beaten by them. We sincerely hope, however, that he may not fail of his due reward for his industry, his skill, his persistence, and his prolonged outlay of capital.

Among the persons who have now for some years been working and spending in furtherance of steam ploughing is Mr. Robert W. Chandler, but lately a modest working engineer, at Bow, and associated with him, Mr. Thomas Oliver, a plain and sensible, but enterprising farmer, at Hatfield, Herts, in the neighbourhood of the Marquis of Salisbury's estates. The two together have from time to time patented several valuable improvements in agricultural apparatus, and have recently added to their inventions an improved form of plough, to be hauled by steam power, which many very experienced agriculturists have extolled, which several implement makers have coveted, in so far as its manufacture is concerned, and which Messrs. Howard and Co., of the Britannia Iron Works, Bedford, are now engaged in producing to order. This improved plough has, undoubtedly, many advantages no where else to be met with. It is a balanced apparatus, like Fowlers, but the ploughs are carried by two independent frames, one on each side of the middle of its length. The balancing is effected by rods or chains extending from the extremities of these frames to arms on a rocking shaft at the middle of the plough, or in any equivalent manner; and the inner ends of the plough frames are connected with racks and pinions or other appliances, whereby they may be raised and lowered—the one rising as the other descends. Thus the inner ploughs, which in Mr. Fowler's arrangement must be situated at some distance from the centre of the machine, in order that they may rise and fall sufficiently to clear the ground, and to enter it as desired, may here be brought close up to the centre. Consequently, Messrs. Chandler and Oliver's machine may be made much shorter, and, therefore, much lighter and cheaper than Mr. Fowler's, and the ploughs may be raised when out of action, and lowered into action with great facility. They also plough up closer to the headlands than the Fowler plough, and beside this afford facilities for reducing or increasing the breadth of the furrow according to the nature of the land under operation.

Fig. 1 of the annexed engravings is a side elevation, and fig. 2 a plan of the Chandler and Oliver plough. A, A is the general frame of the machine, which is made of either iron or wood. This frame is omitted on one side in Fig. 2, that the ploughshares may be shown more clearly. The frame is supported upon wheels B, C, D, but the inventors do not limit themselves to this number, as four or more may, if considered useful, be employed. The wheel B is placed on one side of the frame, and is supported on and works in bearings formed therein. When the plough is at work, the wheel B runs in the furrow that has been last made. The other wheels, C and D, are placed on the opposite side of the frame, and are arranged as shown in the figures near the extremities of the apparatus. The inventors prefer making these wheels of the peculiar shape illustrated in the figures. The wheels C and D work upon short axles, which are screwed or otherwise connected to spindles that are bent in such manner that their ends rise perpendicularly, and carry at their upper parts arms E, E, to which cranks, spindles or rods F, F are attached, which are worked by means of the lever-handles G, G, placed at or near the extremities of the apparatus. Thus, by moving these levers in one or other direction, the apparatus can be steered; that is, the leading wheel can be directed outwards or inwards, as required, either for preserving the regularity of the furrows or guiding the plough into fresh land. The hinder wheel revolves in one position, and is so preserved by placing the pin *c* in the hole *d*, until the plough reaches "land's-end," when the pin is withdrawn and placed in the hole in the spindle of the other wheel, which now becomes the hinder wheel. H, H, are scrapers, which are attached to the arms E, E, and move with them to scrape the mud and stones from the wheels as the plough advances. There is a pin *e* in the axle-spindle to regulate the depth to which the ploughs or other instruments of culture work. I, J, are seats (supported by rods attached to the internal frames and plough-share) on which seats the ploughman sits, and from which he can regulate the progress of the plough. J, J, are two longitudinal internal frames, the remote ends of which are connected by rods or chains K, K, to an arm L, vibrating on a transverse axle M, which is centred on a rod that works in bearings in the bracket or support N. The other ends of the frames, J, J, are connected to rods N, N, which are in communication with the racks O, O, into the teeth of which gears a pinion on a shaft, which is worked by the handle R, on turning which the racks are raised or lowered, carrying with them the longitudinal internal frames J, J. There are rollers in the brackets N, N, against which the racks work in their ascent and descent. Thus, on turning the handle R, the the frames J, J, can be raised or lowered with perfect facility. A sectional view of the bracket

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CHANDLER AND OLIVER'S STEAM PLOUGH.

FIG. 1.

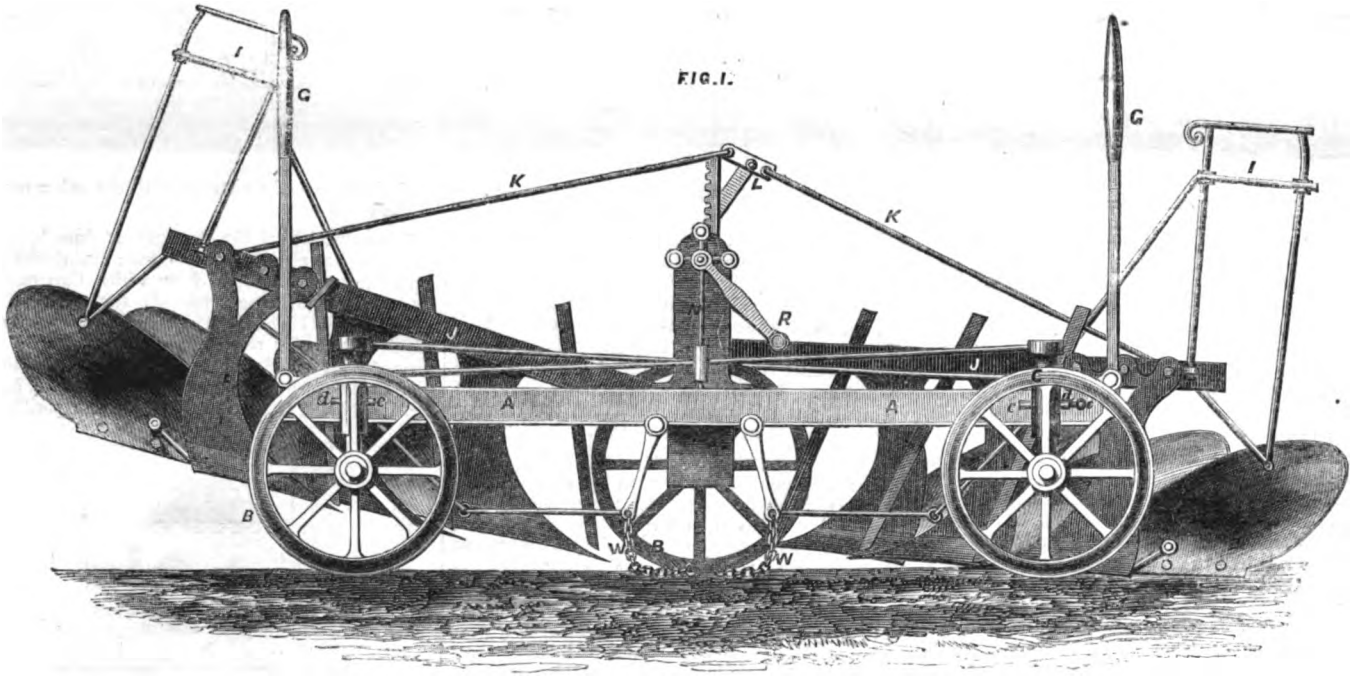
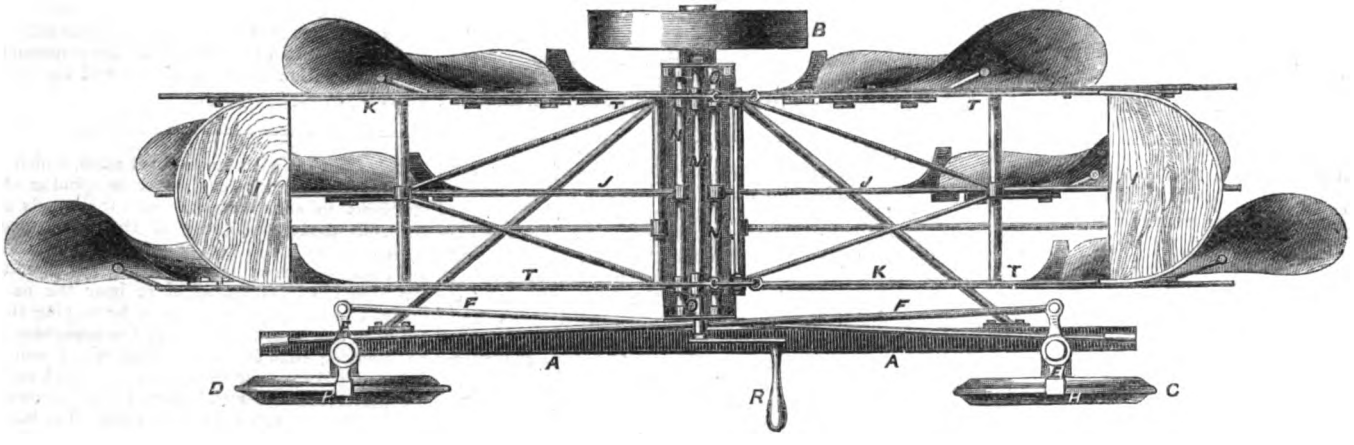


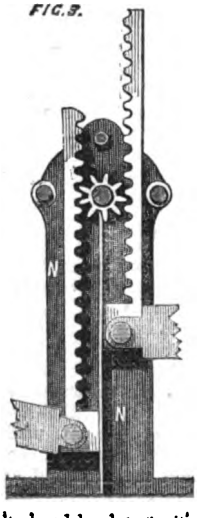
FIG. 2.



N is given at Fig. 3. There are internal frames T, T, which are on the same shaft as the frames J, J, so that they are raised or lowered as the case may be at one and the same time. To these frames J, J, and T, T, the ploughs or other cultivating instruments are attached, and are raised or lowered with the frames to which they are fastened by turning the handle R as before described. Rods or levers are attached to shafts fixed in the lower part of the brackets N, and to these rods are connected links, which are fastened to the framing. Chains W, W, pass from the rods underneath the apparatus in contrary directions, and to these chains the rope, which passes round the drums of the engine, is attached. Or the rope or chain, by which motion is given to the apparatus, may be passed over a pulley at the extremity of the internal frame.

The hauling rope or chain may be driven by any suitable prime mover, but Messrs. Chandler and Oliver prefer to employ for the purpose a portable engine, with two longitudinal winding drums, placed on horizontal axles beneath the engine. Or the engine described in the Specification of a Patent granted to them on the 25th June, 1856, may be employed with advantage for the purpose. For anchoring the hauling ropes or chains, they employ an anchor formed of a bed furnished with cutting and holding blades below, and a winding pulley or drum above, and also with a ratchet and pawl arrangement, whereby the pulley or drum may be turned round and a rope (the other end of which is fixed) be wound upon it, so as to draw the

FIG. 3.



anchor along the head-land as required, the blades cutting through the soil as the anchor advances;

THE DRAINAGE OF LONDON.

ATTENTION has again been directed to "The Great River Question," by the paper "On the Utilization of the Sewage of London and other Large Towns," read by Dr. Joule, before the Manchester Literary and Philosophical Society. Dr. Joule has been enabled to judge of the value of the works which are now being attempted; and the result of his investigation is but the reiteration of what has long been pointed out by the MECHANICS' MAGAZINE, and by almost every other paper whose sphere includes the practical application of science. It is, perhaps, of little avail that a rate-paying public, which cannot now help itself, and a Board possessed of almost unlimited powers in perpetrating and carrying-out, at a vast expense, their gigantic blunder, and which has now gone too far to retreat, should be informed that a few years must prove that the millions devoted to the drainage of the metropolis have been wasted. But in justice to those men of science and undoubted capability whose opinion has been disregarded; in justice to the Royal Commission, whose scientific suggestions, forming the groundwork of a rational plan, have been publicly ignored, but privately adopted as a makeweight in a false and pernicious system; this inevitable conclusion must be insisted upon. The discharge of the sewage into the Thames—albeit it is

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effected at Barking Creek and Crossness Point—must be regarded as a fatal error in every point of view.

The conclusions arrived at by Dr. Joule are the following:—

1st. That under the new system, great accumulations of deposit would take place, which, being carried into the river by storm overflow, would continue to pollute the Thames.

2nd. That the sewage would not be entirely prevented from returning to the metropolis.

3rd. That the river would be rendered particularly noxious at the point where so vast a quantity of offensive matter was to be concentrated; and, in consequence, the large float population, as well as the inhabitants of Greenwich, Woolwich, Gravesend, &c., would suffer most severely.

4th. That the air confined in the new mains would seriously increase the already enormous volume of putrid gases in the sewers.

5th. That the system, as well as that which it was to supplement, could not be considered otherwise than very filthy; inasmuch as, instead of removing sewage to the soil, which is a natural deodoriser, it would cause its accumulation in the bed of the river, at only a few miles distance.

In dwelling upon those points of agricultural economy, the neglect of which must soon impoverish our internal resources, and lead to national distress, the author showed that the daily waste occasioned by the wholesale loss of the constituents of organic growth is, in London alone, equivalent to 2,723 tons of butchers' meat, potatoes, and bread, and 860,000 gallons of milk, beer, and other liquid food—a loss which would speedily reduce the country to a state of barrenness, were it not for the importation of large quantities of food and manure from foreign countries. But guano cannot last for ever. If the produce of the Chincha Islands, which afford it most abundantly, and of the best quality, was reserved for the sole use of Britain, they would, at the present rate of consumption, be exhausted in sixty years. The author also pointed out that with regard to the importation of cattle, corn, and bone manure, such supplies would continue only so long as foreign governments remained ignorant of the permanent injury inflicted on their own fields. Liebig has already complained that, if the exportation of bones continued at the present rate, the German soil would become gradually exhausted.

There can be no doubt that the soil of nearly the whole of Europe is becoming gradually exhausted; nor is the future, when sterility must meet the increase of humanity, so far distant as to be beyond the limits of our anxious consideration. Sterility is no necessary consequence of the increase of consumption, as is proved by the agricultural history of Holland and of China. But when the traveller from these countries, and from "New Zealand, shall take his stand on a broken pier of London Bridge," and look upon the limpid Thames, no longer bearing to the sea the rich freight of ammonia and phosphates which should give strength and life to failing crops, he may, perhaps, moralize upon the strange futuity which, in an age of science, could give nature's materials of life to infusoria and fishes. When these latter have been devoured by sea-birds, and the ammonia and phosphates deposited on ocean rocks, England may no longer require guano!

We heartily concur with Dr. Joule in asserting that we should not be satisfied with merely keeping our agriculture from decline, but that, with a rapidly-increasing population, the wisest course would be to reserve such supplies of guano as we may be able to obtain for the purpose for which it would seem to be designed by nature—that of forming a fertile soil where sterility at present exists. To effect this, we must cease to regard rivers as the "natural drainage of cities!" But it appears hopeless, in the present condition of suicidal neglect of the all-important principles of agricultural chemistry, to look forward to their adoption as a measure of policy and commonsense by the administrative wisdom of this country.

DESMOND G. FITZGERALD.
27 Upper Berkeley-street, Portman-square.

IRON-COATED SHIPS.

GENTLEMEN,—In the very excellent paper by Mr. E. J. Reed, one of the editors of the MECHANICS' MAGAZINE, recently read at the Society of Arts, upon the changes which, during the present century, the ships of the Royal Navy have undergone—a paper abounding in information and judicious observations—there is one statement to which I may be permitted to allude as not being, I think, fully developed.

In some remarks on the proposal to place the "iron armour" of ships at an inclination, and to diminish correspondingly the thickness of the plates, so as to lessen the load, it is observed, that "it needs no appeal to experiment to show that the proposed arrangement would not be attended by any advantage, for the simplest theoretical consideration shows that, for a given height of bulwark, the same quantity of metal will be required to resist a given blow, whatever the inclination may be," inasmuch as the diminished thickness would be exactly compensated by the additional extent of casing. You are well aware that caution and suspicion are entertained by me, almost to the amount of a crotchet, in respect to the truthfulness of the conclusions of mere science in their applications to practical matters, there being so much that is abstract, so much that requires modification by empirical means, before we can arrive at truth in its concrete practical reality. Can experiment be dispensed with in the present instance? I think not.

"If a shot moving horizontally strikes an inclined plane, the crushing force exerted upon the plate is equal to the crushing force which would have been exerted upon it if upright, multiplied by the sine of the angle between the inclined plate and the horizontal." Now this is true only of an abstract, non-abrading, non-crushing *blow*, upon an abstract, unimpressionable surface. If a shot exerts "a crushing force," it is retarded, more or less; and if entirely, the crushing force is wholly unaffected by the sine of the angle at which it strikes, for it is wholly spent. It is true, no doubt, of momentum, as imparted to a body in a direction perpendicular to the inclination of its surface, but only in the abstract again, upon the assumption of the collision being between perfectly elastic bodies. In a breaching force, both the direction and the amount of the components, in its alleged resolution, is altered, if not ignored altogether, and both the cause and its effects require to come under another measure besides that of momentum. A blow, to be viewed practically, must be seen in two aspects, as the result of, and measurable by, momentum, and what more especially belongs to practice, as the result of, and measurable by, *vis viva*; and it is in the latter aspect that crushing effects must be contemplated. The species and phenomena of force cannot be limited to what is observable of momentum alone; and it will depend on practical circumstances, such as the comparative hardness of the conflicting materials, on the velocity being the prominent factor in the *vis viva* of the shot, and on the particular angle at which it strikes, whether it shall freely glance from, crushingly graze, or more crushingly lodge in, or penetrate through, the iron casing of a ship; and the only investigation of these actions and their causes is the experimental.

Well, all this tends only to strengthen the position which the author of the paper has taken, "that the side of a ship will require the same weight of metal upon it, in order to resist horizontal shot, whether it be upright or inclined," inasmuch as the expedient of inclination being nullified in the case of a free glancing shot, it would be yet more useless, in case the shot should hang and tend to penetrate. This is true so far, but there may be circumstances attendant on the abrading action of a shot in an oblique direction, such as the one-sided resistance it meets with, which might, in most cases, cause it to rebound, before that resistance could be equalised on all sides by sufficient penetration; and this would depend on those practical circumstances just mentioned, the effect of which experiment alone could determine. Now, the perforation by shot is, I apprehend, the great thing to be dreaded, and it is possible they may be turned aside by the obliquity of their action under the conditions specified, although without that expedient they may not. If, however, the author means by "crushing force" not that which is exerted in the penetration of the plates, but that which is the result of the blow, in the rending or crippling of the timbers to which they are the casing, then these observations are altogether in aid of his argument.

The great enemy which these tortoise ships of war will have to contend with, is the rifled cannon with steel shot—that is, if bursting can be prevented—for here the velocity of the projectile is prodigiously increased, and it is according to the *square* of the velocity that its destructive effects must be estimated. Hence, a pretty close proximity will always be necessary in an attack on these tortoises, and an armament with a long range will constitute at once their security, and their dangerous character as a foe.

I am, Gentlemen, yours, &c.,
BENJ. CHEVERTON.

PENETRATION BY ELONGATED RIFLED IRON SHOT AND SHELL.

GENTLEMEN,—In the highly instructive and valuable paper read by Mr. Reed, at the Society of Arts, on the evening of Wednesday last, he makes the following observation:—"It is a defence against shells and hollow-charged projectiles generally, and against those only, that iron plating can yet be made available. By applying iron of very great thickness between wind and water, we may reduce the liability to injury by shot to that important part; and it may be well to do this; but if the upper works are made shell-proof, we can export no more. These considerations reduce the question to a form in which it may be practically dealt with, and I doubt not the solution is not very distant."

As I was invited by a letter of invitation from the Secretary, by order of the Council, to take a part in the discussion, I wished to say that, from experiments I made at Cork, nearly seven years ago, with the two-groove 14-bore service rifle of that period, in presence of several members of the council of the National Exhibition held there; and from the results of those experiments I felt confident that rifled cannon would sooner or later be adopted in the service; and the wonderful range and accuracy of fire obtained by Mr. Armstrong's rifled cannon fully bore me out in my expectations. But as, from some misconception in the mind of the Chairman, I was not allowed to proceed, I now beg to state that, judging by the results of those experiments, no iron armour can be put on a man-of-war that will be a protection against elongated iron shot and shell, formed after the manner of those I experimented with at Cork, although iron armour would be a protection against Paixhan's shells. An extract from Col. Beamish's letter to the editor of *The United Service Journal*, of August, 1852, fully and clearly explains the nature and results of those experiments.

I am, Gentlemen, yours, &c.,
Rosherville, 20th Dec. J. NORTON.

FINE ARTS.—We understand Mr. Greville Fennell has been experimenting on hard and soft vulcanite, in order to make it subservient to the uses of the artist, as a medium for receiving oil colours. We hope shortly to publish an account of all his experiments. Mr. Fennell intends liberally to present the result of his labour to the profession.

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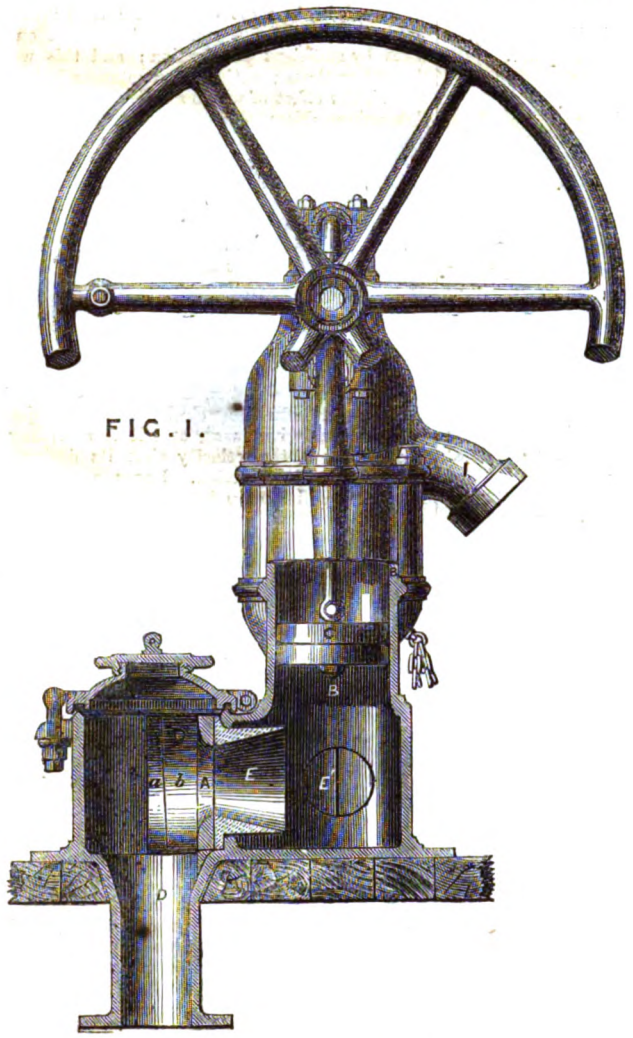
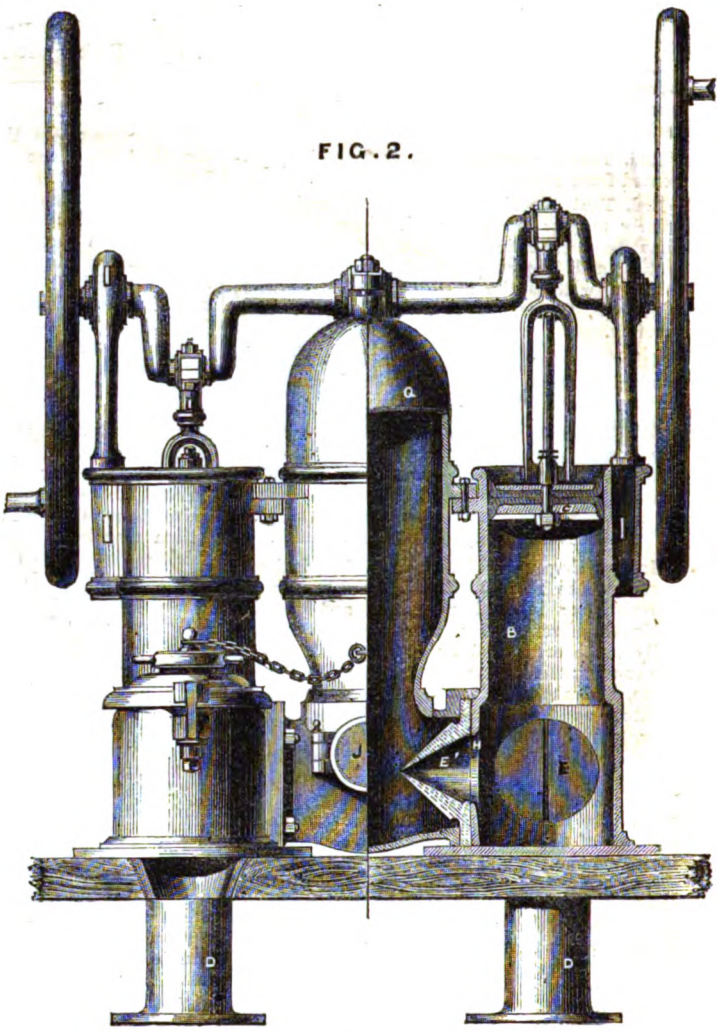
SUFFIELD'S IMPROVED SHIPS' PUMPS.





SUFFIELD'S IMPROVED SHIPS' PUMPS.

WE have had numerous improvements in ships' pumps lately, for which we ought unquestionably to be grateful. No disaster can be more appalling than the sinking of an inhabited ship at sea, unless it be the burning of such a ship, and it is to the pumps that we have, of course, to trust, in the event of accident, for security from both these evils. The extent to which the ocean now swarms with passenger ships renders us eager to embrace every real improvement in these appliances, however modest and unpretending its character may be. For this reason we bring an improved pump, arranged and manufactured by Messrs. Suffield and Co., of Bermondsey-wall, to the notice of our readers. This pump has no very remarkable novelties embodied in it. Its great merit lies in its careful adaptation, by a person of great practical experience, to the varied requirements of service on board ship. For many purposes, where the duty is not too severe, Mr. Suffield fits his pumps with Perreaux's valves, which are now becoming well known, and specimens of which may be seen in operation at the South Kensington Museum. We recently witnessed the working of the Suffield pump, fitted with these valves, and found the results truly astonishing. The great and most characteristic merit of a pump is the liability it has to choke. The advantage of the Perreaux valve in this respect is well understood; and, on the occasion just referred to, we saw bulky pieces of sacking, workmen's jackets, and other like articles, drawn completely through the pump, without any evil effect whatever, and without any kind of difficulty.

In the annexed engravings we have represented, in fig. 1, a side elevation partly in section and in fig. 2, a front view one-half in section, of one of Mr. Suffield's pumps, fitted with Perreaux's valves, and arranged for working with cranks, fly-wheels, and common handles. The channels, AA, are formed separate from the barrels, BB, in which the plungers, CC, work. The passages, AA, from the suction-pipes, DD, to the barrels, BB, are fitted with valves, EE, opening inwards towards the barrels. *aa* are castings or feathers, and *bb* wedges for keeping the valves in their places. The delivery from the barrels takes place through ports, HH, fitted with other valves, E'E', opening outwards into a common pipe, fitted with a dome or air vessel, Q, and with two screwed collars, I and J. For pumping purposes, the under-collar, J, is closed by a screw-cap, and the delivery takes place through the upper collar, I. On the contrary, when the pump is to be used as a fire-engine, the upper collar I, is closed, and the hose is screwed on to the under collar J, the upper part of the vessel forming an air-chamber.

Although we have spoken of these pumps mainly as ships' pumps, they manifestly need but little modification to adapt them to various other purposes. When fitted on board ship, suction-pipes are led from various parts of the ship, and their upper ends are all brought together in a casting, close to the main suction-pipe leading to the hold, and are all furnished with screw-caps to close them. Then, by means of a goose-neck, or other suitable coupling-piece, the pump may be connected to either of the suction-pipes, and thus made to draw from any part of the ship.

At the trial of the improved pump referred to above, we were unable to institute any comparative tests with existing pumps; but the flow kept up by a few men from a depth of many feet was so copious and so uniform as to leave but little doubt of the efficient working of the machine. Indeed, it was the opinion of one very experienced engineer who was present, that he had never before seen results equal to those then obtained, and we must acknowledge that his opinion was not formed without considerable reason. The demand for the improved pump—proceeding, as it does, from a well-known firm of great practical experience—is so great that several dozens are now in progress of manufacture.

We have said that Mr. Suffield uses the Perreaux valve where the duty is not too severe. He does not, however, confine himself to the use of this valve, but prefers, in some cases, other valves of an improved description.

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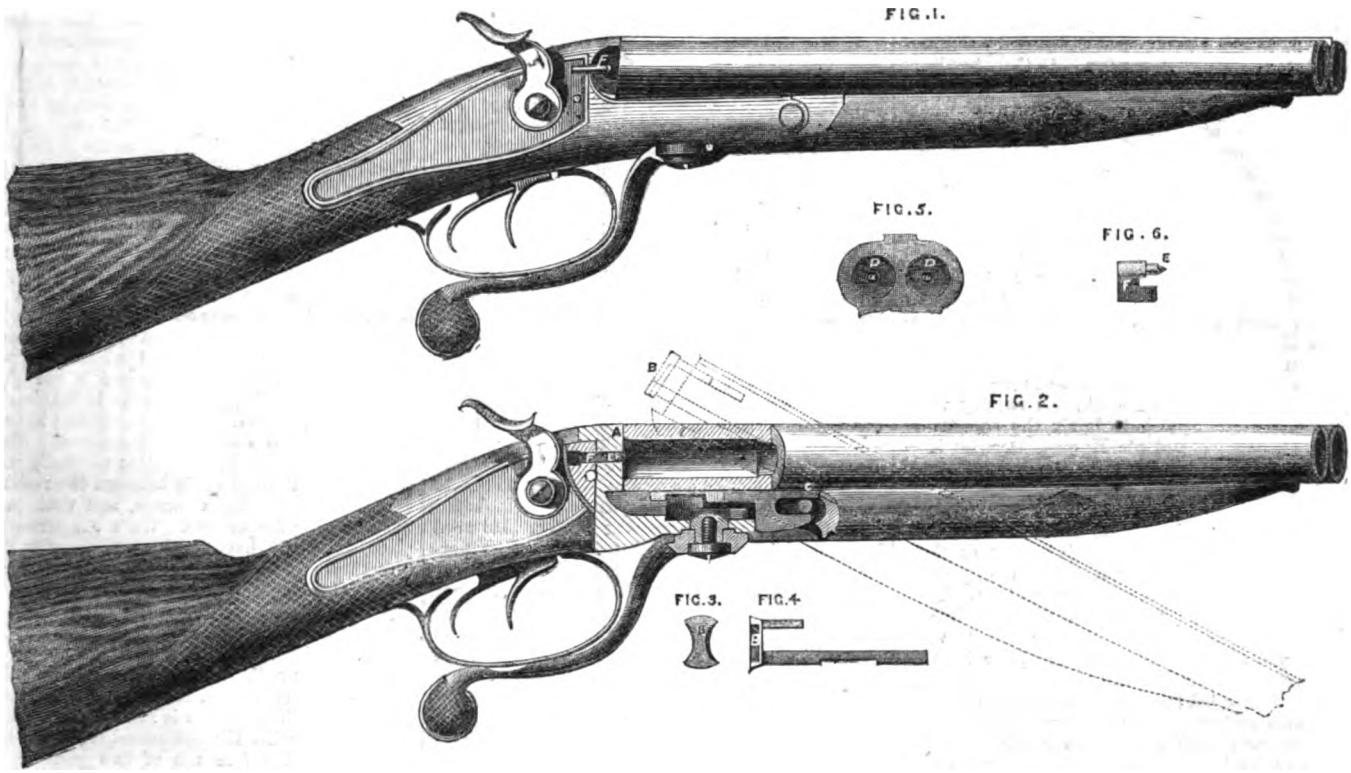
LANCASTER'S BREECH-LOADING RIFLE.



LANCASTER'S BREECH-LOADING RIFLE.

MR. Charles W. Lancaster is universally known, both as a manufacturer of first-class guns, and as an inventor of valuable improvements in small-arms as well as ordnance. But his latest improvement, an admirable breech-loading rifle, has not yet been brought to the notice of the public, although it has already gained golden opinions from sportsmen. This rifle is of that class in which, when the piece is to be loaded, the barrel is drawn forward from the breech, and turned down, so as to present its rear end to receive the charge; and Mr. Lancaster's improvements are four in number. They consist, First, in undercutting the abutment or stationary breech against which the barrels rest when ready for firing, and in cutting the rear of the barrels to correspond, in such manner that when the barrels and breech are in contact, the overhanging part of the breech prevents the rear of the barrels from rising. Secondly, in forming sunken recesses in the inclined face of the breech, to enable the rear end of the cartridges to be supported in their own plane, that is, square to the bore. Thirdly, in fitting the strikers, which carry the points for exploding the cartridges, without springs, the points and strikers being pushed back by the cartridges coming in contact with the points when the rear of the barrels is forced home in the breech. And, fourthly, in constructing the extractor or instrument whereby the cartridges are pushed out from the rear of the barrels when they are tilted preparatory to re-loading, in such manner that it (the extractor), takes the cartridges at two points, and embraces a considerably larger portion of the capsule or rear of the cartridges than heretofore.

The annexed engravings represent these various improvements. Fig. 1 is a side elevation, and Fig. 2 a side elevation partly in section, of so much of a double barrelled gun as is necessary for the elucidation of the invention. A, is the face of the stationary breech. The dotted lines, Fig. 2, show the position of the barrels when tilted prior to re-loading. In this position the extractor B is protruded from the rear of the barrels by its frame coming in contact with the fixed projecting stud S. The extractor seizing the rear of the cartridges at B carries them partially out of the barrels, the fingers being employed to remove them entirely. Face and side views of the extractor B are shown separately at Figs. 3 and 4. Fig. 5 is a front view of the face of the breech. D D are the sunken parts for the reception of the rear of the cartridges, E E are the points (shown separately in side view at Fig. 6) which work in holes *a a* formed in the centre of the sunken surfaces. These points are formed in a piece with the strikers F F, which are free to move to and fro in recesses or slots formed for their reception. They are moved forward by the action of the hammers to explode the cartridges through the points E E, and upon the hammers being raised they are pushed back by the capsules of the freshly inserted cartridges, ready to be again driven forward, as before explained. With this rifle, escape of gas at the breech is rendered impossible, the metallic end of the cartridge remaining intact during the discharge.

NAVAL WARFARE WITH STEAM.*

IF an expert swordsman had a friend who was about to fight a duel, he might show his love of the science of fencing, and might also contribute towards its advancement, by imparting his knowledge to both the combatants. But such impartial conduct would hardly be considered friendly by the man who had claims upon his consideration. If we suppose, moreover, that the friend of the scientific adviser possessed greater quickness of eye and strength of limb than his opponent, and placed his confidence in this superiority, he would have additional ground of complaint. In like manner we doubt not, when it is remembered that the English navy has always, and justly, cherished such a confidence as this, many naval officers will regard the publication of Sir Howard Douglas's advice on steam naval warfare as injudicious.

He says, at the close of his book—"It is hoped that the principles inculcated in this work will be found sufficiently intelligible to enable a good tactician to apply them in any form of battle which he may initiate, or which he may assume, either for the purpose of counteracting any measures taken by the enemy, or to take advantage of any false movement which he may make"—the enemy spoken of being, of course, the opponent of the *good tactician* who studies Sir Howard's work, and who may be an Englishman, but is just as likely to belong to the nation of whose periodic fits of sans-culottism and imperialism we are supposed to stand in jeopardy every hour. But we must plead as an excuse for our author, the peculiarities of the warlike constitution of the British seaman; and the plea will doubtless be deemed amply sufficient. The characteristic habit of our navy, associated with all its traditions, seems ever to have been to consider circumspection and caution as indicative of weakness, and to scorn, as dishonourable artifice, the use of that strategy which constitutes the skill of the *military* commander. As soon as the enemy appeared in sight the English officer thought himself bound to bring them at once to close quarters, and put all to the issue of a hand-to-hand combat, even although the longer range of his guns, and his inferiority in numbers, showed such a course to be unwise and dangerous.

The English admiral has, from the days of our earliest triumphs, strained every nerve to obtain the weather-gage of a hostile squadron, that he might cut through its line, grapple his enemy to leeward, and prevent all chance of escape. The continental chiefs do not seem to have thought it necessary to take any such means for securing a fair fight, but satisfied themselves with such a disposition of their forces as would do most damage to their rash opponents.

So at Trafalgar. "Admiral Villeneuve," says one of Nelson's biographers, "made his own disposition with the utmost skill, and the fleets under his command waited for the attack with perfect coolness." Sir Howard says—"Villeneuve's nautical science was in advance of the practical methods of that day; and it did present great obstacles to the success of Nelson's plan of attack;" and further,—"There can be no doubt that the novel formation which Villeneuve attempted, though frustrated by the disabilities of the sail, shadows forth the adoption of this order of battle which the author

* "On Naval Warfare with Steam." By General Sir Howard Douglas. Murray.

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has endeavoured to propound, and which will undoubtedly hereafter become an established formation in steam warfare." The English fleet was in two parallel lines—the windward one led by Nelson, in the *Victory*, and the other by Collingwood, in the *Royal Sovereign*. As these two lines advanced, at about a mile-and-a-half per hour, each of the foremost ships, the bows of which were square and thinly planked, was under the raking fire of the broadsides of eight or nine ships, consisting of hundreds of guns. Before the *Victory* could reply by a single gun, she had lost fifty men, and had her main top-mast, with all her studding sails and booms, shot away. After having been under fire forty minutes, she reached the enemy's line, and ran into the *Redoutable* just as her tiller-ropes were carried away by a shot from that ship. Admiral de la Gravière thinks that, with ordinary gunnery practice on the part of the French and Spaniards, Nelson would have seen his ships smashed to pieces by those of the French, like cavalry when improperly attempting to break the squares of steady infantry; and Sir Howard Douglas is of opinion that, "if the present improved state of gunnery had existed then, the divisions of the British fleet would have been entirely disabled before they came to close action." What is more manifest than that such actions as these were won by sheer "pluck," in opposition to, and in contempt of, scientific strategy. Thus it has ever been. The Dutch, the French, and the Americans have done their naval work scientifically; and, although they have been so overmatched in the end that the foremost amongst them is compelled to say, "*Je ne suis pas de ceux qui dans l'illusion de l'amour-propre nationale, nous croient en état de lutter sur mer d'égaux à égaux contre la puissance Britannique*,"* yet they have made their self-confident enemy suffer severely for his rashness. But, while Englishmen have been thus neglectful of naval strategic science, France has given birth to Paul l'Hoste, a man who may be said to have been its creator; and among her sons are still to be found some of its ablest expounders.

Hitherto the great difficulties in handling sailing ships, and the capricious nature of the elements on which success depended, have frequently deranged the most skilfully-devised plans of operation, and rendered anything like complexity uncertain and dangerous. Ships in order of battle have formed in lines ahead or in lines abreast, and there was but little else they could do with anything like precision.

"But steam propulsion entirely annuls all the limitations and disabilities imposed by the wind on the evolutions of fleets, and opens the whole surface of the ocean as a battle-field for the contests of steam fleets. . . . . The movements of steam fleets may, like those of armies, be conducted on tactical principles best adapted to the great end of all preliminary manœuvres—the formation for battle in the most simple, speedy, and precise manner. This power of executing the evolutions of fleets and armies on the same tactical principles, cannot but be considered as one of the greatest benefits which will result from the application of steam propulsion in naval warfare. The intended formation may, in all cases, be accomplished by steam fleets, with as much precision as the formation of an army on land, and with the like regard to the avoidance of a premature display of the whole force, or a disclosure of the intentions of the commander. . . . With this new power it may be presumed that success will more than ever depend upon the tactical skill and the quick perception of the chief, together with prompt and resolute execution on the part of hos: under his command."

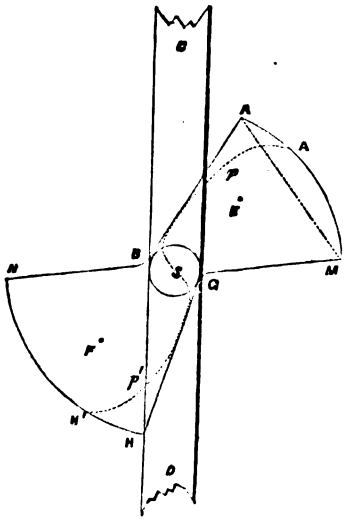
"Naval officers of the old school," says our author, "may at first sight be disposed to repudiate, perhaps to ridicule, the adoption, in their profession, of the principles of military movements and formations, as recommended and expounded by the author. But, moved as fleets will hereafter be, by the obedient agency of steam, so that the station of each ship in a fleet, and the time to be occupied in performing any evolution, can be determined with as much exactness as the post of a regiment or brigade in an army, it must follow that the evolutions of ships of war will be susceptible of being executed with a precision hitherto unknown in the naval service. . . . The rude practice of forming a fleet for battle in one long line has hitherto prevailed in naval warfare, on account, chiefly, of the difficulties and uncertainties imposed by the wind, in executing compound evolutions with sailing ships. These difficulties will not exist for fleets consisting wholly of steam-ships. Armies in the field move in as many columns as there may be practicable roads or opened routes leading to the point at which the intended deployment in order of battle is to take place; but at sea a steam fleet may always be moved in as many columns as there are divisions in its formation, and each ship of a fleet may be considered as corresponding to a batalion in a land army."

If this be true, it is of the utmost importance that our naval officers should set themselves in earnest to the study of naval tactics, which we have the highest authority for saying they have not yet done. Sir Howard Douglas, in the work before us, shows carefully, clearly, and as fully as his limits permit, how the principal military manœuvres may be made available in naval actions.

The former half of the book is taken up by a brief history of the introduction of steam as a moving power to ships, and "an account of the nature and action of steam machinery in its application to the paddle and the screw, together with an inquiry into the relative values of these agents with respect to their powers of communicating motion, and to their conveniencies in the armament of ships of war." Of this part we can say but little. The latter half—on naval tactics—forms an admirable supplement to Sir Howard's incomparable work on "Naval Gunnery." If we might presume to offer advice to Sir Howard, we should say the sooner it is incorporated with that work the better. He need have no anxiety about the fate of the other portion, as it will, in our opinion, never do him any abiding credit. After this statement of our opinion, minute criticism is unnecessary. There are, however, two things in it we should like to notice. One has reference to the tremulous motion of the sterns of screw-ships, and the other to the use of the trunk in screw-ships of war.

The author says, on the first point:—

"The shake of the screw, and the consequent injury to the stern of the ship, are caused by the sudden and violent reactions of the disturbed water in that place against the blades of the screw as they enter and emerge from thence. The rectilinear edges of the ordinary screws are, in this respect, highly disadvantageous, since the whole of an edge enters and leaves at once the water on each side of the aperture; within which aperture the water is comparatively in a quiescent state; but if the leading edges of a screw-blade were curved, as A' pB, Gp'H', in the figure, they



would slide obliquely and continuously through the water, like a screw formed with an entire feather, so that at no moment would there be any shock or discontinuity of action." Page 60.*

We are afraid that Sir Howard's screw would do very little towards reducing the shock complained of; for the ordinary practice of using two small portions of a screw surface instead of an entire thread has two effects, against which he makes no provision, but which are undoubtedly the main causes of the shocks. The first is, that when one blade of the screw comes vertically over the other, a body of water is driven against the after stern-post, and is brought to rest by the resistance the post offers to it. The tremor of the stern has been, in fact, considerably diminished by fitting angular pieces of wood on the foremost face of this post, and is said to have been almost entirely removed in some cases by working the screw abaft the rudder. The other of these causes is, that a quantity of water is driven off *sideways* by the blades of the screw, as well as fore-and-aft—the upper blade driving it in one direction, the lower blade in the other. If these two forces were exactly balanced, the stern would not be moved towards either side. But they are not so balanced. The water driven off by the upper blade moves much more freely than that acted upon by the lower one. The upper blade is, in fact, not unfrequently partially out of the water. The consequence of this is, that at every semi-revolution an unbalanced pressure is brought on the screw in the direction opposite to that in which the lower blade moves. This is equivalent to a series of blows on one side of the stern-post. Similar forces are also brought into action vertically in consequence of the difference between the resistance on the blade moving upwards, and that on the blade moving downwards. Were the screw complete, we should have continuous pressures in the directions named, instead of the more mischievous intermittent ones. But it will be seen at once that the alteration in form proposed by Sir Howard would not tend to diminish any of these forces.

Again, our author has conceived a violent dislike to the trunk or framework round the well through which the screw is raised. He says that it interferes with the armament of line-of-battle ships, where the free use of two guns on each deck is, on this account, greatly impeded: consequently, he says, there may be said to be only two stern-guns on each deck which are wholly effective. Now, we do not think that this objection is well-founded. It is true that there are only two guns on each deck of our screw line-of-battle ships which can fire in the line of the keel, and therefore which are effective as stern-guns; but that this is not owing to the presence of the trunk may be seen from the fact that our sailing ships have no more. The statement that "by suppressing the trunk, the stern-batteries on each deck would be strengthened by the two guns which the trunk had rendered useless," is without foundation.

He says, also:—

"The steerage of the ship is greatly impeded by the intervention of the trunk, which renders it impossible to use a long tiller, and permits only the substitution of two short arms of a lever, called a yoke, which works within the small space between the trunk and the stern. . . . . The arms of the yoke being short compared with the length of an ordinary tiller, it has been found necessary, in order to obtain sufficient power to turn the rudder, to have a multiplying purchase consisting of a system of pulleys near the end of each arm of the yoke, and also in a main beam in its rear. In consequence of the complexity of this apparatus, a *considerable revolving motion of the steering-wheel* is necessary in order to produce even a small movement of the rudder; and there is therefore a want of promptitude in the corrective power of the helm, when moved by the yoke, which is not experienced when a ship is steered by a simple tiller in the ordinary way." And again, "the *great force which it is necessary to apply to the wheel* in order to give motion to the rudder, particularly when the latter is acted upon by sudden and violent impulses from the striking of waves against it, is also the cause that the steering of screw steamers having trunks, is far less steady than that of ships whose helms are managed by the ordinary tiller."

Are not these statements self-contradictory? There is a certain work to be done by the man at the wheel—viz., to overcome the resistance of the water to the motion of the rudder through any given number of degrees. Now, whatever be the nature of the machinery intervening between the man and the rudder, he must—neglecting friction—perform exactly this amount of work. Representing, then, the work done at the rudder by a certain quantity, consisting of pounds multiplied by feet, he performs this quantity by moving a less number of pounds through a greater number of feet—the nature of the machinery regulating the *relative* numbers of pounds and feet. If by

* The Prince de Joinville, in his famous *Note sur l'etat des Forces Navales de la France*.

* Sir Howard says further that these curved edges would also have the advantage of readily throwing off any floating materials that may come in contact with them. He proposes, also, that the curved parts should be furnished with sharp edges, partly notched like saws, and made of a metal capable of resisting the corroding effects of sea water, by which means they would be rendered capable of dividing any rope, spar, or other floating matter, like a powerful circular saw.

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using the yoke "a considerable revolving motion of the steering-wheel is necessary"—*i. e.* if the number of feet is greater than when a tiller is used—it is impossible that it should be necessary to apply greater force to the wheel. Unless it can be shown that there is more friction in the yoke than in the tiller arrangement, we must conclude that it is possible to work the rudder by the same power and with the same promptitude. The amount of friction will depend only on the number and position of the sheaves, and it is quite possible in most cases to make as good an arrangement for the yoke as for the tiller. In fact, it is the practice in the Royal navy to make the rudder go hard over, *i. e.* through 35°, by 3½ turns of the wheel, whatever be the nature of the steering apparatus. We do not deny that the sheaves are frequently so badly placed as to impair the efficiency of the yoke. The yoke-arm and the fixed block are allowed to come so close together when the yoke is hard over, that the ropes of the pulley lose their parallelism, and get jammed. There should always be at least 18 inches between the sheaves in the yoke-arm and in the stern when the rudder is hard over. If this were attended to, we should hear no more complaints about the yoke. It would be as effective in a line-of-battle ship as it is in a gig.*

Sir Howard speaks also of the great force of torsion exerted by the yoke on the rudder-head tending to wring it. He surely cannot wish us to believe that a tiller is less injurious?

With reference to the trunk, we do not doubt that naval officers would be very glad to get rid of such an incumbrance from their cabins; but they would find it rather unpleasant work to raise the screw in bad weather were it suppressed.

We must say a word or two, in passing, on the question of *slip*. We have always understood the slip of a screw to be the ratio of the *loss* shown by the difference between the velocity of the screw in advance and that of the ship, to the *velocity* of the screw in advance. We may cite as an authority to this effect a work quoted as such by Sir Howard, "The Marine Steam Engine," by Brown and Main, 2nd Edition, (the definition and investigation in the 1st edition, p. 270, are incorrect.) But, according to Sir Howard, *slip* is the recession of water from behind the screw. He says:—

"If the water re-acted upon the screw of a steamer precisely as a nut re-acts against the threads of a screw which works in it, the vessel would move through a space equal to the pitch of the screw in the time that the latter makes one revolution on its axis; but such speed is not realised in practice, first, on account of the recession of the water (the slip) from behind the screw, after being acted upon by the latter; secondly, the water in advance of the screw is not free, &c., &c." Page 42.

It is really an important thing to endeavour to preserve scientific terms from corruption—we shall otherwise get into endless confusion. One of the consequences of this very misapprehension on the mind of the author is, that he attempts to show how this slip may become negative—the ship being propelled by the engines only. (Page 37.) We must point out also one very serious misstatement of facts in the latter portion of the book, which has evidently arisen from the loose way in which the term bow-gun is used among naval men. Sir Howard says:—

"A line-of-battle ship fully armed at bow and stern, as well as on her broadsides, has no dead points, since she can bring guns to bear in every direction about her. The bows of such ships are armed with a 68-pounder solid-shot pivot-gun, and there are, besides, *four bow-guns* on each deck." . . . . "Thus, the bow-batteries of a two-decked ship consist of *nine* heavy guns, and those of a three-decked ship of *eleven*. Though ships of the line are thus really strong at bow and stern, these are technically called the weak points." . . . . . "When a fleet is ranged in order of battle called line ahead, a great amount of gunnery power in the bow-batteries is utterly out of action; this, in a fleet of twenty ships of the line, of which six may be three-deckers, will amount to 152 heavy guns, whose fire is masked by the leading ships."

It may be seen from these quotations that by bow-guns Sir Howard understands those which can be fired in the direction of the keel. But we can assure him that there is not a line-of-battle ship in the whole service that has more than two such bow-guns on a deck. We are afraid there are but few which have even these, and that some of our modern line-of-battle ships have nothing but the pivot-gun, which can be fired in the direction of the keel.* But the importance attached by him to these guns in the formation of line-of-battle *en échelon* shows how wrong it is to weaken this portion of the ship's armament. The trifling advantage gained in speed, by increasing the fineness of the bows of our two and three-decked ships, can never compensate for the consequent weakness of their bow-batteries.

We must now bring our notice of the book to a close. It is, in all probability, the last work which its distinguished author will give to the country he has served so long and so well—for he is more than four-score years of age. Yet the book bears no evidence of this, but is, on the contrary, clearly and vigorously written, and will form a most useful companion to the indispensable "Naval Gunnery." It will have the effect of arousing the attention of naval officers to the importance of the subject treated, and will, we doubt not, be the precursor of more elaborate treatises on naval tactics. One present effect which it ought to produce is, the appointment of a commission of naval officers — or, perhaps, a mixed commission of naval and military officers would be better—to consider the changed tactics which the introduction of steam has rendered essential. We know that this subject is weighing anxiously upon the minds of some of our most intelligent and patriotic commanders, from our Admirals downwards, who justly fear that our present neglect of the question may prove disastrous to us in the event of a naval war. All honour is due to Sir Howard Douglas for his zealous and able effort to concentrate attention upon this vital point, and we earnestly hope the Admiralty will avail themselves of the feeling created by the appearance of his work and appoint such a commission as we have suggested, or by some other means provide for the enlightenment of the naval service upon its new duties.

The Literary and Educational Year-Book for 1859. London: Kent and Co.

WE have just seen the proof-sheets of this most valuable book of reference. It is just the thing which literary and scientific people very much wanted, containing, in a concentrated form, an immense mass of useful information—such as lists of all the books published during 1858, with the size, price, and publisher of each book; lists of all metropolitan and provincial newspapers and periodicals, stating price, day of publication, and peculiar politics, or nature of each; lists of the year's maps and prints; the names and addresses of nearly a thousand professional and gratuitous lecturers of the country, with the subject treated of by each person; lists of mechanics', literary, and other educational institutions. It also gives the names of all the successful candidates of the Oxford middle-class examination, and similar information relating to the Society of Arts Union of Mechanics' Institutes, and what, perhaps, will be considered still more valuable matter to some people, viz.; the requisite information referring to the next final examination, including instructions to candidates, subjects on which they will be examined, and the authorised books which they may consult to prepare them for the contest. The book also contains a great deal of information on the learned and scientific societies of London, giving a kind of birds'-eye view of the nature, objects, and present condition of each society. Take, for instance, what it says about the Institution of Civil Engineers. It first gives the name and address of the Institution, then when it was founded and incorporated by Royal Charter, the names of the council and honorary councillors, and a *resumé* of the general objects of the institution; then follows information about election fees, annual subscriptions, the time when the library is opened, the president's *conversazione*, &c.; and lastly, we have the titles of all the papers read before the Society during the session 1857 and 1858, with the name of the reader of each. Almost every other learned institution of the metropolis is treated in a similar manner. Our space will not permit us to specify the varied kinds of reference matter with which the book abounds; but we must not omit to notice that it contains the list of works printed by order of the Commissioners of Patents for Inventions, including chronological indices and classified abridgments of all specifications of patented inventions, from the earliest enrolled to those published under the act of 1852, and the places where such works may be daily consulted in the United Kingdom. After this hasty glance at the contents of the book, it only remains for us to recommend it to each reader, as by far the most voluminous, complete, and accurate compilation of the kind that has ever yet appeared. It deserves to sell, and we doubt not will sell to an unprecedented extent.

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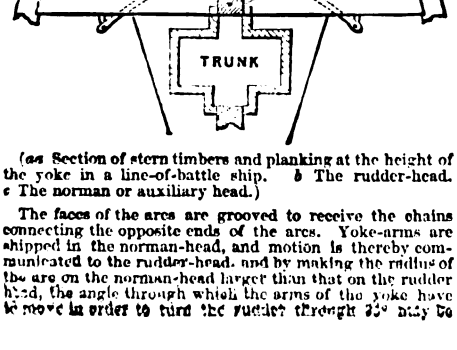
* There are cases in which the space between the trunk and the stern is so limited, that not only is there no possibility of preventing the jamming of the ropes when the yoke is hard over, but it is even found necessary to cut into the angle of the trunk and into the stern-timbers, and to put the blocks outside the ship in order to get the rudder over 32°. This is the case in the *Agamemnon*, and some other line-of-battle ships. That this is highly objectionable there can be no question. There is, however, a model at Somerset House, showing an ingenious and practicable mode of avoiding this by means of multiplying gear. A portion of the head of the stern-post is cut off, and an iron norman-head, 18 in. or 2 ft. long, is fitted between the under-side of the after-beam, which is generally about 2 ft. before the rudder-head, and the top of the stern-post. Both the norman-head and the rudder-head have a portion of an arc of a circle worked on the front of them, the circumferences of the two arcs touching each other, as shown in fig. 1.

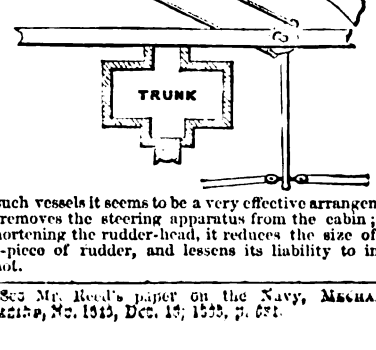
FIG. 1.



(*a*a Section of stern timbers and planking at the height of the yoke in a line-of-battle ship. *b* The rudder-head. *c* The norman or auxiliary head.)

The faces of the arcs are grooved to receive the chains connecting the opposite ends of the arcs. Yoke-arms are shipped in the norman-head, and motion is thereby communicated to the rudder-head, and by making the radius of the arc on the norman-head larger than that on the rudder head, the angle through which the arms of the yoke have to move in order to turn the rudder through 35° may be reduced to any extent that may be required. As we have already explained, the only loss experienced by such an arrangement would be by friction. The chains need only be of the same strength as the threads of the screws by which the lugs in ordinary yokes are set up. Admiral Martin, one of the present Lords of the Admiralty, has an arrangement to effect a similar object. It appears, however, to be only applicable to frigates and similar vessels, as it is to be fitted below the lower deck, and the rudder-heads of larger vessels pass out through the counter above or at the lower deck; there would also be great objection to its use in a cabin. He fits in the *Termagant* (the experimental vessel,) a norman-head between the ship's counter and the under side of a lower-deck beam, and at such a distance from the middle of the ship as to allow a tiller to work on one side of the trunk. Motion is communicated from the norman-head to the rudder-head by means of two bars of iron attached to lugs on the sides of the norman and rudder-heads (fig. 2).

FIG. 2.



For such vessels it seems to be a very effective arrangement, as it removes the steering apparatus from the cabin; and by shortening the rudder-head, it reduces the size of the main-piece of rudder, and lessens its liability to injury by shot.

*See Mr. Reed's paper on the Navy, MECHANICS' MAGAZINE, No. 1813, Dec. 18, 1858, p. 681.

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Numbers 1845 and 1846 of the MECHANICS' MAGAZINE (original series), containing the paper read at the Society of Arts, December 15, 1858, "ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY IN RESPECT OF DIMENSIONS, FORM, MEANS OF PROPULSION, AND POWERS OF ATTACK AND DEFENCE," by one of the EDITORS of this Magazine, together with the discussion upon the same, are still on sale.

The publication of an illustrated article on BLACKBURN'S GREAT STEAM TRACTION ENGINE, which was to have appeared in this Number, is unavoidably deferred for a short time.

NOTICE TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 6d, per line for any number of insertions less than 13; for 13 insertions, 5d. per line; and for 52 insertions, 4d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 6 o'clock on Thursday evening each week. None can be received after 9 o'clock on Friday morning for the ensuing number.

NOTICE TO CORRESPONDENTS.

☞ The practice of publishing a vast quantity of fictitious Notices to Correspondents has become so general in cheap journals, that the public, who are not in the secret, have come to consider it the duty of Editors to answer any and every question that may be put to them by readers. This cannot, however, be done in a journal like our own without entailing an immense amount of labour (often of a very unnecessary character) upon us. We, therefore, beg most respectfully to decline the task. But in order that our correspondents may not be deprived of all advantage in this respect, we shall, as a rule, publish such queries as may be sent in good faith to us, though not such as appear to be sent merely for the sake of giving trouble. To the published queries other correspondents will, we hope, reply, and their replies shall likewise be published. By this arrangement we shall save ourselves much inconvenience, and at the same time secure, we trust, to our readers all the information they may desire. All questions must be stated simply, clearly, and without circumlocution of any kind; and we shall feel grateful to those correspondents who kindly take the trouble to send such information by way of reply as they may possess. Mere questions of business we shall of course answer ourselves; but whenever calculation, reference to published works, &c., are necessary, we shall dispose of the questions sent as stated above.

CORRESPONDENTS' QUERIES.

Gentlemen,—Please to allow me to make the following enquiries through your pages:—

How must I proceed to set out a sweep for striking out a screw with an increasing pitch? I use the hypothenuse of a right-angled triangle for the common screw, and I know the line will be a curve for an increasing pitch, but how am I to find that curve and set it out?

2. The distance between the tubes of a tubular boiler is a constant quantity, *d*; what must be the diameter of the tubes so that I may have a maximum of heating surface?

3. If I suddenly compress a quantity of atmospheric air to half its bulk, what heat will it be raised to?

Your's respectfully, A PRACTICAL ENGINEER.

ON THE CONSERVATION OF FORCE.

GENTLEMEN,—You will remember that some little time ago a discussion took place in your pages on the above subject, as taught by Professor Faraday in a lecture previously delivered at the Royal Institution. You will remember, too, that you permitted me to take part in that discussion. Wishing to learn something further of this doctrine from its leading professors, I have been recommended to read Mr. Grove's essay on the *Correlation of Physical Forces*, and a paper by M. Seguin, read before the French Academy, and published in *Cosmos*. I have perused both these performances, and wish to offer you a few remarks on their respective merits, hoping you may judge them worthy of a place in your Magazine.

Mutual misunderstanding or misinterpretation of terms has been the cause of many a great dispute. And one seldom witnesses a discussion in which the main power of the disputants is not wasted in attempts to refute what has never been advanced, or to establish what has never been questioned. The most important terms employed in the dispute receive different meanings from every person; and some, indeed, are endowed with several distinct significations by the same individual. It is of the greatest moment, therefore, when a weighty doctrine is to be taught, that the words in which it is expressed should be defined with strict precision, and employed with careful integrity. To set forth the exact meaning of the word "force" is absolutely necessary, in order to convey any idea of the subject which heads my present letter. Mathematical writers on Mechanics define "force" to be "the immediate agent which changes, or tends to change, a body's state of rest or motion." After discussing in a somewhat metaphysical manner the terms cause and effect, which have a direct relation to the ideas of force and motion, Mr. Grove says:—

"The position which I seek to establish in this essay is, that the various affections of matter which constitute the main objects of experimental physics, viz., heat, light, electricity, magnetism, chemical affinity, and motion, are all correlative, or have a reciprocal dependence; that neither, taken abstractedly, can be said to be the essential cause of the others, but that either may produce, or be convertible into any of the others: thus heat may mediately or immediately produce electricity, electricity may produce heat; and so of the rest, each merging itself as the force it produces becomes developed: and that the same must hold good of other forces, it being an irresistible inference from observed phenomena that a force cannot originate otherwise than by devolution from some pre-existing force or forces."

Again:—

"The term force, although used in very different senses by different authors, may be defined as that which produces or resists motion. Although strongly inclined to believe that the other affections of matter, which I have above named, are, and will ultimately be resolved into modes of motion, many arguments for which will be given in subsequent parts of this essay, it would be going too far at present to assume their identity with it; I therefore use the term force in reference to them, as meaning that active principle inseparable from matter which is supposed to induce its various changes."

It does not require much consideration to perceive that chemical affinity and magnetism are forces, according to the definition which I have given above. And a very slight relaxation of its rigour, will make it include heat, light, and electricity, which are certainly causes, if they be not immediate causes of change of motion. There is not much to object to in Mr. Grove's definition of forces, but, as we shall see, he does not confine the term to any single idea. It is sometimes used, according to the definition, to indicate the cause of motion, sometimes the motion itself—and this occasions serious confusion. Whether Mr. Grove is unconscious of this disorder I cannot say. I think, however, he underrates its importance. In direct relation to this subject, he makes the following excellent remarks, which, though somewhat lengthy, are well worthy of the space they will occupy:—

"The word force, and the idea it aims at expressing, might be objected to by the purely physical philosopher on similar grounds to those which apply to the word cause, as it represents a subtle mental conception, and not a sensuous perception or phenomenon. The objection would take something of this form. If the string of a bent bow be cut, the bow will straighten itself; we thence say there is an elastic *force* in the bow which straightens it; but if we applied our expressions to the experiment alone, the use of the term force would be superfluous, and would not *add* to our knowledge on the subject. All the information which our minds could get would be as sufficiently obtained from the expression, when the string is cut, the bow becomes straight, as from the expression, the bow becomes straight from its elastic force. Do we know more of the phenomenon, viewed without reference to other phenomena, by saying it is produced by force? Certainly not. All we know or see is the effect; we do not see force—we see motion or moving matter.

"If now we take a piece of caoutchouc and stretch it, when released it returns to its original length. Here, though the subject-matter is very different, we see some analogy in the effect or phenomenon to that of the strung bow. If, again, we suspend an apple by a string, cut the string, the apple falls. Here, though it is less striking, there is still an analogy to the string and caoutchouc.

"Now, when the word force is employed as comprehending these three different phenomena, we find some use in the term, not by its explaining or rendering more intelligible the *modus agendi* of matter, but as conveying to the mind something which is alike in the three phenomena, however distinct they may be in other respects; the word becomes an abstract or generalized expression, and regarded in this light is of high utility. Although I have given only three examples, it is obvious that the term would equally apply to 300 or 3,000 examples.

"But it will be said, the term force is used, not as expressing the effect, but as that which produces the effect. This is true, and in this, its ordinary sense, I shall use it in these pages. But though the term has a potential meaning, to depart from which would render language unintelligible, we must guard against supposing that we know essentially more of the phenomena by saying they are produced by something, which something is only a word derived from the constancy and similarity of the phenomena we seek to explain by it. The relations of the phenomena to which the terms force or forces are applied, give us real knowledge; these relations may be called relations of forces; our knowledge of them is not thereby lessened, and the convenience of expression is greatly increased, but the separate phenomena are not more intimately known; no further insight into why the apple falls is acquired by saying it is forced to fall, or it falls by the force of gravitation; by the latter expression we are enabled to relate it most usefully to other phenomena, but we still know no more of the particular phenomenon than that under certain circumstances the apple does fall.

"In the above illustrations, force has been treated as the producer of motion, in which case the evidence of the force is the motion produced; thus we estimate the force used to project the cannon ball in terms of the mass of matter projected, and the velocity with which it is projected. The evidence of force when the term is applied to resistance to motion is of a somewhat different character; the matter resisting is molecularly affected, and has its structure more or less changed; thus a strip of caoutchouc to which a weight is suspended is elongated, and its molecules are displaced as compared with their position when unaffected by the gravitating force. So a piece of glass bent by an appended weight has its whole structure changed; this internal change is made evident by transmitting through it a ray of polarised light. A relation thus becomes established between the molecular state of bodies, and the external forces or motion of masses. Every particle of the caoutchouc or glass must be acting and contributing to resist or arrest the motion of the mass of matter appended to it.

"It is difficult, in such cases, not to recognise a reality in force. We need some word to express this state of tension; we know that it produces an effect, though the effect be negative in character, although in this effort of inanimate matter we can no more trace the mode of action to its ultimate elements than we can follow out the connection of our own muscles with the volition which calls them into action, we are experimentally convinced that matter changes its state by the agency of other matter; and this agency we call force."

Although these, as I have already said, are very excellent and wise remarks, yet they may perhaps tend to mislead the mind of the reader, if he be not careful to remember that what is here justly said of force applies equally to all our ideas. Take, for example, the subject of geometry, with which our most exact perceptions are connected. The geometer will search his mind in vain for an idea of absolute magnitude, whether of distance, of surface, or of volume. When we say that the diameter of the earth is nearly eight thousand miles, this is but a statement of a relation. And we know no more of distances taken separately by saying that any given line is ten feet or ten miles long. With this idea of distance, our notions of velocity and motion are intimately connected. And if we examine these metaphysically, I think we shall find them no more definite—certainly no more absolute—than our idea of force. It is well to sift our ideas on all subjects in the most rigourous manner possible; but in settling the relative value of any two, we must subject them both to the same scrutiny. And if this be fulfilled, there is on my mind no doubt whatever, that our idea of what mathematicians term force or pressure will be found as worthy of a place amongst our primary perceptions, as that of distance, area, volume, matter, motion. Take any proposition involving these terms, and endeavour to determine in how far it is a mere *façon de parler*, and in how far it is the expression of real knowledge? how much is arbitrary mental assumption, and how much objective truth? and you will find yourself engaged in a most difficult, if not an impossible task. Under such an inquiry, I do not see that our notion of force would be found relatively more fugitive, or more subtle than the others. Moreover, it appears to me that Mr. Grove has done this idea some little injustice, in giving his first and best notice to forces producing motion, and almost overlooking static forces, introducing them last, and recognising them only by the molecular changes which they work on the bodies subjected to their action. I am satisfied that the method of treating statics first as the more simple relations of force—a method adopted by mathematical writers on mechanics—is by far the more just and natural proceeding. Confining the attention to the observation, by the eye, of bodies in motion, we are apt to say with Mr. Grove, "We do not see force—we see motion, or moving matter." But it must be remembered that we have more senses than the sense of sight—that ideas enter the mind by other avenues besides the eye. There are the senses of smell, taste, touch, hearing. And many things which are hidden from the eye, are yet not concealed from the mind. An idea revealed to us by feeling, is not of less authority, not less worthy of trust, than if ushered to our

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knowledge by the hearing or the sight. Force we cannot expect to see, nor hear, nor taste. But do we not know it from feeling as intimately as we know by the eye the countenance of a friend, and by the ear recognise his voice? Every man, whether loaded porter or idle voluptuary, reclining on his couch, while he is conscious at all, has a distinct idea of static force, quite apart from its effect of producing motion. And every vender of butter or cheese knows how this force of pressure may be measured with as much accuracy as the surveyor can measure an estate, or the astronomer the distance to the moon. It is at a comparatively advanced stage of physical inquiry that we deduce the existence, direction, and amount of force from the data of their observed effects in changing motion.

If it meet your approval, I shall be glad to lay before your readers a few more observations on this topic next week.*

I am, yours, &c.,

A MECHANIC.

CURRENT EVENTS IN THE CENTRES OF THE IRON, COAL, MACHINE, AND SHIPPING TRADES.

(COMPILED BY OUR OWN CORRESPONDENT.)

The Holiday on Monday—A Lozenge-making Machine—Disputes in the Glass Trade—Christmas Boxes: their discontinuance—Important Railway arrangements—The Annual Ball of the Great Western Company—Railway Collision—Steam Boiler Explosion Association — Election of Chief Officer — Iron Engine House — New Market Hall at Manchester — Mersey Dock Board: weekly meeting — New Cotton Mill — New Weaving Mill — New Boiler Manufactory—Annual Soirée at Newcastle-on-Tyne—New Town-hall at Alston —The Tyne a Harbour of Refuge—Trying a New Railway Brake—Mining Matters in Bacup, Wakefield, Oldham, and South Staffordshire—An Infant Engine Tender!

THE Manchester, Liverpool, and Leeds Stock Exchanges were all closed on Monday. The black county was no exception to the general rule under which that day was observed as a holiday. In the towns very few shops were opened, and in their vicinity the tall stacks, which commonly are belching forth wreaths of dense smoke, were without this ornamental but unpleasant append age. Here and there a brisk fire on the bank of a new pit told that some sinkers were at work; and at considerable distances apart a handful of men might be seen completing an urgent order of rails or boiler plates. In other respects all was holiday keeping. The stations were thronged during the greater part of the day with pleasure takers desirous of joining in one or other of the many amusements which were offered to them in Birmingham.

A Mr. Chase, of the United States, has succeeded in inventing a machine for making lozenges, and has opened an establishment in Shadwell-street, Birmingham, under the name of Messrs. Chase and Co. The invention works in the most satisfactory manner, and is very remunerative. The machine is very simple and neat, and it fulfils its design in a very rapid and complete manner. A ball of prepared sugar is worked up to the consistency of soft dough, and is rolled out on a board to the thickness of the top of a good-sized fruit pie. It is then laid upon a revolving band, which carries it between a pair of rollers. It is then flattened, and passed through more rollers, until it is spread out to the thickness of a lozenge; it goes again upon the band, and is by it conveyed underneath a quantity of stamps in a straight line, bearing a motto or name, as may be previously directed by order; the paste is then perforated by circular cutters, and clean, glossy lozenges are thrown out with inconceivable rapidity, row after row. It can be worked at almost any speed, and can produce 300 lbs. of sweetmeats an hour. The trade can thus be supplied wholesale with lozenges of all shapes, sizes, and qualities, equal to the best hand-make, and at reduced prices.

The disputes in the glass trade, between the journeymen makers and their employers, which have hitherto been confined to the districts in and around Stourbridge, have at length made themselves felt at Birmingham. On Saturday last the men employed at some six or more of the largest firms in Birmingham received the customary notice of fourteen days either to leave their employment or cease being members of the "Glass Maker's Union." The men appear determined; they have a fund of nearly £4,000, and some of those in work are giving double contributions It is feared that before these disputes can be amicably settled, they will extend to Lancashire. If this should be the case, the consequences are likely to be disastrous to the glass trade generally.

The principal iron-masters of Birmingham have resolved to *discontinue* the practice of giving Christmas-boxes, believing the same to be prejudicial to the interests of the working classes generally.

The treaty by which the recent notorious railway quarrel was put an end to has been followed by an agreement between the three disputing companies, of which the following are the chief points:—Arrangements of a general nature between the three companies as to the traffic from Manchester westward. A line to be made from the Garston station of the Warrington and Stockport Company, or a point near that station, to Edgehill on the Liverpool line of the London and North-Western Company The line of the Warrington and Stockport Company to be extended, for goods purposes, as far, at least, as the Brunswick Dock, Liverpool. The Sheffield Company to have, at Liverpool, and in the offices of the London and North-Western Company, its own clerks both for passenger and goods traffic; and general facilities, upon expressed terms, to be given to that Company and to the Great Western. A bill in Parliament to be promoted jointly by the three Companies to give legal effect to these arrangements.

The annual Ball of the Great Western Railway Widow and Orphans' Fund is to come off on Wednesday next (on this occasion at Oxford) in the Town Hall, under the patronage of the Mayor and Corporation of that city and the Directors of the line. Special trains will start from Paddington and Chester respectively for the accommodation of persons going to the ball from the chief stations between those points.

On Tuesday afternoon an accident occurred near the Hindley Station on the Lancashire and Yorkshire Railway. About the time that the train, which leaves Manchester at 1·20 p.m. was passing the Hindley Station, where it arrived within a few minutes of its usual time, a coal train was being shunted either to or from a siding a few hundred yards on the Wigan side of the station, and at the time the passenger train neared the siding, two of the coal waggons still remained upon its track. With these the passenger train came into collision; but, fortunately, without any very serious consequences resulting.

On Tuesday a monthly meeting of the Association for the Prevention of Steam-boiler Explosions was held in Manchester. From the monthly report of the resigning chief inspector, Mr. R. B. Langridge, we learn that, during the present month, 242 visits have been made (2 of which have been special) and 672 boilers and 504 engines inspected; 9 of these boilers have been examined internally, and 13 have undergone a thorough examination. Diagrams have also been taken from 87 cylinders. Of these boilers, 24 were found in a defective state from the following causes, viz.:—Corrosion of plates, 3 (1 of these dangerous); fractures of plates, 5 (2 of these dangerous); safety valves out of order, 6 (4 of these dangerous); water guages out of order, 7; pressure guages out of order, 3: total, 24. These defects are of an ordinary character, and do not merit further remark. On the same day a special meeting of the Committee of Management of this Association was held for the purpose of electing a gentleman to fill the office of chief inspector to the Association, rendered vacant by the resignation of Mr. Longridge. There were 81 applicants for the office, from whom, at the first revision, 23 candidates had been selected. These were subsequently reduced to ten, and ultimately seven. of these Mr. H. W. Harman, C.E., North Fleet, Kent, was elected.

Mr. Harman, the successful candidate, was originally a pupil with Messrs. Maudslay, Sons, and Field, of Lambeth, and was subsequently engaged by the Great Western Steamship Company at Bristol, and took an active part in the construction and completion of the Great Britain steamship. Since the year 1845 he has had the management of the Steam Factory at North Fleet Dockyard, Kent.

Messrs. E. T. Bellhouse and Co., of Manchester, exhibited in that city a large iron engine house that they have constructed for exportation to Santiago, The "building" will cover a space of 24,000 square feet, forming a regular polygon of 48 sides, whose diameter is 171ft. The company partook of lunch in a large pavilion within the building. Many gentlemen representing the leading firms engaged in the iron trade attended, and also, Mr. Masenlli and Mr. T. S. Pakenham, from Chili. The latter gentlemen (the engineer appointed by the South Chili Railway Company) took the chair. In the evening the men in connection with Messrs. Bellhouse and Co.'s works were treated to an entertainment.

A new market has just been opened in Manchester. It nearly occupies the site of the old butchers' market, has four fronts, the principal of which are to Goadsby-street (between the new building and Smithfield Market), and to Swan-street. The area of the site is 108 feet by 98 feet; the interior area measures 77 feet by 60 feet, and the height is 44 feet. The building is of Yorkshire pierrepoint stone, with summit stone ashlar dressings.

At the usual weekly meeting in Liverpool, on Tuesday, of the Mersey Dock Board, the Committee recommended that £306 be paid to Messrs. Rankin, Gilmour, and Company, as compensation for damage sustained by the vessel the *Marchmont*, on the 7th October, in the Canada Dock; and £3 15s. to Messrs. Bramley Moore and Co. for damage sustained by the *Doctor Kane* on the same occasion. It was explained that the damage arose from the breaking of a ring, which was made of defective metal, and the vessels getting adrift in consequence. The committee also recommend, that two travelling cranes, for the purpose of loading carts, &c., should be placed under the shed of the North Quay of the Victoria Dock at a cost of £500. The proceedings and recommendation were confirmed.

Mr. Alderman Harwood, corn merchant, has commenced the foundations of a new cotton mill, in Great Lever, immediately adjacent to the borough of Bolton. It is to be a four-storey building, calculated for 40,000 spindles, and a shed for the preparatory process of cotton spinning.

From Bacup we learn that the new mill of Messrs. Joshua Hoyle and Sons has commenced running. A building, formerly used as a foundry, has undergone alterations transforming it into a weaving shed. The mill of Messrs. James Smith and Sons has been enlarged. A boiler manufactory has been recently established.

At Newcastle-upon-Tyne, on Tuesday evening, the annual *soirée* of the Mechanics' Institute of that town was held under the presidency of the Mayor, who was supported by a company numbering nearly 500. A large proportion of the 500 members of the institute are mechanics—an exception to the general rule—and there are 9,000 volumes in the library. There are more members on the books now than for four years past.

At Alston, near Newcastle, a new town hall was opened with much spirit on Tuesday. The building is situated on the rising ground near the

* We have been compelled to leave much of our excellent correspondent's present letter standing until next week.—EDS. M. M.

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Vicarage of Alston. It is mediæval in style, and, with its clock tower, gables, and pinnacles, is a conspicuous object from many points of view. The tower forms the principal entrance to the building. The various works have been executed in the most substantial and satisfactory manner by Mr. Thomas March, the contractor, from the designs and under the superintendence of Mr. A. B. Higham, of Newcastle.

Three documents of considerable interest to the maritime community were laid on the table at the meeting of the Tyne Improvement Commissioners on Thursday last, having been printed for the use of that body. One is the memorial of the Tyne Improvement Commissioners to the Royal Commissioners on Harbours of Refuge; another the report of Mr. Walker on the Tyne as a Harbour of Refuge; and the other is a report by Mr. T. J. Taylor, of Earsdon, containing his remarks on the reports and plans of Mr. Walker for the extension of the piers.

The newly-invented brake of M. Guerin, of France, was tried on the Shields line, the other day, with great success.

In mining matters we note that the colliers employed in the neighbourhood of Bacup, on the Spotland side, have all obtained an advance of 8d. per day.——The workmen employed by Messrs. Patchett, Woodhead, and Hunter, at the Manor Colliery, Westgate Common, Wakefield, commenced work, on Friday last, at the terms paid previous to the late attempted reduction of first 15 and then 7½ per cent.——Mr. Oldham's men went in on Tuesday morning at a rise of 1d. in the shilling, The men struck work on the 29th July last against a reduction of 2d. in the shilling, and after they had been out ten weeks and two days, they were informed that they might commence work at the old price; but that they refused to do, and demanded an advance of 2d. in the shilling, that amount having been obtained by some of the miners in the district. On the 9th instant an offer of an advance of 1d. in the shilling was offered, but up to Tuesday was rejected by the great body of the men. It will be thus seen that the strike is at an end in the Ashton district. The Dunkinfield Coal Company's men, in Dunkenfield, are still out, but the other large company is at full work.——The South Staffordshire men are now at work at a drop of 1s. a-day.——At Willenhall, in South Staffordshire, last Monday, a child of eleven was shown to be the person in charge of an engine at a colliery, the property of Mr. S. Frost, who said that he (the child), "had been an engineman from his cradle!" To the hands of this child the lives of twenty colliers were entrusted. His wages were 1s. 3d. a-day, and he had been charged by his master with unlawfully detaining a key. The magistrate remarked that the defendant seemed too young for the situation, and that a boy of that age could not be fit to cope with any emergency that might arise, and was more likely to run away than to act with the requisite nerve.

NOTES FROM THE EASTERN COUNTIES.

(FROM OUR OWN CORRESPONDENT.)

Miniature Steam Engine — Clearing the River between Farnham and Mildenhall — London, Dunmow, and Bury St. Edmund's Railway.— Fowler's Steam Plough —Settlement of a Dispute—Remuneration of an Engineer.

A BOY named Charles Lack, residing at Fen End, Willingham, Cambridgeshire, has constructed a miniature steam-engine displaying much ingenuity. The weight of the engine, exclusive of the boiler, is only 7½ oz., and a high speed has been attained by it, while the steam has been got up in three minutes. The ingenious little toy has been constructed by the lad after the regular work of the day has been disposed of.——An effort is being made to re-open the navigation between King's Lynn and Bury St. Edmund's. A large number of men are now engaged in cleaning out the bed of the river between Farnham and Mildenhall; and it is thought that the sewerage of Bury St. Edmund's (which has for some time been a vexed question) is likely to be advanced by what is being done, as it is not probable that when the river has been improved, the proprietors of the navigation will allow it to be silted up again with the outpourings of the town. ——The most important railway project in the Eastern counties which will be brought before Parliament in the ensuing session is the London, Dunmow, and Bury St. Edmund's. This line is nearly 70 miles in length, and, if carried out, will afford a most direct route to the metropolis from Norfolk, Suffolk, and Essex. The undertaking will, of course, be stoutly opposed by the Eastern Counties Company. Mr. T. B. Grantham is engineer.——Fowler's steam-ploughing apparatus was put in operation a day or two since on the Lynford estate, in Norfolk. A number of persons interested in the solution of the steam-ploughing problem assembled on the occasion, and the result of the trial is favourably spoken of. ——A long-pending dispute between Messrs. H. and M. Grissell and the Great Yarmouth Haven and Pier Commissioners has just been disposed of by arbitration. The dispute referred to the amount due to Messrs. Grissell on the balance of their account as contractors for a new bridge, erected at a very considerable expenditure over the Yare, at Great Yarmouth. The sum of £2,769 5s. 4d. has been awarded to Messrs. Grissell by the arbitrators, Mr. J. Fowler, C.E., Mr. J.-R. McClean, C.E., and Mr. I. K. Brunel, C.E. (umpire). The original contract was, £23,734 10s. The Commissioners paid, on account of the contract and extras, £25,584 1s. 10d., and Messrs. Grissell claimed £32,334 5s. 7d. The amount struck off by the arbitrators was, therefore, £3,980 18s. 9d.——The Great Yarmouth Town Council authorised, some time since, an expenditure of 200 guineas, to support the claims of the port before the committee appointed on the harbour of refuge question. The amount expended, however, was £244, Mr. Walker, C.E, charging £200 for his services. Some grumbling took place in the council when the bill was presented. it being urged that the charges of the engineer were excessive. On the other hand, it was contended that Mr. Walker was the Admiralty engineer, that his influence was exceedingly valuable, and that, consequently, his charges were not too high. An attempt to reduce the expenditure to the amount originally voted, was defeated by a large majority, and the account was ordered to be paid in full.

METAL AND COAL TRADES, &c.

(FROM OUR OWN CORRESPONDENT.)

Preliminary Meeting of Ironmasters yesterday— Condition of the South Staffordshire and East Worcestershire Coal and Iron Trades—Glasgow Pig Iron Market—Northumberland, Durham, and Derbyshire; with North and South Wales districts—Liverpool Pig Iron Market—The Hardware Trades of Birmingham, Wolverhampton, and Sheffield—Copper and Tin— Board of Trade Returns.

The preliminary meeting of the Iron Masters was held at Dudley on Thursday (yesterday). Although some few makers desired an increase of 10s., yet there was no alteration made in the previously existing rates, viz., bars, £7 10s.; hoops, £8 10s.; and sheets, £9 10s. The trade generally still maintained a favourable position, and there is every indication of a steady progress. There are more inquiries, and those makers who have been selling under the trade prices are now declining orders except at improved rates. There seems to be no doubt that the coming year will be one of considerable prosperity. Pig iron continues firm. It is very probable that before long the producers will be able to realise a fair and legitimate price, which has scarcely been the case during the last year.

The coal trade of South Staffordshire and East Worcestershire and prices are firmly maintained, and although a large quantity is being imported into the districts from a distance, it does not materially affect the native produce. Prices have an upward tendency. The strike of colliers and miners there is at an end, and the districts have assumed their wonted quietude. The colliers and miners are for the most part fully occupied.

The following are the quotations of the Glasgow pig iron market on Tuesday last:—No. 1, 52s. 6d. to 52s. 9d.; mixed Nos. warrants, 54s. to 54s. 3d.; and also ditto makers' iron, No. 3., 52s. 6d. to 52s. 9d. Shipped this week, 6,100 tons; corresponding week last year, 7,050 tons.

The coal and iron trades in Northumberland and Durham are represented as somewhat depressed, with certain exceptions, depending on the nature of the coal, &c., produced. At those collieries where only gas coal is produced, there is at present a greater demand than can be supplied.

In Derbyshire, and the adjacent districts, the coal trade is reported to be exceedingly good, prices being very well maintained. It is expected that the Duke of Newcastle's new colliery at Worksop will be down in the spring of next year upwards of 560 yards to the top hard coal of Derbyshire or Barnsley bed.

In the South Wales district the condition of the iron trade is still reported as favourable, the arrival of several fresh orders having given renewed confidence to the masters. Although there is partial slackness in particular localities, yet at the principal works there is general briskness. The chief foreign demand is from France and Russia, but the new lines of railway, now in course of construction in America, require a large and constant supply of rails, and no small portion of the orders for that supply find their way into the South Wales district. Amongst the establishments largely engaged in executing orders of this description, are the Tredegar Works, and those at Ebbw Vale, Nant-y-Glo, and Blaina. The coal trade in the district is not particularly brisk, but there is a somewhat steady demand. In every respect, however, the trade of South Wales is in a much more prosperous state than was the case at the corresponding period of last year.

In respect of North Wales it may be said that the coal trade remains tolerably active in the Wresham district. The iron trade also in that district is flourishing. In the neighbourhood of Ruabon, matters are decidedly looking up, and confident anticipations are formed of a good winter trade. The business in coal is very brisk, the men are fully employed, and are earning good wages.

At Acrefair some excellent orders for iron have been received, which, it is anticipated, will keep those extensive works in active operation for some time to come. At Rhosymedre the freestone trade is prosperous and active.

In the pig iron market at Liverpool on Monday last, business was done at 54s. cash, and the market closed with sellers at 54s. 3d. cash, and buyers at that price one month (open).

In Birmingham the manufacturing trades have evinced a quietude generally prevalent at the close of the year. During the last eight weeks, however, there has been tolerably full employment, and many of the large manufacturers in some of the most important branches will commence the new year with an encouraging number of orders on hand.

The trade of Wolverhampton continues in a state of quiet prosperity. In no branches can we learn that there are any very large orders in hand; but this, at the present season, cannot be expected. The hollow-ware trade, in which there has been the greatest depression, is beginning to assume a healthier aspect, although some time must necessarily elapse before it resumes its former condition.

At Sheffield, the general trade of the town and neighbourhood is also quiet. In most instances, however, the men have made full time. Merchants and manufacturers look with anxiety to the commencement of the new year, fearing, as they do, that they will be tramelled by the threatened restrictive policy of certain foreign nations, that are now their customers. For instance, the American tariff is soon to be raised,

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on an average, probably, of five per cent. The Canadian tariff has also been recently revised, and assimilated to American rates. The Americans are greatly increasing their manufacture of hardware goods—particularly shovels, pick-axes, and axes—which they send in large quantities to various British colonies. One house alone is said to sell shovels to the amount of £250,000 a year.

The markets in copper and tin have remained without much, if any, alteration in the past week, except a growing opinion that they will go higher before they recede again. The advance of £5 in copper has not checked the general trades dependent upon that metal for their raw material. On the contrary, they exhibit more activity this week than last. At the same time, there is little doubt but the advance is in part speculative, and due to the low price of money. Sufficient tin for even immediate necessities can be had only with difficulty, even at the last advance. The metal is unquestionably very scarce, and a further rise is regarded as on the eve of taking place.

The Board of Trade returns for November, and the eleven months ending with that date, furnish us with information on the comparative exports in the month of November in the three undermentioned years.

METALS.	1856.	1857.	1858.
Pig Iron	£119,802	£108,919	£ 59,537
Bar and Rod Iron	454,733	388,892	395,436
Iron Wire	23,591	31,962	16,447
Cast Iron	79,216	60,429	49,095
Wrought Iron	329,410	321,454	245,494
Steel	70,966	39,199	45,712
Copper, unwrought	50,246	82,806	81,822
Copper and Yellow Metal sheathing	159,720	108,338	141,305
Wrought Copper	15,261	51,350	25,690
Brass	14,415	15,135	18,146
Lead	40,899	25,613	36,959
Tin, unwrought	17,555	17,381	10,941
Tin Plates	136,260	53,592	100,874
MACHINERY.			
Steam Engines	101,516	44,649	45,044
Other kinds	172,249	250,262	150,403
Hardware and Cutlery	371,564	315,092	291,531

The pig iron exports for the eleven months show a falling off from £1,554,577 to £1,056,455, or nearly one-third; and bar iron, though the trade was better in November than at the corresponding period of last year, from £5,924,511 to £4,908,289, notwithstanding a considerable increase in the exports to India. Wrought iron was affected to the same extent, showing a decline from £3,767,781 to £3,084,012, though in this trade also, there was an increased exportation to the British possessions in the East.

There was an increase in the exports of hardware and cutlery to the United States, and likewise to the Hanse Towns; but the entire trade of the eleven months was only £2,986,710, against £3,740,743. The slight increase in steam engines was referable to the Russian demand, which has been very great throughout the year, exceeding that of any other country. This is the only branch of the machine trade which compares favourably with last year. There was however, an increased exportation of all kinds of machinery to Russia, France, and Australia.

The copper, brass, and yellow metal trades have not been near so much depressed; and the same may be said also of lead and tin manufactures. The tin plate exports declined from £1,462,217 to £1,258,664, but the Australian demand improved last month, and there are prospects of further change for the better in other directions.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

RAILS.—4,000 tons, for the London and North-Western. Specifications, &c., from Mr. C. E. Stewart, Secretary, Euston Station.

SLEEPERS.—100,000 creosoted sleepers, for East India Railway, as per specifications at Alderman's, Walbrook. Tenders on or before 12 at noon, January 4.

WATER-WORKS PIPES.—156 tons, for the Dundee Water-works. Specifications, offices, Dundee Water-works.

GAS PIPES.—5,000 16-inch socket pipes, for the Birmingham and Staffordshire Gas Light Company, to be cast vertically, and weighing 332 lbs. per yard, delivered at the Trench-side, on the road from Wednesbury to Walsall. The tenders to be sent in on or before Monday, the 3rd day of January, addressed to the secretary of the company.

SETTING-UP OF SMALL ARMS.—War-office.—Applications from persons desirous of tendering for future supplies, or setting-up of small arms, invited by the Secretary of State for War.

NORTHERN LIGHTHOUSES. — Construction and fitting-up, at their respective sites, of lanthorns, &c., for certain lighthouses now in progress, according to plans by Messrs. D. and T. Stevenson, 84, Church-street, Edinburgh. Tenders on or before January 10.

COALS.—1,000 tons of gas coal, by the Improvement Commissioners of Walsall, to be delivered in carts at their gas works, at the rate of about 40 tons per week. It is to be all large coal, and the weight per ton is to be 2,640 pounds. Tenders on or before January 6.——5,000 tons suitable to locomotive burning, on Shrewsbury and Hereford, to be delivered in regular quantities of 120 tons weekly, at their works, Shrewsbury, or Barr's-court engine-shed, Hereford. Tenders to Mr. E. Jeffreys, Colehamworks, Shrewsbury, on or before January 5.——3,500 tons of South Wales, fit for service of Her Majesty's steam vessels, to be delivered in Jamaica. Conditions, &c., at Somerset-place. Attendance before the Commissioners, or by duly qualified agents, 2 o'clock, January 4.

ROADS.—The Corporation of Dublin invite tenders for the maintenance and repair of the macadamised streets and gravelled footways of that city for three years. 45,000 tons of stone to be laid in all. The contract may be taken in whole or part, according to the requirements of the city engineer.

SCAVENGERING.—For the Crown Estates Paving Commissioners, during one year, January 5. Forms at the office of Mr. Francis Adams, clerk to the Commissioners, 1 Whitehall. ——The Dublin Corporation are prepared to receive tenders to February 4, for the scavengering, cleansing, and watering of Dublin during three years, beginning with May next, agreeably to printed Specifications prepared by the city engineer.

RUSHOLME PUBLIC HALL AND LIBRARY.—Tenders to be sent in on or before January 10. Particulars from Mr. W. W. Whittaker, architect, 32 St. Ann-street, Rusholme.

BARRACKS AT PORTSMOUTH.—War Department, Pall Mall, January 24.—Plans at Royal Engineer's Office, Portsmouth, from 3rd to 22nd January.

SCHOOLS, LINCOLNSHIRE.—Two schoolrooms and master's house, Sutton, St. James's, Lincolnshire, January 15.—Plans at the office of Mr. J. P. Sturton, solicitor, Holbeach.

COUNTY GAOL, WORCESTER.—New wings, &c, January 15. Plans at the offices of Mr. Henry Rowe, county surveyor, 17 Foregate-street, Worcester.

COTTON WASTE AND OIL.—By the London and South-Western Railway Company, 20 tons of cotton waste, and 5,000 tons of best burning oil. Forms of tender to be had from the storekeeper at the Nine Elms Station. Tenders to be delivered not later than January 3.

LOCKS, GONGS, &c.—For the new wing of Leicester Gaol. Mr. E. Stevens, borough surveyor, Silver-street, Leicester, on January 15.

PARISH CHURCH SPIRE.—At Ince, in Straurear. Plans, &c., in the hands of Mr. Guthrie, Rephad, Straurear. Estimates before January 14.

LIGNUM VITÆ.—Seventy tons, being 60 St. Domingo and 10 White Bahama, at Her Majesty's Dockyard, Portsmouth. Date for tender, January 11.

ARCHITECTS' COMPETITIONS.—Designs for the Manchester Assize Courts, by March 1. Particulars from Mr. Frederick C. Hulton, 37 New Bailey-street, Salford. Premiums of 250*l.*, 150*l.*, and 100*l.* respectively.——Town-hall, Council-house, Police-office, and Market-houses for the borough of Folkstone. Plans on a scale of 8 feet to the inch, by January 5, to Mr. R. T. Brockman, town clerk, who, for 2*s.* 6*d.*, will forward particulars. Premiums, 30*l.* and 10*l.* Estimate not to exceed 3,000*l.*——New chapel, Aberystwith, not to exceed 1,500*l.* Mr. John Matthews, land surveyor, Aberystwith, will receive the plans up to January 22. 5*l.* prize.

GAS MANAGER.—The Newry Gas Consumers' Company (Limited) are in want of a working manager. Applications to Mr. Charles Lawson, Newry.

IRON WORKS MANAGER.—To superintend the erection of iron works, and undertake their management, for the manufacture of a superior description of iron. H. H., 12 Stoke-orchard, Caledonia-road, Holloway, N.

PROVISIONAL PROTECTIONS.

Dated October 22, 1858.

2360. E. Whitehall, of Nottingham. Certain improvements in machinery for the manufacture of cap fronts.

Dated November 13, 1858.

2548. J. Taylor, of Birkenhead, Engineer. Improvements in portable steam engines.

Dated November 17, 1858.

2588. M. Scott, of Hyde-park-gardens. Improvements in the construction of breakwaters, parts of which are applicable in making other structures.

Dated November 19, 1858.

2626. J. H. Johnson, of Lincoln's-Inn-fields. Improvements in the construction of electric telegraph cables or conductors.—A communication from H. J. Rogers, of Baltimore U.S.

Dated November 27, 1858.

2696. J. Ramsbottom, of Accrington, Engineer. Improvements in machinery or apparatus applicable to water meters, and to indicating and regulating the flow and pressure of fluids generally, and in obtaining motive power from the same.

Dated December 3, 1858.

2762. T. Bailey, of Birmingham, Gun Maker. A mechanical movement applicable to loading fire-arms, and other purposes.

2764. G. E. Noone, at Newington Butts, Engineer. Certain improvements in machinery for generating gas from coal.

2768. C. F. Vasserot, of Essex-st., Strand. An improved apparatus for ventilating mines, or other similar purposes. A communication from M. Welter, and G. Bohringer.

2770. H. Bevan, of Shrewsbury, Accountant. New or improved machines for effecting or facilitating arithmatical operations.

Dated Decembe 4, 1858.

2772. R. Legg, of Ashby-st., Clerkenwell, Millwright. A machine for combining the operation of compressing and cutting tobacco during the process of manufacture.

2774. J. B. Fisher and J. Fisher, of Stourbridge, Worcester, Fire Brick Manufacturers, and J. Bird, Jun., of Kingswinford, Stafford, Agent. An improvement in the doors and dampers of furnaces, and other places where intense heat has to be resisted.

2776. E. A. Servier, of Paris, Engineer. Improvements in pressure and fluid level indicators.

2778. A. Smith, J. Townsend, and E. W. Williams, of Birmingham, Manufacturers. An improvement or improvements in breech-loading fire-arms.

2780. J. Turner, of Queen's-road, Dalston. Improvements in the construction of chairs.

2782. J. L. Norton, of Belle Sauvage-yard, Ludgate hill. Improvements in machines for stretching and drying fabrics and in drying wool and other fibres.

2784. W. E. Newton, of Chancery-lane. Certain improvements in grain and grass harvesting machines.—A communication.

2786. T. R. Harding, of Leeds, Hackle Pin Maker. Improvements in combs, gills, hackles, and similar implements used in silk, wool, and flax machinery, and in the method of making the same.

Dated December 8, 1858.

2811. C. de Cappot, and A. Jarriant, of Neuilly-sur-Seine, France, Civil Engineers. A new hydraulic counter.

2831. M. Henry, of Fleet-st. Improvements in twisting fibrous materials, and in machinery or apparatus employed therein.—A communication from Messrs. Durand and Pradel.

2815. A. Lamb and W. A. Summers, of Southampton, Engineers. Improved arrangements of apparatus for superheating steam.

2817. C. M. Westmacot, of Litchurch, near Derby. Improvements in the permanent way of railways.

Dated December 9, 1858.

2819. R. L. Burrowes, of St. Helen's, Lancaster, Professor of Music, and J. Knowles, Jun., of the same place, Mine Surveyor. Certain improvements in the construction of piano-fortes and organs.

2821. H. Maudsley, of Lambeth, Civil Engineer. Improved glass, and other vitreous vessels.

2823. H. Bell, of Belfast. Improvements in musical instruments.

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2825. J. Elder, of Glasgow, Engineer. Improvements in paddle-wheels

2827. T. Allen, of Clifton, Bristol, Ironmonger. Improvements in folding bedsteads.

2829. H. Wilson, of Norton, Durham, Brass Finisher. Improvements in the construction of pumps.

2831. B. Lauth, of Trafalgar-square, Mechanician. An improved mode of manufacturing rods and shafts.

Dated December 10, 1858.

2833. J. Lightfoot, of Accrington, Calico Printer. Improvements in printing or staining yarns, fabrics, or fibrous substances, and in the manufacture of certain compounds for that purpose.

2835. A. Barclay, of Kilmarnock, Engineer. Improvements in electric, magnetic, and electro-magnetic telegraph ropes or conductors.

2837. C. Hodgson, of Ballard Rathdrum, Wicklow. Improvements in the manufacture of fuel from peat, and and in apparatus employed therein, part of which is also applicable to the moulding of bricks, tiles, and other plastic materials.

2839. G. F. Wilson, of Vauxhall. Improvements in the manufacture of lubricating oils.

Dated December 11, 1858.

2841. W. F. Hall and T. Dutson, of Birmingham, Button Makers. Certain improvements in fancy buttons for ladies' and gentlemen's wear.

2843. S. Dudgeon, of Sheffield. An improved gas regulator.

2845. P. Robertson of Sun-court, Cornhill. Improvements in shuttles.—A communication.

2847. M. Schaffner, of Eisenach, Civil Engineer. Improvements in smelting zinc ores, and in furnaces employed for this purpose.

2849. A. Rollason, of Birmingham, Chemist. For improvements in the manufacture of waterproof tissues, and in applying such water-proof material to woven fabrics, and manufactured fibrous goods.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1816. L. Autray. Advertising.
1818. C. L. Light. Telegraph cables.
1855. J. Cartmel. Hats, &c.
1864. L. A. Forot. Ornamenting fabrics.
1873. J. Jackson and A. Fisher. Hats.
1880. A. V. Pinta. Cheques or drafts.
1881. W. Soleman. Propellers.
1890. W. Smith. Steam-engines. A communication.
1891. W. Pearce. Air-tight bottles, &c.
1893. F. Preston. Cutting files.
1970. E. Spary. Fumigators.
1995. J. T. Pitman. Condensing apparatus. A communication.
2583. C. F. Vasserot. Smoothing iron. A communication.
2783. M. Henry. Weaving. A communication.
2813. M. Henry. Twisting fibres. A communication.
2821. H. Maudslay. Vitreous vessels.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1855
2893. C. J. Appleton
2909. J. Chesterman
2917. R. A. Brooman
2919. A. Tolhausen
2931. J. E. Cook
2932. J. Grist

1855
2934. J. Robinson, R. Cunliffe and J. A Collet
2936. T. F. Uttley
2950. T. Holmes
2951. W. E. Newton
1856--9. W. Bullough

LIST OF SEALED PATENTS.

Sealed December 24th, 1858.

1442. S. Whitehall.
1447. E. Pinchon and W. R. Harris.
1448. E. d'Heurle.
1451. I. Hammond.
1460. B. Young and P. Brown.
1472. B. Nicoll.
1482. W. T. Smith.
1491. J. L. Clark.
1501. O. Sarony.
1512. J. Greenwood.
1542. M. Scott.
1556. J. F. Watson.
1565. N. Defries.
1618. W. A. Lloyd.
1822. M. Moses.
2083. J. Luis.
2368. E. C. Shepard.

LIST OF SPECIFICATIONS, &c., Published during the week ending Dec. 24, 1858.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s d		s d		s d		s d		s d		s d
682	0 6	1105	0 3	1118	1 9	1130	0 3	1141	0 10	1151	0 6
856	2 5	1106	0 3	1119	0 3	1131	0 8	1142	0 3	1152	0 7
1092	3 6	1107	0 3	1120	2 9	1132	0 4	1143	0 3	1153	0 5
1094	0 7	1108	0 9	1121	0 3	1133	0 9	1144	0 5	1154	0 3
1095	0 3	1109	0 6	1122	0 6	1135	0 9	1145	1 2	1158	0 3
1096	0 3	1111	2 3	1123	0 3	1136	0 7	1146	0 3	1176	1 0
1098	0 3	1112	0 5	1124	0 3	1137	0 3	1147	0 6	1181	0 6
1099	0 10	1113	0 10	1125	0 7	1138	1 4	1148	0 3	1187	0 3
1103	0 4	1115	7 2	1127	0 3	1139	0 3	1149	0 4	1199	0 8
1104	0 3	1117	0 3	1128	0 3	1140	0 6	1150	0 3	1934	0 3

NOTE.—Specifications will be forwarded by post on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table:—

STEAM ENGINES, &c.,	954, 955.
BOILERS AND THEIR FURNACES,	956, 959.
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c.,	960.
SHIPS AND BOATS, including their fittings.	*None.*
CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines,	958, 964.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals,	951.
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c.,	957, 961, 963, 965.
BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c.	*None.*
LIGHTING, HEATING, AND VENTILATING.	*None.*
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c.,	952.
METALS, including apparatus for their manufacture,	950.
CHEMISTRY AND PHOTOGRAPHY.	*None.*
ELECTRICAL APPARATUS.	*None.*
WARFARE,	953.
LETTER PRESS PRINTING &c.,	*None.*
MISCELLANEOUS,	960, 962, 963.

950. J. H. JOHNSON. *Improvements in furnaces for the melting and reduction of steel, copper, zinc, and other metals.* (A communication.) Dated April 28, 1858.

These consist in the introduction of heated air by tubes set in masonary, which act as blow-pipes upon the flame as it enters the melting furnace. The furnaces surround a central furnace which heats the series. It is fed with fuel from above, and is supplied with a hot blast, which spreads the flame into the melting furnaces containing the retorts or crucibles filled with the ores or metals. Other parts are included. *Patent abandoned.*

951. J. MARTIN. *Improvements in machinery or apparatus for reducing, cutting, or pulping roots and other substances.* Dated April 29, 1858.

Here the substances to be reduced are operated upon by knives, cutters, or reducers placed inside a revolving hollow cylinder. *Patent completed.*

952. S. BARTLETT. *Improvements in machinery for forming gutta percha soles and uniting them to the upper leather of boots or shoes.* (A communication.) Dated April 29, 1858.

Here two thick metal plates are used, of nearly the same shape as the sole, and connected by bolts and nuts. To the upper one is fixed the covering of the shoe on its last, and to the lower one is attached a hollow metallic mould having internally the shape of the sole and heel, which is filled with semi-fluid gutta-percha spreading it over the whole surface. Heat is applied to the mould, which is immediately screwed up tight against the under side of the last, and allowed to cool. *Patent completed.*

953. E. SIMONS. *Improvements in ordnance.* Dated April 29, 1858.

This is particularly applicable to small guns. The inventor constructs two (or more) cannons together, the breach end of one being joined to the breach end of the other. The double gun is supported upon an axis passing through the breach. The lower end of the axis carries a sphere enclosed in a slotted hollow sphere. The axis may thus be placed vertically or depressed. The hollow sphere is fixed on the gun carriage. *Patent abandoned.*

954. A. M. PERKINS. *Improvements in high-pressure steam-engines.* Dated April 29, 1858.

This consists in a method of condensing the steam from such engines, that the boiler may have the condensed water returned at a high temperature. The steam is passed into a case which receives one of the ends of each of a number of small pipes open to the atmosphere at their other ends. Within these the steam condensed (the tubes being long,) runs back into the case, and thence into a pump, by which it is returned to the boiler. For passing air amongst the pipes, the patentee encloses them in a chest, open at one end to the air, and at the other end in connexion with the ash pit of the furnace. *Patent completed.*

955. C. LAWRENCE. *Improvements in steam-engines.* Dated April 29, 1858.

This relates to combinations of parts applied to steam-engines, by which motion is given to the piston in one direction, and to the cylinder in the opposite direction. *Patent completed.*

956. R. JOHANNY. *Improvements in the construction of furnaces.* Dated April 29, 1858.

This consists principally in the use of a closed fire-hearth, and of certain fire tubes and air tubes. *Patent completed.*

957. W. SMITH, *Improvements in spinning machinery,* (A communication) Dated April 29, 1858.

This consists in the radical suppression of drums or cylinders in spinning frames, whether driving their spindles by bands or tapes. The patentee claims, 1st. The adaptation of a continuous band employed in connexion with pressing rollers for transmitting motion to a series of spindles. 2nd. The combination of a single endless belt, with pressing rollers, and directing rollers when employed for rotating more than two spindles in a spinning machine. 3rd. Several methods of operating the whole of the spindles (or in very long frames any set and section consisting of several spindles) contained within a spinning frame by a single continuous band applied and worked as described. *Patent completed.*

958. W. SMITH. *Improvements in steam ploughs.* (A communications.) Dated April 29, 1858.

This relates to a gang of ploughs driven in either direction by steam power. The ploughs at either end are secured to rocking beams, which allow the rear ploughs to be turned up out of the way; or both gangs may be elevated in turning or moving the machine to or from the field. Small wheels at the extremities act as steering wheels, and regulate the depth to which the ploughs enter the ground. Each driving wheel is surrounded by a "portable track" endless belt, to which blocks of wood or metal are attached. Clearers formed like double mould board ploughs are placed in the track of the off-side driving wheel, one before and the other behind. They are so connected by rods and levers, that when the forward one is in operation, the rear one will be lifted up clear from the ground. The advance motion of the forward clearer opens the furrow, while the reverse motion of the other fills it up again. The boiler and engine are placed in the centre, immediately over the driving shaft for balancing the apparatus. *Patent completed.*

959. D. AULD. *Improvements in working furnaces and steam boilers, and in apparatus connected therewith.* Dated April 29, 1858.

This invention was described and illustrated at page 553 of the "Mechanics' Magazine," for Dec. 11, 1858, No. 1844. *Patent completed.*

960. R. B. H. DE LOWENDAL. *Improvements in the construction of springs, and for their new application to the working machinery.* Dated April 30, 1858.

This consists in so shaping metallic or other springs, that they shall have more than one curvature, so that in one portion of the spring at least there shall be a duplication of the curve. *Patent abandoned.*

961. J. CHADWICK, A. ELLIOT, and W. ROBERTSON. *Improvements in machines for twisting and winding silk, direct from the cocoons, such machines being of the class commonly known as throstles.* Dated April 30, 1858.

This relates to a former patent granted to J. Chadwick and T. Dickens, in 1858. The present patentees impart such difference of motion to the spindles, and bobbin tubes, as may be necessary to put the requisite spin or twist upon the silk as it is wound on the bobbin. The apparatus is not described by the inventor apart from his drawings. *Patent completed.*

962. J. LUIS. *Proper apparatus for separating two substances of different densities; among others may be mentioned pit coal from the slate which it contains.* (A communication.) Dated April 30, 1858.

This apparatus is divided into three principal parts:—1st. A washing table, on which the separation of the substances is carried on. 2nd. A labyrinth, where the lighter matters are deposited. 3rd. A reservoir for denser substances. It is not easy to explain it without the inventor's drawings. *Patent abandoned.*

963. B. E. G. DE BRUN. *Leather tissue and other tissues rendered waterproof by a new process.* Dated Apr. 30, 1858.

Into linseed oil the patentee throws litharge and brown umber, in powder, and hydro-protoxide of manganese, which has been first subjected to a slow fire, with some linseed oil. He mixes all together, then lets them settle. When he wants to use this oil for a cotton, linen, or like tissue, for the first coat he mixes water with the oil, and heats them both until perfectly mixed. Then, by a sponge, he spreads this oil and water all over the tissue, and leaves it to dry. Then to the oil mixed with water he puts lamp-black and makes a paste, which he spreads on the tissue by a small iron scraper. If the tissue employed is thin, and it is wanted to dry quickly, the oil mixture must be boiled; then salt of lead, turpentine, and lamp-black are added to form a paste, which serves for a second coat. The operation continues in all cases by fresh coats of the oil mixture not boiled, till the bottom of the tissue is well made, taking care to pounce or polish the tissue, to make it close and even. After this it must be made black or coloured, dried, pounced slightly, and varnished with a varnish formed of common oil boiled with brown umber, litharge, and Prussian blue; turpentine is added when the oil thus composed is three parts cold. When the tissue is perfectly dry it is passed under an engraved cylinder, to give it the appearance of grained neat's leather or morocco, if it is to have this appearance. The tissue is waterproof, and can be used for boots, hats, furniture, &c. *Patent completed.*

964. B. L. A. PENCEALLIER. *An improved plough.* Dated April 30, 1858.

This is composed of the body and what may be called tail of the plough, which contains four shares. The axle has a vertical support of two uprights meeting at the top by a central part traversed by a screw for earthing or unearthing the plough. This screw acts on a half-circular branch of iron, which supports a cast iron box. Behind the body are two riving knives, and the shares for opening the first furrow. The special character of this plough consists in its power of turning at the end of the furrow. To effect this, the handles are placed horizontally, and on pulling a spring placed against the body of the plough, a half-revolution is effected. The handles are then placed according to the necessary slope, where they are fixed by a shaft of iron which unites them. The ends of the shares can be raised or lowered by a screw, and can be separately earthed or unearthed. *Patent completed.*

965. E. T. HUGHES. *An improved regulator and float combined, applicable to the manufacture of paper.* (A communication.) Dated April 30, 1858.

The patentee employs a combination of regulator or governor and float connected with suitable apparatus, so that a continuous delivery of pulp may be obtained, independently of the variation in the speed of the paper machine, and also of the variations in the level or depth of the mass in the large vat or reservoir. The apparatus is not described by the inventor apart from the drawings. *Patent completed.*

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THE
MECHANICS' MAGAZINE.
LONDON, FRIDAY, JANUARY 7, 1859.

WHILE all the world is keeping holiday, and London is lying "unseen, yet sounding through its shrouding mists," we shall prefer occupying our opening columns this week with a few paragraphs on matters of general interest, rather than with formal articles of a more technical and troublesome character. And, first, a word or two to our subscribers. We have received several requests to publish a weekly table of contents, and also to discontinue numbering the advertisement pages with the others. To both of these requests we have cheerfully acceded, as our readers will observe. We shall take care at the end of the first volume, so to number the index, or some other introductory matter, as to supply pages 1 to 4, of which, when the advertisement sheets of last week's number are removed, the volume would otherwise be deficient. The first volume will thus be made complete, and consecutively paged throughout, as our correspondents desire. We have to apologise for the lateness of our last week's issue, for the somewhat unfinished appearance of a portion of our impression, and for the scarcity of our Abridged Specifications of Patents. All these things were contingent upon the *first* appearance of the Magazine in its new form, and will not, we confidently believe, occur again. In respect to the Abridged Specifications, we wish it to be understood that we shall soon bring them up to date, and then publish them regularly, week by week.

DR. LIVINGSTONE sends us news from Tete, on the Zambesi. He has been much hampered by the great draught of water of the *Pearl*, which, it will be recollected, was appointed to see him fairly, and as far as possible, on his expedition. He adheres to the opinion he has all along expressed—that a vessel drawing from four to six feet of water, could run upon the river seven or eight months of the year; and adds, from further observation, that it could be navigated nearly, if not entirely, throughout the year with still lighter vessels, say, of thirty inches' draught. What a pity it is that we could not furnish our renowned explorer with a craft like that which El Hami Pasha has had built for his pleasure by Mr. Scott Russell! When will the English nation be capable of doing as much for itself as a mere Turk, with his handful of piastres, compels it to do for him? The heroic doctor was further troubled by the difficulty with which the *Pearl* backed, when her screw was reversed, in feeling the way along the river's channel. Having entered the river by a side branch—possessing a very good bar and harbour—and explored the delta for about a month, the river was found to be fast falling. To prevent the detention of the *Pearl*, which he was stringently ordered not to delay, the Doctor landed all his goods on an island, and, at the time of writing, was carrying them up to Tete by successive trips in his small steam-launch. The news sent by him is most encouraging and important. He arrived in the midst of a war between the natives and Portuguese, but, observing a clear neutrality, he has been treated with friendliness by both the belligerent parties, and is endeavouring to push away beyond them with all speed. Of the Zambesi itself he speaks very favourably, entirely confirming the opinion expressed by the two naval officers who accompanied him. On reaching Laputa, where the river is no longer divided into many channels, all difficulties in navigation ended. Here, at DOCTOR LIVINGSTONE'S suggestion, were dug a ton and a-half of coals, the very first ever taken out of the earth in that country. Mr. RAE, "a Glasgowegian," pronounces them to be good, and promising better, as they are got from the surface, on the bank of the Muatoze, where they have been exposed to the action of the floods and atmosphere for ages. There is an immense coal-field there, and many of the seams crop out. With coal, and the best iron ore in abundance, surely Africa will not always be the trodden-down nation it has been. Their vessel was the first that ever steamed to Tete, and was visited as if it had been another Leviathan. "It is sad to see so fine a country," says the estimable Doctor, "in this state. We meet some very fine cotton, growing wild, wherever it has once been sown. It is long in the staple, and has been introduced, as its name imports. The other has a short strong staple which clings to the seed, and is more like wool in the hand than cotton. We have also more lignum vitæ than ebony. . . My men were still at Tete, though 30 of them had died of smallpox, and six had been killed by a neighbouring chief. The poor fellows received me with great joy, and no less glad was I to see them. All the party is now well. We have had illness, but no coast fever. I think as both we and the *Pearl* escaped, it was greatly owing to pushing with all our vigour away from the mangrove swamps at the mouth of the river. These are the hotbeds of fever."

PHOTOGRAPHIC DRAWING ON WOOD, for the purposes of the wood engraver, has this week been most satisfactorily advanced. A conversation with Mr. CROOKES—whose name is well-known among photographers, and who has recently become the editor of the best of all photographic journals (the *Photographic News*)—prepared us some months since for the reception of the improvements which are now made public by that gentleman. He covers the wood block with oxalate of silver and water, to which a little gum or pulverised bath-brick may be added if desired. The material is spread over the wood in the same manner as the engraver's ordinary flake-white and gum-water are applied, a delicate and almost impalpable coating of the oxalate being thus produced. The block may then be placed in a drawer, or in any place from which daylight is excluded, and there left to dry, or until required for use. When taken out and exposed to sunlight under a negative in the printing frame, a positive picture will be produced upon the block, as it is upon paper in the ordinary way. A block thus prepared is ready, without any further process, for the engraver's hands. In cutting it, he need only be careful not to expose it to the direct rays of the sun; diffused daylight will not blacken it, except by many hours of exposure. By this process all kinds of pictures may be transferred to the wood block; and the inventor sees no reason why it may not be applied to the reproduction of stereoscopic views, which would bring them within reach of the humblest. A use which is more important to us is that of applying reduced mechanical drawings, and photographs of machines themselves, directly to the wood. This would save much time, and, in the main, conduce to greater accuracy than is usually attained at present. These applications must, however, be made with care, for there is sometimes a disposition, either in the sun, or in the chemicals, or in the manipulator, to introduce twists and turns which, in portraits at least, we know not always how to tolerate. We remember that DE QUINCEY once complained of the excessive proportions which his mouth, and most other mouths, acquired whenever the sun painted the picture; and there are many parts of machinery which will bear distortion even less than Mr. DE QUINCEY'S features.

THE SHIPPING STATISTICS AND TONNAGE QUESTION is again revived in our columns this week, by the publication of the Report of the British Association's Committee. The same question also recurs in a correspondence publishing in the Society of Arts' Journal. Mr. MACGREGOR, of the Temple, there opens the subject in a letter on Mr. REED'S paper on the Ships of the Royal Navy. Mr. MACGREGOR states that, having seen the Turkish ships at Sinope before the battle, and other avowedly large ships in America, he has found that Turks, Americans, and Russians, all exaggerate the sizes of their vessels when it suits their purposes; and he says, "it is extraordinary that men will continue to compare the tonnage of vessels, as if a proper standard were actually in use." Mr. REED, in reply, admits the imperfection of the existing rules for calculating tonnage, but contends that they form the best basis of comparison which we at present have, and shows that he carefully bore in mind the discrepancy between the English and American rules in making the comparison between the *Shannon* and the *Merrimac*—the only comparison instituted by him. He adds that the tonnage question has lately had such a mountain of words heaped upon it that he made no attempt to exhume it before the members of the Society of Arts. The report referred to will come under our consideration in due course.

PREMIUMS FOR INVENTIONS are again offered by the Council of the Society of Arts, and gentlemen having a love of distinction, gold and silver medals, and pounds sterling, will do well to apply to the Secretary for a list of subjects for improvements in which prizes will be awarded. Under the will of Dr. SWINEY, a silver goblet, worth £100 sterling, containing gold coin to the same amount, will be presented on the 20th of January next to the author of the best published treatise on Jurisprudence. A special gold medal, provided by the gift of Benjamin OLIVEIRA, Esq., is also to be given for a substitute for cotton; and other special gold and silver medals for an incombustible paper, and a design for a Literary and Scientific Institute. An abundance of the society's ordinary gold and silver medals is also ready to be scattered among men possessing either genius or ingenuity. They may patent their inventions and still win the prizes. Let inventive brains and diligent hands become busy!

THE NAVIES OF ENGLAND AND FRANCE form the subject of a lengthy paper transferred to the *Times* from a German publication entitled the "Conversations Lexicon," published at Leipzig. The most remarkable feature in this paper is the prominent notice it takes of the modern expansion which the French navy has undergone. In this respect it has a decided value, and deserves the attention of the English people. It is written, however, with undue partiality; is in many places very erroneous, and owes its position in the leading journal to its undue depreciation of our present navy, the nature and strength of which its author but imperfectly comprehends. This we shall probably show in an early number.

THREE NEW MASTER SHIPWRIGHTS have this week been promoted to the Dockyards of Devonport, Sheerness, and Pembroke Dock. The Devonport vacancy has been filled by Mr. JAMES PEAKE, late assistant at Woolwich Dockyard, who has acquired eminence in consequence of his services in devising and superintending the construction of life-boats; Mr. HENWOOD, late assistant at Chatham Dockyard, and a member of the late School of Naval Architecture, has been appointed to fill the vacancy at Sheerness; and Mr. CRADDOCK, late assistant at Portsmouth, also a member of that School, proceeds to Pembroke Dock.

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[THE LATE HENRY CORT.]

THE CASE OF HENRY CORT, AND HIS INVENTIONS IN THE MANUFACTURE OF BRITISH IRON.

By THOMAS WEBSTER, M.A., F.R.S, &c., &c., Barrister-at-Law.

No. I.

THE history of inventors and inventions presents many features well-deserving consideration. The authors of inventions which have enlarged the boundaries of science, have extended the dominion over matter, have added to the comforts and conveniences of man, or have increased the power and wealth of the nation to an extent which can hardly be estimated, have lived neglected and died unrequited for the benefits conferred on mankind. In some cases the inventors have lived, so to speak, before their time; in others, the difficulty of introducing an invention, however meritorious, by reason of the opposition of existing interests—a difficulty not unfrequently proportionate to the merits of the invention—or the apathy and indifference of the public to changes not actually forced upon them, or the jealousy of competitors, present sufficient causes for the lamentable fate of many whom posterity regard as the great pioneers in the domain of social science and the progress of useful inventions. This is so notorious, that the hard lot of some of its greatest benefactors of their country, as authors and introducers of useful inventions, has been made matter of national reproach. Instances, however, are not wanting in which liberal rewards have been granted by Parliament, or by the Government of the day, to such benefactors, either by the grant of large sums of money or by pensions, or by appointment to important and lucrative situations. The real difficulty lies in the due appreciation of the individual merits amidst the host of persons who, in the case of a successful invention, claim to have had some share in contributing to that success. Nor are such claims altogether ill-founded; the history of abstract as well as of practical science shows how difficult of attainment and how small are the steps, so to speak, of discovery or invention when viewed alone or independent of their combinations or applications as part of some system, and as conducive to some special results, and when dissociated from, or not associated with those elements and conditions which are essential to a successful system. Hence it follows that the merit of the individual is rarely fully and duly appreciated by his contemporaries; and in this, as in many other cases, it must be reserved for the historian and for posterity to do that justice which can hardly be expected at the hands of contemporaries.

But in addition to the difficulty of duly appreciating the merit of the individual who may have contributed to a successful invention, there is not unfrequently considerable difficulty in estimating the merit of the invention. The merit in general is a question of degree; the invention has to be compared not only with what preceded, but with what succeeded it—with the new creations, so to speak, which it has called into existence. Experience and the test of time alone can authoritatively decide on the merit of an invention as an absolute step in the progress of knowledge, however it may appear in relation to those by which it is surrounded. Invention is and must be in its very nature ever progressive; the steps in that progress may be unduly regarded at the time, but the course of improvement will ere long clearly indicate those steps which mainly established the existing state of advancement.

In connection with this subject, it would not be right to disregard or omit all mention of the operation of the system of patents which has been adopted as a means of encouraging inventions, and of reward and remuneration for their introduction, and by which each individual is felt to make the best of the property so recognized in the products of his ingenuity, so that the inventor who fails by such means to derive that reward and remuneration which he might reasonably have expected, must be regarded as presenting an exceptional case.

If the discovery be one not the subject of those laws, he has a distinct claim as a public benefactor on the consideration of his fellow-citizens for some remuneration in respect of his labour and expenditure of time, money, or other capital, and for some reward according to the benefits conferred. If the discovery or invention be one in respect of which those laws give such special property, and the inventor has thought fit to forego, or neglected to avail himself of this advantage, he may have claims on the public similar to those existing in the former case, if the discovery or invention be one which may be thus thrown on the waters and abandoned to it fate. If the inventor, having availed himself of the law, and created property in his invention, has failed to receive the remuneration and reward which he might reasonably have expected, an exceptional case is at once presented, the special circumstances of which will require careful consideration before the claim which may be made can be acceded to.

For such exceptional cases, special legislation was provided in 1855, by Lord BROUGHAM'S Act, whereby the Crown was empowered to grant an extension of the exclusive privileges in cases of the authors of meritorious inventions, for which no adequate reward and remuneration had been derived. The exercise of this power, on the recommendation of the Judicial Committee of the Privy Council, has provided for the ordinary cases of want of adequate remuneration and reward; but exceptional cases are still of occasional occurrence, requiring special consideration, for which that recent legislation affords no relief.

Amongst such, the case of Henry Cort, the successful introducer of the manufacture of iron, as at present practised, stands most prominent, presenting, as it does, peculiarities which distinguish it from all others.

Public attention has been from time to time called to this, perhaps the most exceptional of all such exceptional cases; and it may be hoped that the survivors of the children of this most meritorious inventor may not be permitted to languish in penury, amidst the universal recognition of the wealth created for the nation by the genius and enterprise of their father.

THE THEORY OF NAVAL ARCHITECTURE.

No. I.

THE theory of naval architecture is readily seen to divide itself into two parts, the first embracing questions which relate to vessels floating quiescently upon the water, the second comprising those which relate to vessels moving through the water under the action of some propelling power. The whole of the questions in the first division may be solved in all their ramifications, like other statical problems, as certainly as any proposition in plane geometry. In the second division there are many which might be similarly solved, at least in parts, since a body in uniform motion may be looked upon as being in statical equilibrium, and there are consequently relations known to exist among the forces exerted upon it, although the forces themselves—depending as they do for their amount and the directions of their action upon the laws of the resistance of fluids—are unknown to us.

The first division is very extensive, and every constructor who wishes to know what kind of ship he is designing, and what qualities it will possess, should be able to investigate for himself the considerations embraced by it. Of the second division, the principal questions relate to the position in the ship of the masts and spars, or rather of the centre of effort of the wind on the sails as regards both length and height, in order that the ship may work well with a given amount of canvas, and not heel over to too great an angle under it.

In considering the construction of a new ship, the first conditions which have to be fulfilled are that the ship when built, rigged, stored, and manned, may be able to carry the required cargo, if she be a merchant ship, or the required armament, ammunition, &c., if she be a man-of-war—if a steamer, the engines, boilers, and sufficient coal besides. The ship must carry these without either sinking too deeply in the water, or floating too lightly upon it. These conditions must also be fulfilled with minimum dimensions, for in proportion to the size is the cost of the vessel; to build a larger ship than necessary is to incur unnecessary expense; to build one too small to carry her weights is to render the whole expense useless.

Archimedes, nearly 300 years before the Christian era, showed that the depth to which any floating body sinks in the fluid, is such that the weight of the fluid displaced is equal to that of body. We do not, however, find that the observed fact was then taken advantage of for practical purposes. In early times in England, probably until Sir Anthony Deane became the constructor of ships for the Royal Navy, new ships were mere copies of others already in existence, with trifling alterations to answer particular purposes, or to correct existing defects. Constructors could not then move far out of the beaten track, but had to wait patiently for results until the structures which they reared floated in their native element. Pepys, in his Diary, 1666, says:—"Mr. Deane and I did discourse about his ship, the *Rupert*, which succeeds so well, as he has got great honour by it, and I some by recommending him. The King, Duke, and everybody say it is the best ship that was ever built. And then he fell to explain to me his manner of casting the draught of water which a ship will draw beforehand, which is a secret the King and all admire in him, and he is the first that hath come to any certainty beforehand of foretelling the draught of water of a ship before she is launched." The secret referred to was this:—That the weight of a volume of water equal in bulk to the part of the ship below the water's surface, is always equal to the weight of the ship and its contents; and possibly, though not probably, the corollary from it,—that the

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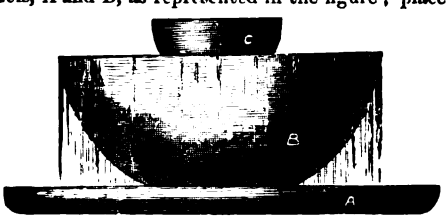
centre of gravity of the volume of water displaced is always in the same vertical as the centre of gravity of the ship and its contents.

These propositions we shall now prove. Let C

be any floating body, a ship, for instance, and A B the surface of the water. Imagine the body to be lifted up vertically out of the water, and the water surrounding the ship to retain the imprint after the body has been removed; and further imagine this space to be again filled with water to the same level as before. The volume of water in this space is evidently the "volume of water displaced by the body," and it is called, as is also its weight, the DISPLACEMENT. Its centre of gravity is denominated the CENTRE OF GRAVITY OF DISPLACEMENT; or, more briefly, THE CENTRE OF BUOYANCY. The particles of water which we imagine to retain the imprint of the body, now support the volume of water which the body displaced, in the same manner as they supported the body itself when it was immersed. Each of these—the water displaced and the body immersed—must then be supported by the same pressure acting upwards. And since the weight of the body would be sustained by the same upward pressure as now supports the weight of the water displaced by the body, *the weight of the floating body must be equal to that of the water displaced—that is, to the Displacement.* Again: When the body is immersed, the pressure downwards is the weight of the body—the pressure upwards, a pressure equal to the weight of the water displaced. These two may be considered as forces acting the one at the centre of gravity of the body, and the other at the centre of gravity of the displaced water, each in its respective direction, and the two being equal to each other, there can evidently be no equilibrium unless their lines of action coincide—that is, unless *the centres of gravity of the body and of the displacement lie in the same vertical line.*

That the weight of the water displaced by a floating body is equal to that of the body and all its contents, may be practically proved by apparatus within the reach of every one. Take two vessels, A and B, as represented in the figure; place



one within the other, and fill the upper one with water to the brim: then take another empty vessel, C, and lower it gradually into the water in B, until it is supported by the pressure of the water. When C is at rest, a volume of water equal to that displaced by it has run over into A; and if this water be placed in one side of a pair of scales, and the vessel C in the other, they will be found to balance each other. Replace C in the water, and gently drop some heavy material, such as sand or shot into it, and more water will overflow; remove C with the material it contains carefully to one end of the balance, and add to the water before put in that which was caused to overflow by the introduction of the material into C, and, as before, the water will balance the vessel and its contents. This may be often repeated, until C sinks nearly to its upper part, and it will be found in every experiment that the weight of the water which has overflowed from B is always equal to that of C, and of the material it contains.

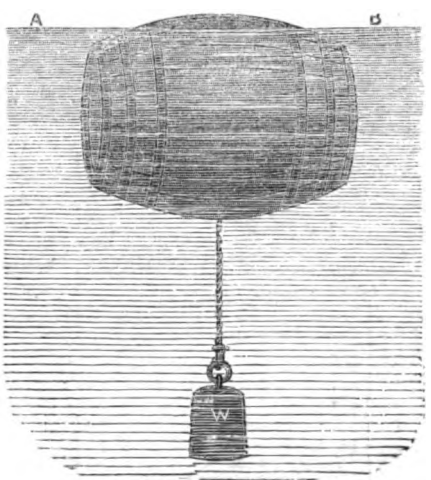
From these practical proofs of the equality which always exists between the weight of the floating body with its contents and that of the water displaced, we also learn that for every weight put on board of a ship there is an equal weight of water displaced by it. Of the knowledge of this fact we shall avail ourselves when we have to discuss the question of stowage, and we shall find that, by its judicious application, our calculations will be found very much abridged when compared with those generally in use.

That the centre of gravity of the ship with its contents is always situated in the same vertical line as the centre of gravity of the displacement, does not admit of a simple practical illustration, inasmuch as the centre of gravity of any floating body and its contents is not generally directly obtainable. But an ingenious person will have no difficulty in proving it by experiment to his own satisfaction. As we said before, however, this follows as a necessary consequence from the equality which has been proved to exist between the pressure of the water upwards, and the weight of the body downwards.

In consequence of the necessity for this equality of the weight of the ship and of the water displaced, we perceive that, if the water in which a ship floats at different times differs in density, there will be a corresponding difference in the immersion of the ship. Now, the weight of a cubic foot of sea water is a little more than 64 lbs., and the weight of a cubic foot of river water about one-fiftieth less. A line-of-battle ship like the *Agamemnon*, when ready for sea, weighs about 5,000 tons, and it requires 26 tons to increase her immersion one inch; consequently, were such a ship to come direct from sea into the river, keeping precisely the same weights on board, she would sink $\frac{5000}{50} \times \frac{1}{64}$ inches, or 4 inches (very nearly) deeper in the river than when at sea. Ships which have flat floors, and are full forward and aft—approximating, in fact, to the form of a rectangular box—as are some colliers, barges, &c., will sink just one-fiftieth deeper when in river water, than when at sea.

The necessary equality already discussed also explains why heavy metals swim in a vessel containing mercury in its ordinary fluid state. The specific gravity of mercury is about 13½, whilst that of iron is about 7¾; it will therefore be readily seen that a mass of iron, 13½ inches deep, with vertical sides, will only sink 7¾ inches in the mercury, and will float in the same manner as a piece of wood floats on the water.

We have already proved that a floating body presses downward, and is pressed upwards, by forces equal to its weight. If, now, a light air-tight vessel, such as an empty cask, be placed in the water, it will float, until it be loaded with a weight equal to the difference between its weight and that of an equal volume of water. Let one end of a rope be secured to the weight, and the other end to the air-tight vessel; throw the



weight into the water, and as soon as the equilibrium has been restored, it will be found that the vessel is nearly at the surface (A B) of the water, as represented in the figure, and the weight W hanging vertically under it, supported by the tension of the rope. It would be entirely immersed, were it not for the effect which the immersion of the weight and the rope has on the vessel, that effect being to raise it a little out of the water—the part emersed being equal to the volume of the weight and of the rope, diminished by a quantity of fluid the weight of which is the same as that of the rope.

On this principle, sunken vessels are often recovered in the following manner:—At low water, a number of empty casks, air-tight caissons, or one or two ships or barges, are attached by strong ropes or hawsers to parts of the sunken ship, and the ropes are hove in tight. As the tide rises, the vessels become more and more immersed in the water until the weight of the additional volume of water displaced by the whole of them equals the force necessary to raise the ship. When tide is nearly at its height, the vessels, with the sunken ship under them, are removed towards the shore until she touches the ground again. If the ship be then in such a position that the falling tide will leave her above water when at its lowest, the vessels are cast off: but if not, they are hove down as before, and the process described is repeated.

The number of air-tight vessels necessary to raise a sunken ship may be thus approximated to. On the sunken ship the pressure downwards is the weight of the ship and of the cargo, and the pressure upwards is the weight of a volume of water equal to that occupied by the materials of the ship and by the cargo. If the ship be built of wood, the specific gravity of the mass could not much exceed unity—that is, the weight of the whole mass would be about the same as that of an equal volume of water. There would then remain to be overcome by the water-tight vessels a pressure equal to the weight of the cargo when placed in water. This pressure can often be found very readily. When known, we must have a number of water-tight vessels, such that their weight, together with the weight of cargo when in water, shall equal the weight of the volume of water displaced by these vessels. If the ship be built of iron, with the usual amount of wood work, the weight of the whole would be about five times the weight of a volume of water equal to the bulk of the materials. In addition, therefore, to the difference of the weight of the cargo and that of a volume of water equal to it—that is, to the weight of the cargo in water—four-fifths of the entire weight of the ship has to be overcome by the pressure of the immersed water-tight vessels. We perceive, therefore, that although an iron ship may be lighter than a wooden one of the same tonnage, yet, were the two sunk with the same cargo on board, the labour necessary for raising the iron ship would be much more than that required for raising the wooden ship, as might have been expected.

It will be thought by some persons, perhaps, that these considerations do not belong to our subject. But it is only by such illustrations that fixed principles are gained, and the student in naval architecture is made familiar with the various phases under which the same problem appears, and it is our intention at all times thus to illustrate whatever we discuss whenever it can be made more clear by doing so.

To return to the displacement: we have seen that the displacement is always equal to the weight of the ship. The consequence of this is that the two are spoken of indifferently; and it is only when speaking of the centre of gravity of displacement, and the centre of gravity of the ship, that we are made aware by the terms that they are not synonymous.

The weight of any vessel cannot be very accurately assigned by calculating the weight of the several parts composing it, even when the timbers and planks are straight—as in some barges—because of the great differences which exist in the specific gravities of timbers of the same species. And in calculating the weight of a ship of the usual form in this way, besides the errors which creep in on account of the variations in the specific gravity of

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the timber, others arise from the difficulty of obtaining the correct contents of curved timbers. These causes of error taken together render the result obtained by this method very questionable, even when the greatest possible care and labour have been expended in the operation. But, after the ship is completed and floating in the water, since we know that her weight is equal to that of the water she displaces, we have only to find the cubic contents of the part immersed, multiply it by the weight of a unit of volume of water, and the result is the weight of the ship and everything in it.

When the ship is of any regular form, the volume of displacement may be found by the ordinary rules of mensuration. Ships are, however, usually of no regular figure, their sections conforming to no other law than the will of the constructor; consequently, whatever methods may be employed to find the displacement, they cannot be more than approximations. These approximations, however, as we shall hereafter show, may be made to approach the actual amount as nearly as we please.

SHIPPING STATISTICS.

IT will be recollected that a committee was appointed by the British Association in 1857, to inquire into the statistics of shipping, with a view to rendering statistical records more available as data, and more conducive than heretofore to the improvement of naval architecture as respects the adaptation of the form of ships to the requirements of sea service. The committee so appointed consisted of the following gentlemen :—

Admiral Moorsom.	William Fairbairn.
J. Scott Russell.	James Perry.
J. E. McConnell.	Henry Wright.
Charles Atherton.	Andrew Henderson.

The committee, on commencing their proceedings, received letters from Admiral Moorsom, Mr. J. Scott Russell, and Mr. J. E McConnell declining their co-operation as members of the committee. The remaining members, however, agreed to prosecute the duties assigned to them, and W. Fairbairn, Esq., F.R.S., by the unanimous desire of the committee, undertook to conduct the proceedings as chairman, with the assistance of Henry Wright, Esq., as honorary secretary.

The following is the report which the committee made to the British Association at Leeds in 1858, the publication of which has not heretofore been authorised. We are indebted to the Editor of the Journal of the Society of Arts for an early copy, forwarded at our request.

The Report runs as follows :—

In the first place, the committee issued a circular, inviting statistical information as to the actual sea performances of ships, with a view to compiling a comprehensive statement as to the sea performances of vessels generally, whence the committee might be enabled to select a considerable number of vessels, of which the performances at sea may have been remarkable; and their attention being thus directed to a limited selection embracing a considerable number of vessels of practically established excellence for sea service, the committee hoped, after making due inquiry, to be enabled to present, as respects those vessels, a statistical exposition, in tabular form, of their various elements of construction and type of build; and thus, by a system of collation and induction, to discover practically those types and elements of construction which have been found by experience most conducive to good performances at sea. In the case of steam-ships, it was purposed that the statistics of the original trials to which steamers are generally put when new, should also be collected, classified, and collated with reference to the subsequent performances of the same vessels at sea, whence it might be determined to what extent and in what respects the usual smooth-water trials of steam-ships may be indicative of the probable properties to be expected of the same ships at sea, as respects their dynamic capabilities.

The committee are happy to say that this attempt at practically inquiring into the peculiarities of construction to which the good or bad qualities of steam-ships may be attributable, has not been wholly fruitless, for, although shipowners, ship-builders, and marine-engine manufacturers have been generally reluctant to communicate particulars whereby the dynamic merits of ships may be numerically classed and compared, the results of which classification and comparison might, if promulgated, affect the commercial value of their property, and the relative professional reputation of constructors, still, in reply to the before-mentioned circular, information has been communicated, as to the performance of vessels, particularly steam-vessels, by which it appears that a great difference exists between steam-ships as respects their economic capabilities for the performance of mercantile steam transport service, leading to the conclusion that the general aggregate of steam service is performed by vessels of inferior adaptation for economic duty, and consequently at a rate of prime cost expenditure, and, therefore, ultimate charge on the public, greatly in excess of that which would be involved if all steamers were of the superior class of excellence that has been already, in certain cases, actually attained. For example: this committee are assured, on authority which they believe to be unquestionable, that a certain vessel, the *Bremen*, of 3,440 tons displacement at the time of trial, propelled by engines working up to 1,624 indicated horse-power, attained the speed of 13·15 nautical miles per hours. Now if we esimate the dynamic duty thus performed by the formula $V^3 D^{\frac{2}{3}} = C$, we shall have the co efficient,

$$C = \frac{(13{\cdot}15)^3 \times (3440)^{\frac{2}{3}}}{1624} = \frac{2274 \times 227{\cdot}88}{1624} = 319,$$

(Ind. h.p.)

and this co-efficient of dynamic duty, resulting from the mutual relation of displacement, speed, and power, appears, from the statements which have been communicated to this Committee, nearly 50 per cent. higher than that realized by the average performance of the steam-ships of the present day. The following are the co-efficients of dynamic duty deduced by the foregoing rule from the performance of mercantile steamers of high repute, of which the trial data have been communicated to this Committee, viz., 325, 291, 291, 288 259, 218, 231, 230, and 201, and many others below 200.

This Committee, therefore, regard the *Bremen* as being a felicitous exemplification of naval architecture as respects type of form adapted for easy propulsion; and as we conceive that the promulgation of some of the constructive elements of this vessel may be of public importance, we are happy in being authorised and enabled, by Messrs. Caird and Co., of Greenock, the constructors of the ship and of the engines, to communicate to the British Association the following statistical data as to the elements of construction of the *Bremen* :—

Length between perpendiculars of stem and rudder post			318 feet.
Breadth of Beam			40 ,,
Depth of held			26 ,,
Mean draught of water at the time of trial			18ft. 6in.
Displacement (D) at trial draught			3440 tons.
Area of maximum immersed section (A) at the trial draught			606 sq. ft.
Distance of maximum section (A) measuring from the stem			159 feet.
Constructors' load draught		forw.	18 feet.
		aft.	19 ,,
Displacement at constructors' load draught			3440 tons.
Rate of ships' displacement at constructors' load draught			25 tons per inch.
Data for laying off Peake's curve of sections.	Area of immersed vertical section at the distance of ¼ length, measuring from stem		256·5 sq. ft.
	Do. ¼ Do. Do.		486 ,,
	Do. ¼ Do. Do.		606 ,,
	Do. ¼ Do. Do.		489 ,,
	Do. ¼ Do. Do.		253·5 ,,
Data for laying off curve of Displacement.	Displacement at draught of 4′ 7½″, being ¼ load draught		360 tons.
	Displacement at draught of 9′ 3″, being ½ load draught		1165 ,,
	Displacement at draught of 13′ 10½″, being ¾ load draught		2240 ,,
	Displacement at draught of 18′ 6″, or load draught		3440 ,,

The foregoing data afford all the particulars required for the construction of Peake's curve of vertical sections, whence may be deduced the position of the vertical line passing through the centre of gravity of displacement, and also the positions of the centre of gravity of the fore and aft bodies respectively.

It will be observed, from the foregoing data of the constructive elements of the *Bremen*, that the maximum immersed section is at the middle of the length, and that the vertical sections are in such ratio to each other, with reference to their respective positions, that the curve of vertical sections will be a close approximation to a parabola.

The ratios deducible from the foregoing particulars of constructive data, combining Peake's curve of immersed vertical sections with the curve of displacement, will give a close approximation to the type of form of the immersed hull.

The engines of the *Bremen* consist of two direct-acting inverted cylinders, 90 inches diameter and 3 feet 6 inches stroke, fitted with expansion valves capable of working expansively to a high degree. All parts of the engines are felted and lagged with wood wherever practicable, the lower 16 feet of the funnel being surrounded by a casing forming a superheating chamber, the steam entering at the lower end, and passing off at the top into the steam pipes leading to the cylinders.

(To be continued.)

THE SMITHFIELD CLUB SHOW.

(Continued from page 7.)

IN resuming our notice of the late implement show, we should not omit to mention the growing interest which is being manifested in the system of "guideway" steam cultivation, introduced and practised by Mr. P. A. Halkett, of 80 Chancery-lane, who is now engaged in forming a company to carry it out upon a comprehensive scale. Its general principle has been often described, and is probably known to most of our readers; but the attention of the agricultural public having been lately drawn to the subject from Mr. Halkett's paper, read before the Society of Arts, and which gave rise to an interesting discussion, we may be excused for saying a few words at this time. At a recent meeting, at the Freemasons' Tavern, when the guideway system of cultivation was discussed, several gentlemen spoke in very high terms of it; Mr. Mechi, Mr. Robert Scott Burn, and Mr. Wren Hoskyns, being amongst the number. The system (by which the whole operations of agriculture are proposed to be, and have actually been, performed by steam-power) consists in laying down, at intervals of fifty feet or more, permanent rails, upon which travels a locomotive cultivator, carrying its own motive power, and to the under-side of which are attached the various implements to be used in cultivating the land. On the headlands rails are laid at right angles to the former, upon which a shunting or traversing carriage moves, by which means the cultivator is transferred from one set of rails to another, or is brought to the homestead, where the engines can be used for thrashing or other barn operations. Upon this plan it will be seen that no weight bears upon the land, thus admitting of its being cultivated in any weather or state of the ground, leaving, it is said, the heaviest clay soil in a state of lightness impossible to arrive at where the weight of men, implements horses, or steam-power is constantly "poaching" it; whilst by consecutive ploughings in the same furrow, it can be cultivated to any depth required. The crops are carried off, and the manure carried on to the land by the same means as other operations are performed; and when we consider the great weights to be moved and the distances over which they must be borne, we may conceive some of the advantages of a smooth road, both as regards saving of time as well as of cost. The quantity, says Mr. Halkett, that can be ploughed per day with power suitable to a farm of 1,000 acres, is 25 acres, and three men are all that are required to conduct the

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operation. This calculation, he states, is based upon work which has been actually and repeatedly performed. As, however, when time presses, a double set of men may be employed, double this amount of ploughing may be done in the twenty-four hours, the operation being capable of being carried on both by day and night. It must be apparent to all, that by no possible system could greater precision in the work be attained than by one in which, as in Mr. Halkett's system, every operation may be ganged almost to within half-an-inch. Indeed, hoeing has been done without injury to within that distance of the plants. The cost of the guideways, if of creosoted timber, is calculated at £10 per acre, or if of hard burned brick and angle iron, £20 per acre; while the cost per acre of various operations for a farm of 600 or 1,000 acres, is set down as follows:—ploughing 5in. by 10in. furrows, 1s. 7d.; hoeing, 3d.; scarifying, grubbing, &c., 8d.; harrowing, clod crushing, rolling, 5d.; drilling or dibbling seed, 5d; reaping (cutting and delivering) at 60 acres per day, 8d.; underground watering crops, at the rate of 3,000 gallons per acre, 1s.; surface watering, 1s. 2d.; carriage of manures, &c., 1d. per ton per mile; and, finally, deep cultivation, to the depth of 25in., 12s. per acre. The mode of cultivating to this depth has been performed by first using six ploughs, cutting six furrows simultaneously of five inches depth; then ploughing again to a further depth of five inches; and at fifteen inches below, through the subsoil of a hard yellow clay, an anchor was drawn, with a palm nine inches in width; thus ploughing and breaking up the ground to a depth of twenty-five inches. This depth of cultivation is sometimes attained by market gardeners by trenching, and, it is said, costs £10 to £12 per acre. Whether or no it be probable that more extended practice will verify the statements here made as to the cost of various agricultural operations, it is perhaps impossible to say; nevertheless, enough has doubtless been done to fully justify extended trials, especially when we remember how much success in agriculture, as in manufactures, depends upon methodical modes of working, which, when introduced in the latter case, have never failed not only to cheapen production, but also very greatly to improve the things produced. We trust Mr. Halkett may succeed in inducing those whose interest it is to set themselves soberly to work to test, on a sufficient scale, the importance of his system. During the show, and for some days subsequently, Mr. Halkett exhibited his cultivating apparatus in the neighbourhood of London.

Powis, James, & Co., of 26 Watling-street, exhibited their endless band-sawing machine, capable of being worked by hand or steam power, as also their circular-saw bench, also adapted for hand or steam power. These machines, although not new, have not, we believe, been before exhibited by the firm at any of the Smithfield shows. They also exhibited an admirable combined machine for morticing, tennoning, and plaining, capable of being worked with ease by hand-power, and performing the operations with the greatest nicety and very great ease.

Joseph Lardner, of Banbury, exhibited his chaff-cutting machines, the peculiarity of which consists in the knives being divided, thus rendering the labour of working more uniform, and, consequently, less exhaustive than when they are of the usual length. Another feature in these machines is, that the legs are made of wrought iron, the tops being cast as usual.

Dray and Co., of Swan Lane, exhibited, in addition to their usual collection of implements, a new hand-dibble, invented and made by Mr. H. Bek, of Lamberhurst, Kent. This dibble we carefully examined, and do not hesitate to say, that it possesses strength and simplicity in an eminent degree. It is adapted for sowing various-sized seeds, including mangold wortzel seed, as well as beans, and is capable of being easily adjusted to suit the particular work required to be performed.

Samuel Nicholson, of Newark, exhibited a new double-barrelled oil-cake breaking machine, with arrangements which allow of a much greater variation being made in the size of the broken pieces of cake than those hitherto made. Mr. Nicholson's oil-cake breaker, of which the one now noticed is an improvement, obtained a prize at the late Chester meeting.

Clayton & Shuttleworth exhibited one of their well-known single blast combined machines, which performs the various operations of bolting, thrashing, straw-shaking, riddling, winnowing, chaff separating, and barley horning. To this machine, in many cases, is added a blower and separator, for finishing the grain for market, the tail being separated from the good corn, and the whole delivered into four sacks—marketable corn, best tail, chicken corn, and light particles blown out before entering the screen. These machines are fitted with patent drums and improved straw shakers. The fixed barn works of this firm are well known, and combine thrashing and dressing machines, corn and tail elevators, necessary shafting, and a self-acting sacking apparatus, for weighing the sacks, and calling by a bell, at the proper time, the man in attendance to remove the full sack, and replace it by an empty one. Messrs. Clayton & Shuttleworth also exhibited one of their small horizontal fixed steam engines, about which we need not further remark than by saying that their workmanship is of the very best kind, and such only as can be ensured by the most perfect arrangements for their manufacture. Although this firm proceed very cautiously in the introduction of changes in their machinery, yet the adoption of nothing is neglected which they consider to be a real improvement to any of the machines which they construct. We believe of portable engines alone, they have turned out between 2,000 and 3,000 during the last few years—a great number having been sent abroad, the greater part of the foreign trade in portable engines being done by them.

William Cullingford, of Islington, exhibited his simple but very cleverly-arranged bird nets, which, when set, are entirely hidden from the bird, but which spring up and make a captive the moment the delicately balanced board upon which the bird alights is touched. The nets may be had complete for 10s. each, being chiefly intended for trapping larks.

Hughes and Sons, of the Great Dover Road, exhibited a new "ring" stone (Pym and Rand's patent), the object of which is to grind faster and cooler than ordinary stones. The top stone on this plan stands, while the bottom one runs. Messrs. Easton and Amos are fitting several of these stones to new mills; but those who are against innovations deem Hughes' ordinary 4 feet stones, with the dressing known as "fourteen threes," as the best. The new stones are beautifully put together, and if the principle upon which they are constructed be sound, which we think it is, there is no fear of failure as the workmanship is perfect.

A. B. Child, of 192, Tottenham Court Road, exhibited his new grain separator combining the action of the blast, screens, and suction, and suitable for dressing both English and foreign grain. These machines are made for cleaning from 300 to 400 bushels per hour.

Barrett, Exall, and Andrewes exhibited one of their two-horse portable engines, which, at the Chester trials, was found to be exceedingly economical in fuel; as also one of their well-known fixed horizontal engines, which gained the first prize at Chester. These engines, when equal to, or above, 10-horse power, are fitted with condensers, which greatly reduces the consumption of fuel. One of this firm's fixed horizontal condensing engines gained the 600f. prize and a gold medal at the Paris Exhibition, and was much commended by M. Caille, the well-known extensive manufacturing engineer of Paris.

As we have still upwards of thirty stands to notice, we must postpone further comment until next week.

PREMIUMS FOR INVENTIONS.

THE Council of the Society of Arts, in issuing a list of desiderata as subjects for premiums during the sessions of 1858–59, and 1859–60, urge upon their members and the public the importance of communicating detailed accounts of new processes in arts or methods of manufacture of any modifications by which these may be simplified, or labour saved, and of any novel application of raw materials, whether previously known or not, to useful purposes. It is quite possible that some of the things set down in their list as to be done may have been already accomplished; but, in such cases, the knowledge of them is limited. One of the objects of the society is to elicit discussion on the subjects with which it deals, to see that nothing is concealed which may in any way tend to promote the good of all, and to record facts and opinions. The weekly meetings, and the Journal of the Society of Arts, afford the requisite facilities for effecting this, and the council earnestly hope that the opportunities thus given may be taken advantage of. Patented inventions are not excluded from receiving the society's rewards. The society is willing to receive communications on subjects not included in the following list, but in all cases expressly reserves the power of rewarding any communication according to its merit, or of withholding the premium altogether. The degree of originality and extent of suggestions for improvements will have material influence on the adjudication of the award. All communications must be written on foolscap paper, on one side only, with an inch and a quarter margin. They must be accompanied by such drawings, models, or specimens, as may be necessary to illustrate the subject. The drawings should be on a sufficiently large scale to be seen from a distance when suspended on the walls of a meeting-room. In regard to colonial produce of all kinds, it is absolutely necessary that a certificate from the governor, or other qualified person should accompany the samples sent to the society certifying that they really are the produce of the particular district referred to. The samples should be sufficient in quantity to enable experiments to be made, and an opinion to be formed of their quality; and it is desirable that the cost price in the district from which they are forwarded should be given. In every instance the probable extent of supply, with the average yield, if cultivated, and whether similar articles have hitherto been exported from the colony, or not, and in what quantities, should be stated. All communications and articles intended for competition must be delivered, addressed to the secretary, at the society's house, free of expense, either on or before the 31st of March, 1859, or on or before the 31st of March, 1860. In the first case, they will be considered during the session 1858-59, in the second case during the session 1859-60. This restriction, as to the date of receipt, does not apply to articles of colonial produce, in respect of which this list is valid until the 31st December, 1860. A list of subjects for premiums may be had on application (by letter) to the secretary of the society.

THE CORT FOUNDRY AT GOSPORT.—There is a curious circumstance worthy of mention regarding the foundry at Gosport, in which the celebrated *Cort* worked out all his important improvements in the casting of iron. The foundry had been shut up for a long time, until a few years ago, Mr. Cunningham, the inventor of the now well-known "Cunningham System of Reefing from the Deck," took the premises for the purpose of working out his great invention. The foreman of the smiths employed by him, happened to be a very clever workman of the name of *Carofe* or *Cort*, and supposed to be a descendant of the same family as the great iron founder. Thus two great inventions, each of which has conferred upon the world incalculable benefits, have been wrought out in the same place, and the name of Cort has been in connection with both of them.

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RAISING AND LOWERING SHIPS OR CANAL BOATS.

FIG. 1.

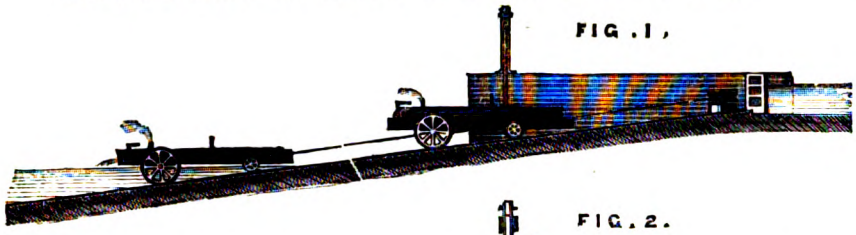
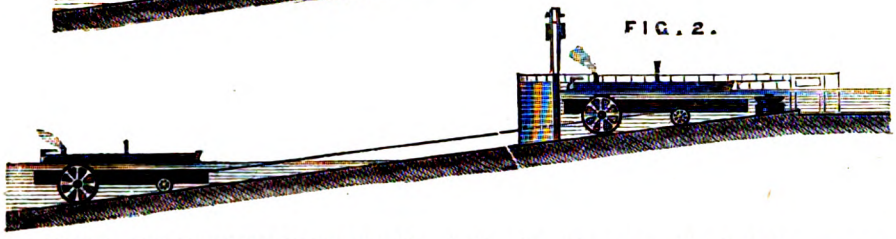


FIG. 2.



RAISING AND LOWERING SHIPS OR CANAL BOATS.

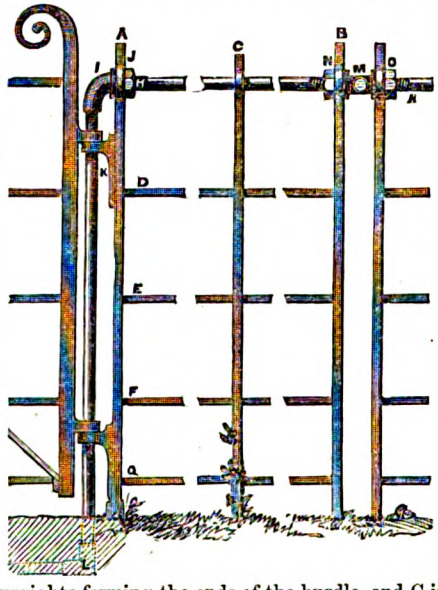
MR. T. FLETCHER, of Brackenley House, near Skipton-in-Craven, writes as follows:—

Herewith I send you drawings of a method of raising or lowering ships or canal boats from one level of water to another. I think you will find the drawings sufficiently intelligible not to require many observations from me. You will perceive it is worked on the self-acting incline plane principle; the moving power being an excess of water in the descending cradle. The cradle will be required to be all of iron; the perforation of the middle pier for the passing of the galvanised wire rope will require facing on both sides with a clow, so that the chain at the end of the rope being placed behind the clow, the clow put down, and the lock filled with water, the ship or boat may proceed. Fig. 1 illustrates the boats in motion on the cradles; fig. 2 shows the boats leaving the cradles.

The above plan, if applied in crossing an isthmus, or in place of canal locks (where there are a number together) would result in a great saving of time and expense in the conveyance of goods by water.

TUBULAR FENCING FOR IRRIGATION.

AN ingenious invention has been made by Mr. W. Bayliss, of the firm of Bayliss & Co., of Monmore-green, Wolverhampton. It has occurred to him that fencing might be so made as not only to possess improved strength and general appearance, but so also as to form a means for conveying water to troughs or cisterns, for the use of cattle, for irrigation, and for other purposes where water may be required. He effects this by making one or more of the fence or hurdle rails tubular, which may be conveniently done by forming them of common iron gas tubing, varying the size and number of tubes according to the quantity of water to be passed through them; and as the manufacture of the same description of tube necessarily involves the use of an extensively diversified shape of angle, and other connecting parts, the same appliances enable him to adapt this mode of constructing fencing in every possible way that water may have to be conveyed. For instance, the connection from one hurdle to another may be made either by forming a shoulder near the ends of the tubular rail, or by tapping the ends externally and screwing on a nut, so that the shoulders or nuts on each end shall form a bearing for the upright end rails to abut against. The hurdle being placed right, and the succeeding hurdle in continuous position, a common connecting piece may be placed between them, and screwed up to form a perfect and strong connection, white lead and washers being used to prevent leakage. As such connecting pieces are commonly made somewhat of a T shape, great convenience is offered for applying a lateral spout, tap, or plug, so that the water may be allowed either to flow on, or to flow out at these connecting parts, the supply being obtained from a reservoir suitably placed to ensure the desired pressure and supply. It does not of course matter if the tube is passed underground, when the water has to be conducted across roads or pathways, or from one permanent hurdle to another, with a swinging gate between- The annexed engraving shows a hurdle (the rails of which are broken, and the uprights brought near together for convenience in engraving). The top rail of it is tubular, and it is connected on the one side to a gate, and on the other to another hurdle. A and B are flat iron

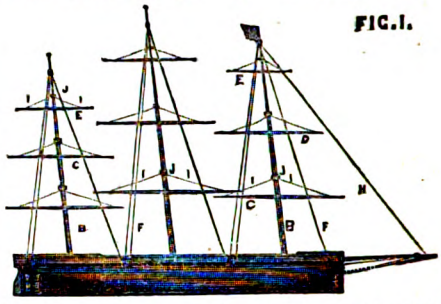


uprights forming the ends of the hurdle, and C is the centre support. The rails, D, E, F, and G, are of common rod iron. The top rail, H H, is of common gas-tubing, one end of which passes through the standard A, and is united by screwing the part I up tight, so as to confine the upright between this part and the nut J. The upright, K, K, is also a tube connected at top with the part I, and to an angle piece at the bottom, shown in dotted lines, showing how the water may, as we have said, be conducted underground. The connection of the gate to the fixed hurdle may be arranged in the ordinary way, or as here shown, viz., by making the vertical tube, K, K, form the axis on which the gate swings. The part I may be like the angle shown in dotted lines at L. For connecting the hurdles together, a connecting piece, as at M, may be used. It is a simple ordinary means of connecting gas tubing, and, by turning this around with proper tools, and regulating the nuts, N and O, a perfectly strong water-tight union may be formed. If desired, arrangements in these parts may be formed for supplying a suitable plug, or tap, or hose, for drawing off the water for any required purposes. Mr. Bayliss has patented his invention.

WEBSTER'S METHOD OF MASTING AND RIGGING VESSELS.

MOST of us know that "made masts" are greatly superior in strength to "single stick masts." Every piece of timber put into the former is, of course, sound and strong, or it would not be used for the purpose, but the latter is liable to be very rotten internally, without affording any external indication of the fact. Notwithstanding these considerations Mr. W. Webster, of Jefferson County, Washington, United States, has thought fit to patent in this country what he calls "an improved method of rigging vessels," the main feature of which is the use of single stick masts for all classes of ships. Fig. 1 is a diagram of

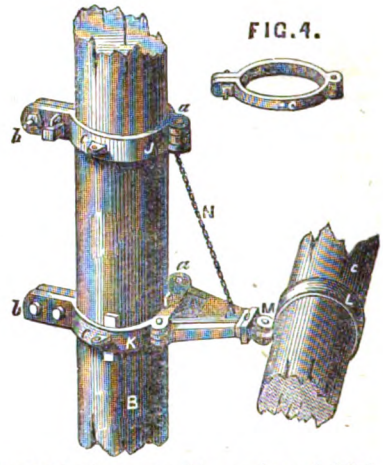
FIG. 1.



ship rigged according to his plan. A is the hull of the vessel; B, B are the masts; C, C, the lower yards; D, the topsail yards; E, the topgallant yards; F, the shrouds; G, the bowsprit; H, the jib-stay; I, the lifts; J, the slide bands to which the lifts are attached; K, that part of the truss band that embraces the mast; L, that part of it

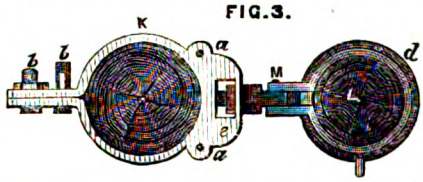
FIG. 2.

FIG. 4.



which holds the yard; M, a universal joint; N, chain slings; *a*, hinges; *b*, bolts; *b'*, clamp screws; *c*, eye bolts; *d*, annular sheave for rotating yards; *e*, yoke. Ship's masts are now usually made, he says, of three or four pieces by doublings, which necessitates a great deal of top hamper to secure and hold these pieces in place. and cumbrous contrivances to hoist and lower them; this top weight involves a decrease in the length of the

FIG. 3.



spars and in the spread of the canvas; it is also an important element in the cost of a ship. Abundance of sticks, long, straight, and large enough for a ship's mainmast, and of the proper material, can be obtained on the north-west coast of the United States, and probably in many other portions of the world. For smaller vessels sticks of proper dimensions are everywhere readily

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obtained. The masts formed of them are secured to the hull by wire shrouds, F, F, placed at an unusually large angle with each other, and so that the lower ends of the after shrouds of the foremast are immediately contiguous to those of the forward shrouds of the mainmast, and so with the others. "A ship with masts and shrouds of this description will carry," says Mr. Webster, "with safety one-fourth more canvas than the ordinary amount, and will sail much nearer to the wind." The yards he makes much longer than usual, as shown, and secures them to the masts by an improved form of truss-band and slings. These bands, figs 2 and 3, are hinged at *a*, *a*, and have clamp screws, B, to hold them at any desired point on the mast, The yards are held in bands, L, hinged to a bolt, which rotates in a yoke, *e*, attached to and forming part of the band K which grasps the mast. This attachment is a universal joint, M, and allows motion to be given to the yards in every required direction. The lifts, I, are attached to hinged slide-bands, fig. 4, occupying the positions J, J, on the mast, fig. 1, that is, they are clamped to the masts at the proper distance above their respective yards. The hinge-bolt of these bands has a ring at its lower end, fig 2, to which the chain-slings of the yarn are hooked. There are also eye-bolts, *c*, in the sides of these bands, to which the lifts, I, are attached. The bands of the top-sail yard are slit, L, fig. 3, for the reception of a grooved hoop or sheave, *d*, which may be rotated in them as a sheave is rotated in an ordinary pulley. The yards, C, D, E, work inside the shrouds, and can be hoisted up or lowered down upon the rail as readily as sails are now hoisted and lowered, and when on the rail can be pointed nearly fore and aft. The topsail yard may be rotated on its own axis in its band by means of the annular sheave *d*, fig. 3, turning in the slit in the band. The bowsprit, G, he makes to run inboard; when it is thus run in and the yards lowered, the ship will present to the action of the wind only three bare poles and a few small wire shrouds. It will be observed that he does not connect the masts together by stays as in ordinary ships, relying upon the great inclination of the shrouds to give them the required stability; nor does he connect the bowsprit to the foremast by anything more than a small cord, H, which can be severed in an instant, and would yield of itself to a much smaller force than would suffice to carry away the bowsprit. "The effect of this arrangement is," he says, "that the loss of one mast does not involve the loss of the others, and the common accident of carrying away the bowsprit does not endanger the masts."

ON THE CONSERVATION OF FORCE.

(*Continued from page* 16.)

In very much of this essay, Mr. Grove endeavours to expunge from the mind the idea of force as an external reality, and to induce in the mind of his reader, the habit of regarding physical phenomena as various modes of motion impressed upon matter, force being a mere hypothetic mediate idea, demanded by psychological convenience, but having no objective truth. The only objective realities which he is inclined to admit are matter and motion. These are the two elements of various proportions of which Mr. Grove attempts to show all physical phenomena are consituted. Is it possible that science should gain anything from such an attempt? In order that such a proceeding may be of any considerable use it must be first shown that the ideas of the two elements, matter and motion, are themselves of a simple nature. Before we can say that the term or the notion of force as an outward fact is unnecessary for the knowledge of physical philosophy, and that the two ideas of matter and motion are all-sufficient, it must be shown that the idea of matter does not itself involve any idea of force.

If the subject here suggested be followed up, it will be found so difficult to determine which of the two terms, and which of the two ideas is the more important, and which first reaches the mind, that I think it only prudent to accept them both. It is said we only know force by the motion with which it impresses matter, and it may be answered we only know of matter from the forces with which its various particles interact on one another. To attempt to eliminate force from its companion ideas of matter and motion is not desirable, and cannot be successful. These three ideas, too, are distinct, and must not be regarded as interchangeable or convertible. Even as Mr. Grove has defined force, it cannot be regarded as identical with motion. And matter, though it is the connecting link between the other two, is conceivable apart from both. But he does not preserve the distinction. He is wise enough in his preliminary maxims and observations. When I follow him, however, to their application to practical particulars, I am induced to wonder how performances of such various merit could proceed from the same author. By his own definition above quoted, which is substantially identical with that ordinarily given by mathematical writers, force acting to produce motion is identical with pressure, which, associated with equal and opposite pressure, retains a body at rest. It is an established doctrine, that a definite force or pressure acting on a body, and unopposed, during a definite time, produces in that body a definite velocity, and that this velocity varies directly as the pressure and the time, and inversely as the mass or quantity of matter of the body. Hence it follows that, if a constant force has produced in a given body a given velocity in a given time, the force will be proportional directly to the mass and the velocity, and inversely to the time. To measure forces, therefore, by means of the motion which they generate, it is the custom to use the momentum, as it is called, or the product of the mass moved and the velocity produced in a second of time. It must be particularly observed that not the momentum or quantity of motion developed, but the relation of this motion to the time consumed in its production, is the real measure of force. If I were to take a cylindrical vessel of unknown section, one foot deep, fill it with water, and weigh the contents, I might take the number of pounds of water as a measure of the area of the sections of all such vessels of the same depth. But the two ideas are by no means convertible, and it would be productive of the greatest confusion to interchange the terms weight and area in most propositions involving these ideas. This is the ordinary doctrine with regard to a single constant force acting on a single body.

But forces never appear singly. Every force on one body is accompanied by an equal and opposite force acting on some other body. With every action there appears an equal and opposite re-action. From these two propositions it follows that every change of momentum impressed upon one body is generated at the cost of an equal and opposite change of momentum in some other body or bodies. For as there is no such thing as a single isolated force acting in one direction in a single body, so every change of motion involves the mutual action of at least two bodies The force acting on the one must, therefore, not only be equal to, but of the same duration as that acting on the other; and since momenta in equal times by equal forces are equal, the changes of momenta in the two bodies are equal in amount and opposite in direction.

This law of action and re-action, extended to the other changes of which the material world is susceptible, implies, in my belief, all that is true in the general doctrine of the conservation of force.

The key notion in the system of physical doctrine which Mr. Grove and others endeavour to teach, appears to be that the universe, on the whole, must be in a state of permanence—that no change in any place or any body of matter is isolated and absolute, but that every modification is compensated for by an equivalent counter-modification in some other body. But they far outstep the limits of this law and of truth at the same time. Take the following extract from Mr. Grove. It relates to impact, and appears to me to be neither related to fact, nor required by the general principle of action and re-action:—

"It may be asked what becomes of force" [motion should be meant] "when motion is arrested or impeded by the counter-motion of another body? This is generally believed to produce rest, or entire destruction of motion, and consequent annihilation of force: so indeed it may, as regards the motion of the masses, but a new force, or a new character of force, now ensues, the exponent of which, instead of visible motion, is heat. I venture to regard the heat which results from friction or percussion as a continuation of the force which was previously associated with the moving body, and which, when this infringes on another body, ceasing to exist as gross palpable motion, continues to exist as heat.

"Thus let two bodies, A and B, be supposed moving in opposite directions (putting for the moment out of the question all resistance, such as that of the air, &c.), if they pass each other without contact each will move on for ever in its respective direction with the same velocity; but if they touch each other the velocity of the movement of each is reduced, and each becomes heated. If this contact be slight, or such as to occasion but a slight diminution of their velocity, as when the surface of the bodies are oiled, then the heat is slight; but if the contact be such as to occasion a great diminution of motion, as in percussion, or as when the surfaces are roughened, then the heat is great, so that in all cases the resulting heat is proportionate to the diminished velocity. Where instead of resisting and consequently impeding the motion of the body A, the body B gives way, or itself takes up the motion originally communicated to A, then we have less heat in proportion to the motion of the body B, for here the operation of the force continues in the form of palpable motion: thus the heat resulting from friction in the axle of a wheel is lessened by surrounding it by rollers; these take up the primary motion of the axle, and the less, by this means, the initial motion is impeded, the less is the resulting heat. Again, if a body move in a fluid, although some heat is produced, the heat is apparently trifling, because the particles of the fluid themselves move, and continue the motion originally communicated to the moving body; for every portion of motion communicated to them this loses an equivalent, and where both lose, then an equivalent of heat results."

I must confess that I am by no means certain of my interpretation of this passage. I am not sure whether it is intended as a statement of facts *as they are*, or as they *ought to be*, according to the author's notions of physical propriety. Does heat result from impact only for certain absolute velocities of impinging bodies? If two persons come in collision, will the heat developed be less if they are on board ship than if the same thing happened on *terra firma*? Will not the heat which supervenes depend only on the intensity of the blow, which in turn depends only on the relative velocities of the impinging bodies? Suppose one body, A, in motion to impinge on another, B, at rest, and suppose their mutual elasticity is ½, and the mass of A = ½ that of B. In such a case the whole of A's motion would be transferred to B, and A would be reduced to rest. No motion of the masses could, therefore be supposed to be lost. Will any one pretend that no heat would be produced, and that heat would be developed if the bodies struck each other the same blow on board a ship, with different absolute velocities? Who would believe such a one? And how could he prove his point? There is no doubt that the same heat would appear in the case I have proposed as if the same bodies came into collision under any absolute velocities whatever, so long as their relative motion is the same. If the heat called forth in other cases of impact can be regarded as an equivalent of motion, apparently lost, then in this case, where no motion is lost, and yet heat is generated, there is an appearance of new force without an equivalent disappearance of the old. Thus Mr. Grove's own opinions appear to me to involve that creation of force to which, in general, he so seriously objects.

May not the true account of such cases be that the "force," or rather motion, which is said to be lost, is not motion lost at all, but that the two masses, with their motions after impact, are equivalent to their motions before impact? If they were moving in opposite directions, the motions destroyed are equal in amount and opposite in character, so that whether existent together or together destroyed, they are alike valueless at all stages of the phenomenon. May not the heat, too, which makes its appearance, be of the same double character as the motion lost sight of?

That there is a law of conservation of momentum I do not doubt, and there may be a law of conservation in relation to other natural phenomena. But I am quite sure that the advocates of the conservative doctrine who have hitherto come to my notice, have either mistaken the law altogether, or grossly misinterpreted it in its branches.

A MECHANIC.

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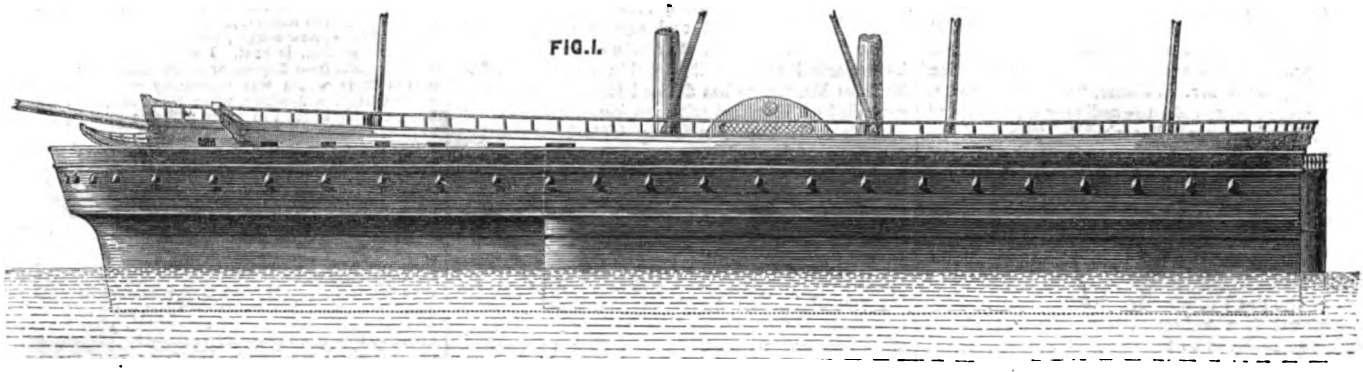
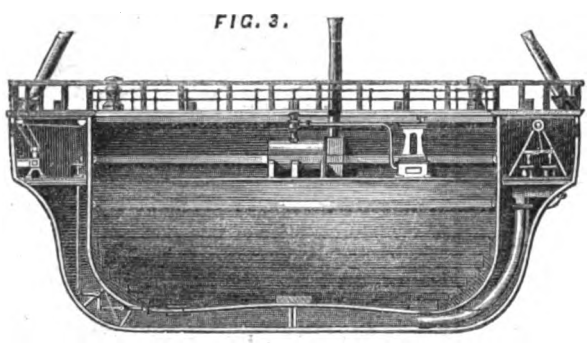
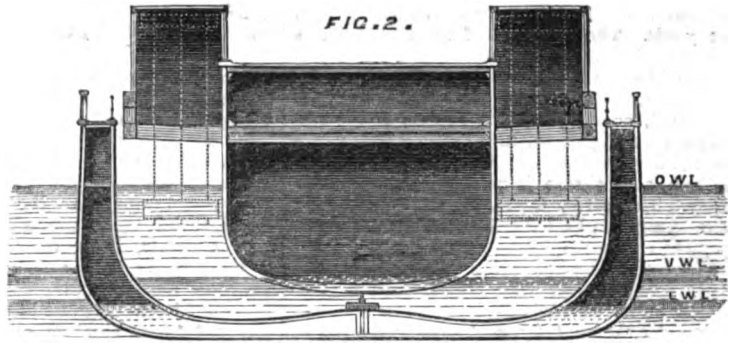
LENOX'S IRON FLOATING DOCK.







LENOX'S IRON FLOATING DOCK.

THE esteemed principal of the Chain Cable and Anchor Works, Mill Wall, Poplar, has favoured us with the following communication, and with the drawings from which the annexed engravings were made:—

GENTLEMEN,—Observing in your No. 1835 a description of a floating dock to be constructed of wood, proposed by Mr. Geo. Bayley, of Cowper's Court, Cornhill, in 1836, I was reminded of an arrangement I made for a similar purpose, to be constructed in iron, for which I took the preliminary steps for a patent in 1846. I had not then heard of any similar proposal, nor did Mr. Bayley's plan appear to be known at that time. I made a model with air-tight compartments, air pipes, and model of a brig, floating it in water, which I exhibited to several engineers, the late Mr. John Seaward, the late Colonel Brandreth, of the Admiralty, Mr. Denison, of Woolwich Yard (now Sir William Denison), and to the Lords of the Admiralty—all of whom expressed their satisfaction with my invention. Their lordships directed me to place the model again with Colonel Brandreth and Mr. Denison, for the purpose of estimating its practicability and cost; the working of the model was much appreciated by those gentlemen, as will be seen by letters from the latter, and by the former having asked for my specification of its construction and estimated cost, to place in his department in Somerset House. There it has, unfortunately, remained unnoticed ever since, under the care and keeping of Mr. Scamp, into whose hands Colonel Brandreth resigned it on quitting the office; Mr. Denison was shortly after appointed to the government of Swan River. I will venture to mention the origin of the idea, and then give you a short description, after which I will leave it in your able hands, to deal with it as you may deem it merits. I will premise by observing, that I am indebted, in a considerable degree, to the assistance and able services of my friend, Mr. Robert Murray, the brother of Mr. Alexander Murray, the Admiralty engineer of Portsmouth Dockyard, for the drawing out of the specification and description of my invention. About the year 1843, from a knowledge of the strength of iron, I was favoured with a visit from Mr. Murray, on behalf of Mr. Fairbairn, for the purpose of considering what size and strength would be required to construct some vessel or machine in iron, for the Emperor of Russia, that should supersede the pontoons used for floating the men-of-war over the bar, and out of the river Neva, to Cronstadt; but, after much consideration, we came to no result. About two years afterwards the idea struck me, that an entire dock might be made to float a ship, with her armament complete; and thus my model arose. I connected it with the possibility of war with a great neighbouring power, whose ships and forts might riddle our steamers, which, thus disabled, might at once run up to the Medway, or to Woolwich, where floating docks might be moored always in readiness, and enter them irrespective of tide, and out again in a few hours, returning to their work of mischief in the chops of the Channel. I now submit a lithograph of the dock, which I propose to make a complete dockyard, by the introduction of workshops and machinery around the main deck, and over the air-tight compartments, to be worked by the pumping engine, and a strong sheer-legs erected from side to side over the middle of the dock, for the purpose of masting the ships, putting in and out the boilers of steamers for repair, &c., &c. The construction of this dock is upon the principle since used in the *Great Eastern*, viz., double-sided, with internal divisions, &c. GEO. W. LENOX.

We have but little to add to this communication. The perfect practicability of Mr. Lenox's proposals experience has placed beyond doubt. The origination of so sound and useful an invention does him much credit. The floating dock has, in modern days, become comparatively common in countries where there is but little tide, but its use is unnecessarily restricted, and appears likely to be interfered with by more specious, but less efficient contrivances. The publication of Mr. Lenox's letter and illustrations may tend to counteract this circumstance, and to promote the adoption of the dock in many parts where it is much needed. But few will now doubt the superiority of iron to wood as a material for its contruction; and Mr. Lenox has drawn a specification of the construction, showing how it may be efficiently applied. Fig. 1 of the engravings is a side elevation of the dock, containing one of the Peninsular and Oriental Company's steam ships. Fig. 2 is a midship section of the same; O W L being the water line when the dock is open, and the vessel entering it; V W L the water line when the dock is pumped dry, with the vessel in it; and L W L the water line when the dock is empty, and pumped dry. Fig. 3 is a transverse section through the dock forward.

MAUDSLAY'S IMPROVED FURNACES FOR MANUFACTURING IRON.

EVERY engineer knows that immense expense is incurred in the manufacture of those large masses of wrought iron which have to be used for certain parts of steam-engines for which ordinary cast iron cannot, with security, be employed. After many years' experience, especially in connection with the manufacture of large marine engines for the Admiralty, Mr. Joseph Maudslay, of Lambeth, has instituted experiments with the view of producing an iron which should possess but little less strength than wrought iron, and at the same time be susceptible of being cast in moulds to the forms required; and he has been, to a very great extent, successful. The apparatus by which he effects his object is a rotating furnace, moving about an inclined axis, as illustrated in figs. 1 and 2 of the annexed engravings, of which fig. 1 is a longitudinal vertical section, and fig. 2 a transverse vertical section through the bed of the furnace. A is the fire-place; B, the feeding hole for the fuel; C, the inclined bed of the furnace, which is made to revolve about an inclined axis; D, an arched cover above the furnace, which cover is supported by a fixed iron frame, or casing; E, the door through which the furnace is charged with metal; F, a tapping-hole, through which the metal is run off; G, a roller-frame, upon which the bed of the furnace revolves; H, a bevel pinion gearing into the teeth of the wheel for giving motion to the revolving bed; K, a lower frame furnished with wheels, by means of which the revolving bed, after having been lowered by the screw L, may be withdrawn from beneath the arched cover, for repairs or otherwise. The

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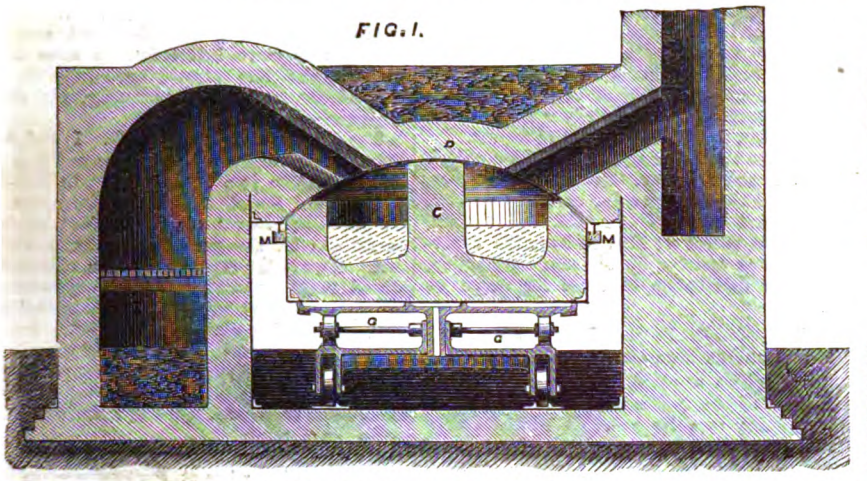
MAUDSLAY'S IMPROVED FURNACES FOR MANUFACTURING IRON.

FIG. 1.



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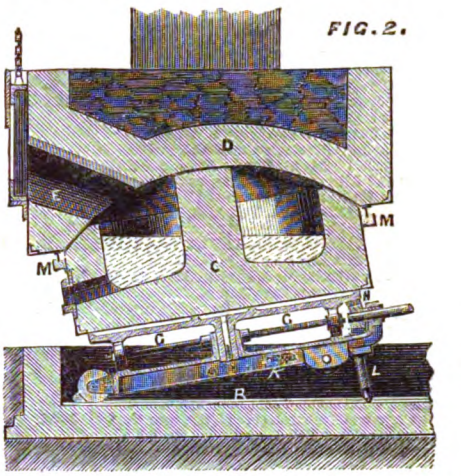


wheels of the lower frame run upon rails, R; M is a sand-joint for preventing the access of cold air into the furnace between the fixed top and the revolving bed; N is the flue leading to the chimney. The arrangement of the furnace above described is the best with which the inventor is at present acquainted for carrying his invention into effect, but he does not limit himself to the details thereof, as they may be variously modified.

By keeping the metal stirred about for some time whilst in its molten condition, by means of the rotating furnace, the sulphur and other impurities contained in it are allowed to readily fly off, so that the apparatus answers, in some measure, the purpose of a puddling furnace, and leaves the metal itself in a semi-puddled state, somewhat approaching the condition of wrought iron, but still with sufficient fluidity to allow of its being run into moulds and used for many purposes for which wrought iron is at present employed.

The axis of the improved furnace is placed by preference about 10° out of the perpendicular.

SIR JOSEPH PAXTON'S IMPROVED HORTICULTURAL BUILDINGS.

FIG. 1.

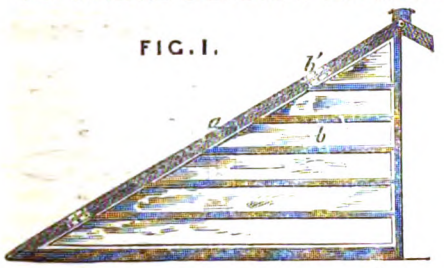


FIG. 2.

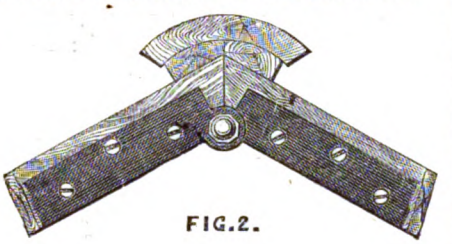


FIG. 4.

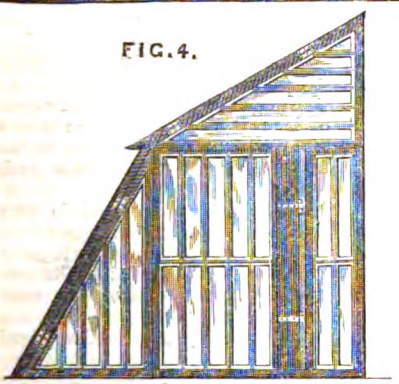
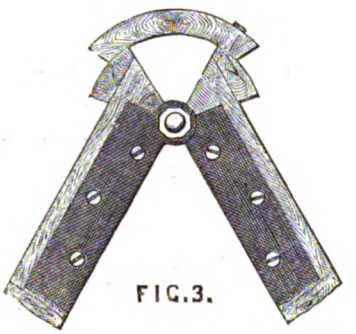


FIG. 3.



SIR JOSEPH PAXTON'S IMPROVED HORTICULTURAL BUILDINGS.

SIR JOSEPH PAXTON, M.P., who has probably as good a knowledge of the requirements of horticultural buildings as any man living, has patented a set of improvements in their construction. In carrying out his invention rectangular glazed frames are used, and are by preference longer than they are wide. These frames are combined in pairs at their upper ends by hinges, in such manner that their lower ends may be set apart at different times to a greater or less distance, according to the horticultural purposes to which the buildings are for the time applied, and their upper ends are so arranged as to form good ridges, where two of the frames go together. Each pair of such frames is confined with the neighbouring pair by distance pieces of a few inches in length, which are made to lock or hold the neighbouring pairs of frames correctly together, leaving an open space between; and it is by means of these openings that ventilation is obtained for the interior of the buildings. The openings are arranged to be covered, or for a time partly covered, by doors or flaps hung to the sides of the frames, such doors being by preference made to open or close in parts to facilitate the adjustment of the ventilation from time to time. The lower parts of the frames, when of wood, are shod with zinc, or other metal. In some cases, such frames as are above described are placed one above another, the upper ones forming a roof, and the lower ones forming inclined sides sustained by uprights. The ends of such buildings may be made of angular glazed frames, so arranged as to form different angular ends, or the ends may be made of wood, or of mats, or of other material.

Fig. 1 of the annexed engravings is an end view of one-half of a horticultural building or glazed structure constructed according to Sir Joseph's invention. *a a* are the side frames, which are hinged together at their upper ends, and are in this structure inclined at an angle of 30° to the ground line. *b b* are triangular glazed frames, forming the ends of the structure; they are hinged to the side-frames at *b' b'*. If it is desired, the side-frames may be inclined at an angle of 60° to the ground line, and the end frames, *b*, to adapt them to the change of inclination in the side-frames, may be turned one-quarter round. Fig. 2 is an end view of one of the joints employed to combine together in pairs the side-frames, *a a*. In this figure, the joint is in the position which it assumes in fig. 1. Fig. 3 is a similar view of the joint in the position it assumes when the side-frames are at an angle of 60° with each other.

The frames have each a metal eye fixed to them, and a thumb-screw passes through the eyes of the two frames, and screws into a nut beyond. Each frame has also a wooden block, with a curved upper surface fixed to its upper edge; and a curved ridge-piece is employed, which, resting on the curved blocks of the two frames of each pair, makes a tight joint at whatever inclination the frames may be set. The ridge-piece is held in position by pins at intervals.

Fig. 4 is an end view of one-half of a structure formed from the same frames, *a* and *b*, and in which frames, *a a*, are placed one above another, the upper ones forming the roof, and the lower ones the inclined sides. In this structure a fixed framework, *A A*, is employed, and the roof is fixed to this by screws, and the side-frames may be hinged to the upper part of the fixed frame-work, *A*, all round in a similar manner to that in which the frames *a* were before hinged together in pairs.

PRESS PERVERSION.—A paragraph which has lately gone the rounds of the press, presents a singular example of the perversions which, somehow or other, are effected by the press. At a late meeting of the Society of Arts Mr Scott Russell mentioned the "circuitous way" in which a copy of the Report on Naval Architecture was obtained. The paragraph says it was procured "from the continent!" It was not, however; and Mr. Russell did not state that it was.

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LIST OF NEW BOOKS.

Adcock's Engineer's Pocket Book, 1859, 12mo. 6s.
Ashford's London, Past, Present, and Future, 5s. 6d.
Bohn's "Carpenter's Animal Philosophy," n. ed. 6s.
Braithwaite's Retrospect of Medicine, Vol. 38, 1858, 6s.
British Imperial Calendar, 1859, 12mo., 5s. 6d.
Buckland's Curios. Natural Hist., 4th edit. 6s. cl.
Burke's Dict. of Peerage, and Baronetage, 21st edit. 38s.
Cambridge Essays, by Members of the University, 7s. 6d.
Chambers's Journal, Vol. 10, New Series, royal 8vo. 4s. 6d.
Conington's Handbook of Chem. Anal., 7s. 6d. cl.
Conington's Tables for Qual. Anal., 2s. 6d. cl.
Engineer's and Contractor's Pocket-book, 1859, 6s.
Fowler's South. Lights and Shad.: Notes on Australia, 1s. 6d.
Historical and Literary Celebrities, crown 8vo. 3s. 6d.
Hunt'sTown, its Mem.Characters and Events, new ed. 2s. 6d.
Hunt's Yachting Magazine, Vol. 1858, 14s. cl.
Johnson's British Ferns, Popularly Described, 3rd ed., 3s. 6d.
Kelly's Life in Victoria, 1853 and 1858, 2 vols. crown 8vo. 21s.
Laxton's Builder's Price-book, 1859, 4s. cl.
London and Provincial Med. Direct., 1859, 6s. 6d. cl.
Lumley's New Sanitary Law, 10s. cl.
Mitford's Recollections of a Literary Life, new edition, 6s.
Nautical Magazine and Nav. Chron., 1858, 13s. 6d.
Oliver & Boyd's New Edin. Almanac, 1859, 5s. bd.
Orr's Circle (re-issue) "Organic Nature," Vol. 3, 5s.
Parent's Cab. of Amus. and Inst., n. ed. Vol. 2, 1s.
Photographic Almanack, 1859, 12mo. 1s. sewed.
Photographic Art Annual, 4to. 21s. cloth.
Piesse's Chymical, Natural, and Phy. Magic, fc. 8vo. 3s 6d.
Pupil Teacher, The, Vol. 1, post 8vo., 3s. 6d. cloth.
Ranking and Radcliffe's Abst. of Med. Sci., Vol. 28, 6s. 6d.
Rubens as an Artist and a Diplomatist, by Sainsbury, 16s.
Scottish Annual, 1859, edited by Brown, crown 8vo. 7s.
Sharpe's London Magazine, Vol. 13, New Series, 6s. 6d
Shaw's Union Officers' Manual, for 1859, 12mo. 4s. cloth.
Sketches and Lessons from Daily Life, fc. 8vo. 2s. boards.
Somerville on Connexion of Phys. Sci., 9 ed. 9s. cl.
Steane & Hinton's Notes of Tour in Sweeden, 1859, 3s. 6d.
Tweedie's Ruined Cities of the East, fc. 8vo. 3s. 6d. cloth,
Who's Who, 1859, 16mo., 2s. 6d. cl.

FOREIGN BOOKS RECENTLY PUBLISHED.

Barruel (M. G.), Traité de chimie tech. tome iv. 6s.
Bellermann (Heinr.), Die Mensu. u. Taktz. d. xv. u. xvi. Jahrhunderts erläutert, 4to. Berlin, 6s.
Biot (J. B.), Mélanges scient. et litt., 3 vols. 20s.
Champion La fin du monde et les comètes, 1s.
Chenu, Encycl. d'hist. nat., 5s. 3d.
Desbarreaux-Bernard, Les Lanternistes, Techener, 5 portraits, 12s., without, 8s.
Gervais et Van Beneden, Zool. med., 2 vols. 12s. 6d.
Keppleri (Joa.) astron. op. omnia, Ch. Frisch, vol. ii. pars. i. Frankfort-a-M. 6s.

LITERATURE.

The Carpenter and Joiner's Assistant; a complete course of Practical Instruction in Geometry, Geometrical Lines, Drawing, Projection and Prospective—the Selection, Preparation, and Strength of Materials, and the Mechanical Principles of Framing, with their Applications in Carpentry and Joinery. Parts 5.—14. Blackie and Son. Glasgow, Edinburgh, London, and New York.

WE have nothing but praise to give to this admirable work, which is now sufficiently far advanced in publication to enable us to speak of it with confidence. Its authors are equal to their work; its theoretical disquisitions being sound, and its practical articles full and reliable. Its illustrations are really perfect. We earnestly recommend it to carpenters, joiners, and other mechanics, and wish every trade possessed an equally splendid text book.

Painting Popularly explained, including Fresco, Tempera, Encaustic, Miniature, Oil, Mosaic, Water Colour, Missal, Painting on Pottery, Porcelain, Enamel, Glass, &c.; with Historica, Sketches of the Progress of Art. By THOMAL JOHN GULLICH, Painter, and JOHN TIMBSS F.S.A., Author of Curiosities of London, &c, Kent and Co. (late Boyne) Fleet-street.

THE work before us singularly bears out, in their utmost integrity, the promises made to the reader in its title. To a great deal that is original in thought, expressed in simple and not inelegant language, and free from technicalities, is added much ably condensed information from the best and most expensive volumes devoted to art. Mr. Timbs, admirable as a collator, is here conjoined with Mr. T. J. Gullich, an artist, whose pen exhibits a happy fluency of style, and occasionally a just severity of handling which, only requires a little less modest reserve to render his literary talents a most desirable aid in the detection and exposure of the cant which prevails at the present moment in art. As a means of reference, the careful index of the book before us will afford facilities to the connoisseur and general reader to an extent, the expectation of which, its comparatively small size at first appears to discourage; and the artist may learn in the volume all that description of knowledge, which books have the power to bestow—a history of art, with its mechanical resources and requisite paraphanalia; more than this, it would be absurd to expect.

We have to thank the author of the Year-Book of Facts, Popular Errors, Curiosities of Science, Curiosities of History and other excellent works of reference; and his co-adjutor, Mr. T. J. Gullich, for a volume which we hope to have the opportunity of often opening for our own information, and for the delectation of those for whom we write.

Adcock's Engineer's Pocket Book for the year 1859. London: Simpkin Marshall, and Co.

THIS book suffers, as usual, from the very comprehensiveness of the information contained in it. Without going over its valuable contents very minutely, we find that its articles are brought up to the end of last year, and are prepared with the accustomed care of its authors. We know of no book of the kind in which the information needful for engineers is, in the main, so sound or so complete. We observe, however, with much regret, that the absurdly blundering article on Naval Architecture—the defects of which were pointed out by us two years ago—still stands uncorrected even by an "Erratum."

A Short Handbook of the Comparative Philology of the English, Anglo-Saxon, Frisian, Flemish or Dutch, Low or Platt Dutch, High Dutch or German, Danish, Swedish, Icelandic, Latin, Italian, French, Spanish, and Portuguese Tongues. By HYDE CLARKE, D.C.L., London: John Weale, 59, High Holborn. 1859.

A LITTLE book on a great subject; but, though small, it contains more than any reader will thoroughly master, unless he bring considerable previous knowledge to its study. One important lesson it may, however, teach to every reader, viz., that between ages so widely different as to form the broadest barrier which can separate two peoples, there is a relation sufficiently intimate, and sufficiently apparent, to suggest the thought that all mankind belong to one great family, and that "God has made of one blood all the nations of men."

Five Place Logarithms, arranged by EDWARD SANG, F.R.S.E. William Blackwood and Sons. Edinburgh and London. 1859.

THIS little book is about four inches by three inches, and contains thirty pages of tables in a paper cover. It sells for 6d. This is all we observe on looking at it, and into it; and as the author has not chosen to say anything about it, we do not see why we should add more.

CRUSHING APPARATUS.—Mr. E. W. Blake, of Newhaven, has introduced a simple but useful form of crushing apparatus. It consists essentially of a pair of vertical jaws, one fixed, the other moveable; or both may be moveable. These jaws have their faces corrugated vertically, and convergent downwards, so that whilst the space at the top, where the stones, &c. are introduced is sufficiently large to receive them unbroken, the space at the bottom is only sufficient to allow the fragments to pass when broken to the required size. A short powerful vibration is imparted to one or both of the jaws by any convenient levers worked by a crank or eccentric. The back stroke of the jaw is effected by a spring. If one stroke does not crush the stones sufficiently the next will crush them still smaller, and so on until they are sufficiently reduced to pass through the bottom space between the jaws. It is also proposed to combine with this machine a revolving screen to receive the fragments as they fall from the jaws, and sort them into two or more sizes,

AN IMPROVED LATHE CHUCK, AND LATHE VICE.

I beg to forward for insertion in the MECHANICS' MAGAZINE, a drawing of two adjuncts to a lathe, which I have invented, and which I trust may prove interesting to some of your readers, who like myself, have suffered trials of patience, constantly occurring, for want of some such instruments.

The first is an universal chuck. I had turned my attention to it some years ago, and had put it on paper, when in a book called "Le Manuel du Tourner," I found, figured, precisely the same thing as I had *then* thought of; in that, the helical screw was on the part of the chuck which is screwed on to the mandril, and an objection was stated that the work was always jammed, and sometimes broken, by the force of the tool acting to turn the face-plate, and therefore force the "dogs" still tighter. This I then remedied by putting the helical screw on a loose face plate, fitting behind, and capable, as shown in the drawing, of turning on the true face-plate, which was screwed on to the mandril.

My profession calling me abroad, I had ceased to think of this, when at Pernambuco, in Brazil, I was surprised and pleased to see on an American lathe the identical chuck, acting, as the chief engineer assured me, most perfectly, and saving so much trouble even for factory work (it was in a factory attached to a cotton mill), that he would not be without it on any account. Adapted to it was also a vice (worked by the same helical screw), of which I have given a sketch at G., Fig. 3.

The second is a small lathe-vice, which for some purposes would be preferable to the one I have just spoken of.

I will now give an account of each, with reference to the drawings.

FIG. 1.

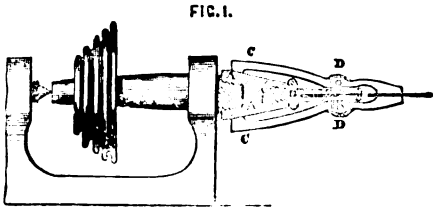

Fig. 1. A is a face-plate with four or more slots, in which move the dogs. B B are the dogs which gear in the helical screw. C helical screw worked on the face of D. D a plate which turns round by hand on the collar of A. E is a ring screwed on to D, and which keeps A and D in their relative positions. *a a*, portions of A, are the slots in which the dogs work.

For use, screw A on to the mandril; turn D till the dogs have receded far enough from the centre to embrace the work; now, by turning D back again the dogs will be forced to the centre, and hold the work firmly and truly centered at one operation.

The second is very simple, and will require but little explanation.

FIG. 2.

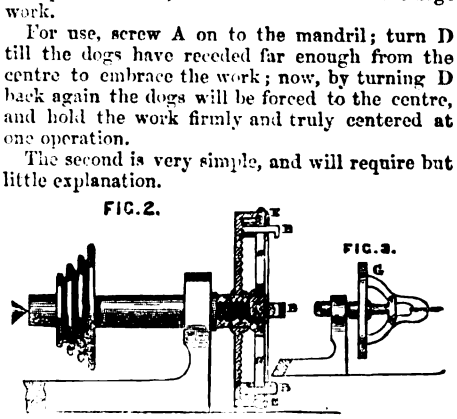

Fig. 2. A is a conical chuck screwing on to the mandril. As the screw B is turned into the collar D, in which the jaws are piveted at E E, the ends of the jaws C C, are forced asunder by it, and the work is held firmly by them, or *vice versâ*, it is released.

J. H. SELWYN, Capt. R.N.

Woodland Crag,
Grasmere, Westmoreland,
Dec. 20th, 1858.

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NOTICES.

Numbers 1845 and 1846 of the MECHANICS' MAGAZINE (original series), containing the paper read at the Society of Arts, Dember 15, 1858, "ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY IN RESPECT OF DIMENSIONS, FORM, MEANS OF PROPULSION, AND POWERS OF ATTACK AND DEFENCE," by one of the EDITORS of this Magazine, together with the discussion upon the same, are still on sale.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 6d. per line for any number of insertions less than 13; for 13 insertions, 5d. per line; and for 52 insertions, 4d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 6 o'clock on Thursday evening each week. None can be received after 9 o'clock on Friday morning for the ensuing number.

TO CORRESPONDENTS.

☞ The practice of publishing a vast quantity of fictitious Notices to Correspondents has become so general in cheap journals, that the public, who are not in the secret, have come to consider it the duty of Editors to answer any and every question that may be put to them by readers. This cannot, however, be done in a journal like our own without entailing an immense amount of labour (often of a very unnecessary character) upon us. We, therefore, beg most respectfully to decline the task. But in order that our correspondents may not be deprived of all advantage in this respect, we shall, as a rule, publish such queries as may be sent in good faith to us, though not such as appear to be sent merely for the sake of giving trouble. To the published queries other correspondents will, we hope, reply, and their replies shall likewise be published. By this arrangement we shall save ourselves much inconvenience, and at the same time secure, we trust, to our readers all the information they may desire. All questions must be stated simply, clearly, and without circumlocution of any kind; and we shall feel grateful to those correspondents who kindly take the trouble to send such information by way of reply as they may possess. Mere questions of business we shall of course answer ourselves; but whenever calculation, reference to published works, &c., are necessary, we shall dispose of the questions sent as stated above.

Erratum.—No. 1 (New Series) for Dec. 31st, 1858, p. 12, 1st. col., last line, *for* "liability," *read* "little liability."

STEAM BOILER FLUES.

A "PRACTICAL MAN," of much experience, writes:—

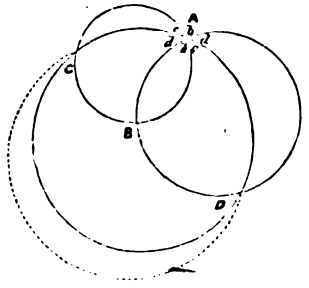
I have read, with much interest, the article in your new Magazine on "Improved Modes of Constructing the Flues of Steam Boilers," by W. Fairbairn, Esq., but one thing strikes me as contributing materially to the distortion of the flues in the boilers made for the North-Eastern division of the London and North-Western Railway, and that is, their being composed of plates only 3-8ths of an inch thick. I should be very sorry to place myself in antagonism to so eminent a man as Mr. Fairbairn, but my conviction is, that these boilers, from the outset, were constructed of too thin iron for the working pressure of 40lbs. to the square inch, and that had they been constructed of half-inch iron, the flues would not have become elliptical. I cannot detect any such distortion in my high pressure boiler flues, both the outer and inner shells of which are of half-inch iron, and the working pressure 40lbs. P.S.—I do not wish to be understood by the foregoing to deprecate the value of additional rings round a boiler flue, as anything that tends to additional safety must be valuable; but unscientific as I am, I should never have ordered of my boiler-maker boilers of that size, even work at a far less pressure, of less thickness than half-inch.

THE SPHERICAL EXCESS.

A VALUED correspondent, who is very favourably known to many of our readers, sends us the following interesting geometrical suggestion:—

GENTLEMEN,—I send you a little theorem, by the help of which it is easy to exhibit, geometrically, an angle on the sphere equal to half the spherical excess.

Let A B C D be four points on a sphere.



Through these points, three by three, let three circles be drawn, all intersecting in A:—viz., A B C, A C D, A D B. Then, in the curvilinear triangle (which is not, however, a spherical triangle), B C D, the sum of the three angles shall be equal to two right angles.

On reference to the figure, it will easily be seen that the angles B C D are severally equal to the angles *b c d*, and, therefore, that

$$B+C+D=b+c+d=\pi.$$

Euclid I, 32, is the stereographic projection of this theorem.

By making the radius of the sphere infinite, it appears evident that it holds *in plano*.

If A be the opposite pole to B, A B C and A B D will be great circles. Draw a great circle (dotted) through C D: then it is evident that the angles at C and D, which the great circle, C D, makes with the small circle, A C D, are each of them equal to half the spherical excess of the spherical triangle, B C D.

C. W. MERRIFIELD.

MISCELLANEOUS INTELLIGENCE.

PROPOSED DOCKS AT EAST GREENWICH.—An important project is now on foot for the formation of extensive dock accommodation at Greenwich, between that town and Woolwich, adjoining the Angerstein Branch of the South-Eastern Railway, and having entrances from the Thames at Greenwich on the west, and Charlton on the east. The site thus selected, from the peninsula form of the land, possesses remarkable advantages, offering facilities for the entry and departure of vessels similar to those afforded by the East and West India Docks, with the addition of a greater depth at low water, the entrances to consist of locks, 90 and 50 feet in width, which will be capable of taking in and floating larger vessels than any other docks upon the Thames. It is proposed to construct three docks in the first instance, comprising an area of about 48 acres of deep water, in addition to which land will be taken for quays, graving docks, warehouses, timber ponds, &c., the total length of frontage for dock quays being 9,200 feet. The cost of the docks is estimated at 500,000*l*., or 10,410*l*. per acre of water, whilst the West India Docks, containing 112 acres, cost 2,003,000*l*., or 17,884*l*. per acre; the St. Katherine Docks, containing 11 acres, cost 2,152,800*l*., or nearly 195,640*l*. per acre; the London Docks, containing 28 acres, cost 3,938.310*l*., or 140,654*l*. per acre, the latter company being now about to expend 700,000*l*. to obtain an additional dock space of about six acres. The Board of Directors of the South-Eastern Railway Company, appreciating the results likely to arise to the traffic of their line from the establishment of the proposed docks, have signified their approbation of the scheme, which their railway will connect with the counties of Kent, Surrey, and Sussex, and by the narrow guage junction at Reading, with the pottery and hardware districts, South Wales, and the western counties. It is proposed also to combine with the docks a steam-ferry, thus affording a connexion with the Blackwall Railway, and a convenient access to the docks for merchants and others from the eastern district of London.—*South London Journal*.

PORTSMOUTH DOCKYARD.—A great improvement has lately been made in the dockyard at Portsmouth. Gravel has been laid over the rough paving stones which from time immemorial have been the horror of all unhappy officers on "dock yard duty," especially those troubled with corns, or addicted to wearing tight boots. Another improvement cannot fail to strike one who may not have been dockyard visitors for some time; and this is the arrangement of the police, when the men are leaving the yard. In olden times, the police were stationed immediately at the gates, and it was impossible for them to exercise a proper amount of vigilance on the pushing crowd of men hurrying past them. Now they are stationed in open order, extending a considerable distance, and forming a lane through which the men have to pass in review, so that if a suspicious man should pass the scrutiny of the advanced policeman, it is almost impossible for him to escape the notice at the whole of the parts forming the lane. It is believed that this simple improvement will be the means of preventing much robbery of Government stores.

CHARCOAL.—H. S. Warner, Esq., of Trinidad, proposes to utilize the pitch of the celebrated lake in his neighbourhood. The deodorizing and purifying powers of different charcoals depend, he says, entirely upon the carbonaceous matter in them. But for such carbonaceous matter to act efficiently, it must be of a very porous nature, and as the pitch of the pitch lake of Trinidad does not contain such porous substance he merely uses it as affording carbonaceous matter, and he causes this carbonaceous matter to be diffused or spread through a substance which performs the same function as bone earth in animal charcoal. The substances found to answer this purpose are clay, pumice-stone, broken brick, spent animal charcoal, calcined bones, &c. There are several modes by which, from these materials, decolorizing and purifying charcoal can be made, one of which is as follows:—The pitch may be simply fused in a proper vessel, and when melted, the clay or other material may be added, it being in a dry state, and if necessary, previously crushed. The heat is then raised and continued as long as any valuable matter is given off by the pitch at a red heat. During this operation the materials should be kept stirred. The best proportions are three parts, by measure, of pitch powder to five or six parts of porous material.

MACHINERY FOR MAKING BOOTS AND SHOES.—Mr. Archibald Neilson, of Glasgow, has invented an improved apparatus for making boots and shoes. The main portion of the apparatus used consists of a shoe sole, the upper face of which is formed to a fine surface corresponding to the sole and heel to be moulded. This sole face is channelled all round the contour for receiving a corresponding frame of metal hinged at one end to the sole plate, and in pieces, if convenient. This frame has upon its upper face an angle or ledge piece for forming the seam at the junction of the sole with the upper of the boot or shoe, whilst its main inside edge face shapes the external contour of the sole edge. The workman takes the lasted boot, and having deposited solution or softened gutta-percha upon the face of the sole, he places the lasted "upper" down upon it, and then shuts down the open moulding frame. This at once moulds the sole, firmly attaches it to the edges of the lasted leather, and completes the operation. If required the heel portion may also have an open moulding frame.

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CURRENT EVENTS IN THE CENTRES OF THE IRON, COAL, MACHINE, AND SHIPPING TRADES.

(COMPILED BY OUR OWN CORRESPONDENT.)

Fox and Henderson's Estate—Bilston Gas Company—Welsh and Newcastle Coals—Cunningham Sail Reefs—The Sunderland Merchants and the Timber Duty—Hand-Loom Silk Weavers and their Wages—The Leeds Town Council applying to Government—£5,000, a Donation—Society of Agriculture at Brussels—Deaths in Collieries—The Radcliffe Coal Proprietors—Fortnightly Payments—Important Mine Drainage.

THERE has been a meeting for audit and dividend on the separate estate of Sir Charles Fox, and for declaring dividend on the separate estate of Mr Henderson. Mr. Beale (of the firm of Beale and Marigold, solicitor to the assignees) said that on the separate estate of Sir Charles Fox there were assets amounting to £2,000, in the hands of the official assignee, and as his debts were only £1,800, this, after paying 20s. in the pound, would allow a small amount to go to the joint estate. The separate estate of Mr. Henderson showed a small amount in hand. When the sale had taken place there would be dividend.

The mains of the Bilston Gas-light Company have been considerably extended, as was shown by the report read at the anuual meeting on Monday last. The profits of the year are shown to be £2,125 1s. 11d., besides a balance of £114 9s. 5d. from the previous year's profits. The directors propose to make a general reduction in the price of gas at Lady-day next. Already they have remitted the annual charge of meter-rent.

The careful experiments, extending over several days, on the comparative evaporative power of Welsh and Newcastle steam coal, are at an end. The results will shortly be published.

All the new ships that are being built upon the Tyne and Wear, with one exception, are being fitted up with the self-reefing topsails, patented by Mr. Cunningham.

The Sunderland timber merchants, ship-builders, ship-owners, and ship-wrights have met, and resolved to petition the House of Commons for a total repeal of the timber duties. The existing Government restrictions gave a bonus on a Canadian vessel requiring 980 loads of timber in her construction, of £49 to the shipbuilder of St. John's and Quebec, over that of the ship-builder in this country. The same principle applied to foreign-built ships, and timber from foreign countries.

The hand-loom silk weavers at Middleton and Leigh are uniting to obtain an advance of wages. They allege that the manufacturers are ready to give them an advance of ½d. per yard.

The Town Council of Leeds have held a special meeting, and appointed a committee of their number to consider the propriety of presenting a memorial to Her Majesty's Government in favour of the establishment of bonded warehouses of Leeds. At the same meeting the council determined to petition the Queen in favour in making Leeds the assize town for the West Riding.

Lord Shaftesbury has received from a lady, whose name has not been communicated to the public, a donation of £5,000 for the improvement of dwellings of working men in Hull. All honour to her!

Bell's Weekly Messenger says:—"The Central Society of Agriculture at Brussels has resolved on holding an international meeting for the trial of reaping machines during the next year. The date is not yet fixed. A sum of 3,000 francs has been voted by the society, to be distributed in one or two prizes, and to defray the expenses connected with the carriage of the machines. We believe that an invitation to attend the meeting has been sent to all the leading implement makers in England."

Among the deaths in collieries since our last are ten, the result of two accidents, one in South Staffordshire, at the Osur Bod Colliery, near Bilston, where three men were killed from the breaking of the skip chain; and seven men and boys at the Agecroft Colliery, Pendlebury, in the north, by the snapping of the wire-rope by which the men are drawn up the shaft, occasioned by the over winding of the engine.

Messrs. Knowles and Hall, coal proprietors, Zadcliffe, have made an advance of one penny in the shilling to their men, to commence at once.

The South Staffordshire collieries have met in public meeting, advocating fortnightly instead of monthly payments, and the abolition of the truck system.

The "Deepfield Pond" has been once more pumped out of the mines in the neighbourhood of Deepfields, Bilston. Messrs. W. P. and W. H. Smith have, after a long struggle, been rewarded with success. They entered last summer into an agreement to pump the water out of the mines. The engine is computed to work to the power of 300 horses, discharging at every stroke 150 gals. of water, from a depth of 137 yards. The engine has made eight, and more frequently 9 strokes per minute. The water since 1834, has only been once pumped out of this mineral property, containing an area of upwards of 400 acres. This was in 1849, when the present engine wes erected and worked by a body of mine-owners, as the Union Engine Company. Since 1854, up to the present time, the mines of this district have been under water.

NOTES FROM THE EASTERN DISTRICTS.

(FROM OUR OWN CORRESPONDENT.)

The Gas Question at Norwich—The New Continental Telegraph—Gas at Holbeach—Drainage Works at West Haven—Newmarket Cemetery Works—The New Valley Drainage Commissioners and the Authorities of Wisbeach—Proposed New Corn Exchange at Norwich—Ipswich Railway Station—Norfolk Estuary Works.

THE Norwich Local Board of Health have had a long discussion in regard to the arrangements at present in existence for lighting the public lamps in that city. It seems that the British Gas Light Company, in whose hands the gas supply of the city is vested, require £4 per lamp per annum, while the Board are only willing to give £3 15s. The upshot of the matter is, that the Board have resolved to advertise for tenders for erecting lamps, &c.; to make all necessary arrangements for lighting, extinguishing, &c.; and to require the gas company to supply the lamps with gas in the manner prescribed in the 29th section of their act. The matter has been on hand since the summer.——Sir Charles Bright and Mr. Moseley, two of the principal officers of the British and Irish Magnetic Telegraph Company, have met a committee of the Norwich town council for the purpose of conferring with them in reference to the mode in which the wires of the land portion of the new telegraph, from the metropolis to Hanover, are to be carried through Norwich and its suburbs. Sir Charles Bright explained the course which the company wished to pursue in carrying the wires across the city and along the Newmarket-road; referring also to the difficulties incident to laying the wires underground from St. Stephen's-gates to Eaton-hill, as proposed by the committee. The chairman of the council committee informed Sir Charles that the residents in the neighbourhood of the Newmarket-road and the citizens generally were averse to posts and wires being placed along the road. Sir Charles replied that the directors of the company would not persist in a course likely to annoy the inhabitants, and would carry the wires from Hellesdon-gate along the bye roads over Hellesdon-bridge, and thence to Eaton, as first contemplated, having a communication across the city from Exchange-street to Hellesdon. The line from Norwich to Cromer (where the cable leaves the coast for Emden, Hanover) is in operation, and messages are now transmitted to the continent by the new route, over which it is estimated that 40,000 telegrams will be dispatched annually.——It is rumoured that a new gas company will be organised shortly at Holbeach, Lincolnshire. The rates charged at present are 7s. 6d. per 1,000 cubic feet, while at Boston, 16 miles distant, the charge is only 3s. 6d. ——The tender of Mr. Mortar, of Stratford, for sewerage works, proposed to be carried out by the West Ham Local Board of Health, has been accepted by the board. The amount of Mr. Mortar's tender is £16,379 15s. 11d.——The Newmarket Burial Board have accepted the tender of Messrs. Westley for their cemetery buildings—two chapels, entrance lodge, boundary walls and gates; the amount of the contract is £951.——Certain dams placed in the Nene at Waldersea and Guyhorn, are considered by the authorities of Wisbeach to injure the navigation and trade of that port; and a special meeting of the Nene Valley Drainage Commission has been held to consider a notice from the Wisbeach town council in reference to their removal. Mr. Stevens moved, and the Mayor of Wisbeach seconded, a resolution to the effect that the dams should be removed under the superintendence of Mr. Fowler, the engineer to the commission, the middle opening of Waldersea dam to be first removed, and if this course were attended with no ill effect, the other part to follow; the same course to be afterwards adopted at Guyhorn, and the dams to be closed again if any evils resulted from the more free course of the waters. On the votes being taken the only commissioners in favour of the motion were found to be the proposer and seconder. Mr. Fowler stated that if the local magistrate should be induced to make an order for the removal of the dams which have been placed in the river on the advice of eminent engineers, he should recommend the commissioners to disobey it, and even if a mandamus were issued, the same course would be advisable. He should require £2,000 for strengthening the Waldersea dam.——An effort is being made at Norwich to promote the erection of a new corn exchange, with an area of 12,000 square feet. It is proposed to erect the new building upon the site occupied by the present Exchange (which has an area of 7,000 square feet) and some of the adjoining premises. The cost of site and buildings is estimated at £23,000, and towards this sum £14,000 has been furnished in shares and donations. When this sum is increased to £20,000, the provisional directors will proceed with the undertaking.——A new railway station is progressing at Ipswich on the north side of the Stoke tunnel (Eastern Union Railway), the brickwork having been raised a few feet from the ground. Anent this station hangs a tale. Mr. Bruff, C.E., states to the Ipswich paving and lighting committee that the station will be used in two or three months whether it is completely finished or not. There have been, it is said, parties in the town making calculations for a station to be built by the Eastern Counties Company; but Mr. Bruff stigmatises this as merely a "vexatious proceeding." The Eastern Union Company will finish the station at present in hand, and place it at the disposal of the Eastern Counties Company. If that company refuse to use it, Mr. Bruff believes that the Board of Trade will interfere when the East Suffolk system is opened, as all the traffic, he thinks, cannot be safely worked at the present station (which was erected nine years ago merely as a temporary expedient, but has been in use ever since). It would occupy too much space to enter into all the circumstances of this affair, but it will be seen that the nominally-united Eastern Counties and Eastern Union Companies are not working very harmoniously.——It is understood that the Norfolk Estuary works are suspended for the present.

GLYCERINE MANUFACTURE.—An important improvement in the manufacture of glycerine has been patented by Mr. Reynolds, an experienced chemist, King William-street, London-bridge. It chiefly consists in blowing dry steam at a temperature of about 400° Fahr. through spent soap lees. By this means the glycerine is evaporated, and the salts are left to deposit themselves in the containing vessel.

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METAL AND COAL TRADES, &c.

(FROM OUR OWN CORRESPONDENT.)

The Mills, Forges, &c. of South Staffordshire—The Blast Furnaces—New Furnaces—A Contract—Pig Iron per ton—The Coal and Ironstone—Hematite Ore—The Furnaces in blast in Scotland—The manufacture of Pig in Scotland—The Stocks—The Glasgow Market—The state of the Iron and Coal Trades in Yorkshire, &c.—The demand for Railway Ironwork—The Sheepbridge blast furnaces—Employment—Activity of the Coal trade—Employment in Yorkshire, Derbyshire, and Lancashire—Sheffield, Birmingham, and Wolverhampton trades—The Hollow-ware trade—Cut nail trade—Tin Plate and Japan markets—The Lock trade—Walsall—Saddlery—The prices of 1842—The Woollen market at Leeds—Ditto at Bradford—Leicester machinery—Kidderminster trade.

THE mills and forges in South Staffordshire are in fair operation, the leading markets being tolerably busy. It is also stated that amongst the Iron Founders and machinists of the district there is more doing, and that employment is on the increase.

At present there are 133 blast furnaces in the district in operation, and about 50 out of blast.

Three new furnaces have been completed, and two others are nearly finished. Contrasted with the period immediately before the late crisis, Sept. 1857, there are now 25 blast furnaces less in operation than at that time.

Good hot blast mine pig iron is realising £3 15s. per ton, and cold blast, £4 5s.

The coal trade continues brisk, and the rates are well maintained. Ironstone, the yield of the district, is in good demand, and prices have an upward tendency. In fact, sales have been effected at from 1s. to 1s. 3d. advance.

Large quantities of hematite ore are coming into the district, and higher rates are obtained.

The furnaces now in blast in Scotland are 132, and there are 45 not working. The total quantity of pig iron made in 1858 in Scotland, was 945,000 tons, which, at the average price of the year, represents a total value of £2,554,000. The stocks, which are now 295,000 tons in warehouse keepers and makers stores, have increased 135,000 tons in the year. The market in Glasgow was weaker on Tuesday, and a large business was done at 54s. cash, and proportionate open rates. No. 1, G.M.B., 53s.; No. 3, G.M.B., 53s.

The reports of the state of the iron and coal trades in Derbyshire, Yorkshire, and Lancashire, state that orders for the Continent are more plentiful, whilst the demand for the home consumption continued to increase. The demand for rails and railway ironwork is on the increase. The three new blast furnaces which have recently been erected by the Dunstan and Barlow Company at Sheepbridge, near Chesterfield, will be blown in during the ensuing month. Additional furnaces are about to be erected, all of which will afford employment for a large number of hands. The coal trade continues to increase in activity, and the demand is exceedingly brisk. The West Staveley Colliery at Whittington has been recommenced, and employment for colliers abounds everywhere in the three counties.

In the Sheffield trades a decided improvement is perceptible on every hand. Respecting the trades of Birmingham and Wolverhampton, it may be reported that the majority of manufacturers have sufficient orders on hand to keep them fairly employed. The hollow-ware trade, which has been extremely depressed during the year, shows some symptoms of improvement. In the cut nail trade the different manufacturers are tolerably busy. Tin plate and japan workers are in full work, with every prospect of a continuance. In the lock trade there has been a decided improvement in all its branches during the past fortnight, and some of the larger manufacturers have been working overtime. Walsall has suffered least from a general depression in trade, military orders for saddlery having compensated to a considerable extent for the falling off in the general demand.

The reports from the manufacturing districts continue to be decidedly favourable. At no period since the great turn out of 1842, which lasted for eight weeks, have stocks of goods been so bare at Manchester.

The reports from the woollen districts are also very favourable; at Leeds, the opening market of the year was of a very satisfactory character. The report from Bradford is, that the transactions in English wools have been on an extensive scale, with an upward tendency in prices. In the trade of Leicester, there is now a greater quantity of machinery employed than was ever before known. A wonderful change for the better has taken place in the trade of Kidderminster.

PROVISIONAL PROTECTIONS.

Dated December 6, 1858.

2788, J. G. Arnold, of Worcester. Improvements in envelopes for letters and similar purposes.

2790. J. Muir, of Glasgow, Pattern Designer, and F. Muir, of Paisley, Pattern Printer. Improvements in ornamental or colour printing.

2792. J. Dawson, of Holbeck, Leeds, Machine Maker. Improvements in machinery or apparatus for raising the nap on woollen cloths.

2794. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in the manufacture of gloves.—A communication from Messrs. A. and L. Fontaine, of Paris.

2796. E. W. Seale, of Merthyr Tydvil, Agent. Improvements in railway and other breaks.

Dated December 7, 1858.

2798. W. A. Gilbee, of South-st., Finsbury. An improved portable bath.—A communication.

2800. J. Whiteley, of Halifax, Machine Maker, and T. Kitchenman, of the same place, Stuff Presser. Improvements in press plates or apparatus employed in hotpressing woven fabrics.

2802. J. J. Harris, of Woodlesford, near Leeds, Brewer. Improvements in apparatus for refrigerating and regulating the temperature in worts and beer, which may also be employed as condensers in distilling.

2806. W. Burness, of Brixton. Improvements in pumping and forcing liquids.

2808. J. Ferrabee, of Stroud, Engineer, and F. H. England, of Stroud, Manager. Improvements applicable to machinery for carding, scribbling, and condensing wool and other fibrous substances.

Dated December 8, 1858.

2810. G. F. Chantrell, of Liverpool, Furnace Engineer. Improvements in apparatus applicable to the manufacture and revivification of animal or vegetable charcoal.

2812. R. L. P. Manning, of Princes-sq., Mariner. A floating paddle wheel.

2814. S. Phillips, of Moseley, near Birmingham, Gentleman. Improvements in sliding window sashes, shutters, and doors.

2816. W. King, jun., of Guildford, Grocer and Tea Dealer. Improvements in apparatus for roasting coffee and other substances.

2818. H. Meidinger, of Heidelberg, Germany. Improvements in electric batteries.

Dated December 9, 1858.

2820. J. Barrow, Jun., of Manchester, Manufacturing Chemist. Improvements in the treatment of coal gas tar, and of the oils obtained by the distillation of the same, and for the application of substances obtained thereby.

2822. J. Eccles, of Blackburn, Cotton Manufacturer. Improvements in arrangements and machinery for preparing for manufacture and for manufacturing clay and other plastic earths into bricks, tiles, pipes, and other articles formed of such materials.

2824. J. Little, of Glasgow, Ironmonger. Improvements in fire grates and heating apparatus.

2826. J. Stewart, of Tottenham-court-rd. Improvements in the construction of the action of piano-fortes.

2828. J. Wilson, of Wansford, Northamptonshire. Improvements in machinery for tilling and cultivating land.

Dated December 10, 1858.

2830. J. Flockton, jun., of Manchester, Engineer. Improvements in stop or reversing taps.

2836. A. Barclay, of Kilmarnock, Engineer. Improvements in obtaining motive power by means of electricity, magnetism, and electro-magnetism.

2838. W. Beardmore, of Deptford, Engineer. Improvements in steam boilers.

2840. G. W. B. Kiallmark, of Bridgewater, Somerset, and W. T. Timewell, of Paddington. Improvements in the manufacture of cements.

Dated December 11, 1858.

2842. J. B. Guthrie, of Manchester, Warehouseman. Improvements in the manufacture of India-rubber overshoes.

2844. J. Hinks, of Birmingham, Manufacturer. Improvements in ships' and other lamps.

2846. C. J. Richardson, of Kensington-square, Architect. Improvements in apparatus to be applied to chimneys or flues of buildings, for economising heat and reducing the quantity of smoke passing into the atmosphere.

2848. W. E. Wiley, Pencil Maker, of Birmingham. Improvements in ever-pointed pencils.

Dated December 13, 1858.

2850. J. A. Carruthers, Reed Maker, and T. Blackburn, Mechanic, both of Blackburn. Improvements in apparatus for guiding and regulating the warp threads in the operations of warping, tape-sizing, looming, and weaving.

2851. R. Whittam, of Accrington, Engraver. Improvements in machinery or apparatus, for tracing designs from an engraved roller, or from an engraver's sketch upon steel or other metallic surfaces, used as dies by engravers to calico printers.

2852. L. C. V. Yon, of Lisieux, France, Upholsterer. Improved elastic beds.

2853. J. M. Rousset, of Belleville, Paris, Mechanician. A new system and new apparatus, using air as a motive power.

2854. J. E. Boyd, of Lewisham, Gentleman. Improvements in candlesticks, lamps and lanthorns.

2855. R. A. Brooman, of 166 Fleet-street, London, Patent Agent. Improvements in twisting and otherwise operating upon threads, twine, or cords, and in apparatus for performing the same. A communication from Messrs. Edmond Empis and Co., of Wazemmes, France.

2856. R. A. Brooman, of 166 Fleet-street, London, Patent Agent. Improvements in the manufacture of cranked axles and shafts. A communication from Messrs. Rousery, Lacombe, and Co., of Rive de Gier, France.

2857. E. Loomes, of Whittlesea, Cambridge, Farmer. An improvement in the construction of steam engines.

2858. J. Ferrabee, of Stroud, Engineer. Improvements in the construction of steam engines, and in the mode of working the same.

Dated December 14, 1858.

2859. J. Webster, of Birmingham, Engineer. A new or improved method of recovering copper and zinc from liquids, which have been employed to dip or pickle articles made of brass or other alloys containing copper and zinc.

2860. E. Bow, of Port Dundas, Coalmaster. Improvements in pumps.

2861. D. Anderson, of Glasgow, Ironmonger. Improvements in taps or valves.

2862. J. Wade, of Bradford, York, Manufacturer. Improvements in means or apparatus employed in weaving.

2863. G. Baker, of Woburn, Bedford, Farm Steward. An improved construction of manger fastening.

2864. R. A. Brooman, of 166 Fleet-street, London, Editor of the MECHANICS' MAGAZINE and Patent Agent. An improvement in transmitting electric telegraph signals. A communication from T. A. M. Sortais, of Lisieux, France.

2865. J. T. Smets, of Placamen, France, Distiller. A method of making vinegar from a refuse product obtained in the manufacture of starch.

2866. F. Jossa, of Bishop Auckland, Chemist. Improvements in furnaces for generating steam and other purposes.

Dated December 15, 1858,

2867. J. Pendlebury, of Crumpsall, Bleacher. Certain improvements in machinery or apparatus for bleaching or cleansing textile fabrics or materials.

2868. D. Rowan, of Greenock, Engineer. Improvements in steam engines.

2869. H. Bridges, of Bridgewater, Carriage Builder. Improvements in the means of working breaks on carriages on railways.

2870. F. C. N. J. Migeon, of Morvillars, France, Manufacturer. Improvements in manufacturing screws, rivets, nails, spikes, and all similar articles made of metallic wire, and in the machines connected therewith.

2871. A. V. Newton, of Chancery-lane. Improved machinery for manufacturing bullets. A communication.

2872. A. V. Newton, of Chancery-lane. An improved arrangement of condensing apparatus. A communication.

2873. J. Bullough, of Blackburn, Manager. Improvements in looms.

2874. C. F. Vasserot, of Essex-street, Strand. An improved pendulum governor for regulating the supply of steam to the cylinders of marine engines. A communication from M. Billotet, of Marseilles.

2875. W. Clark, of Chancery-lane. Improved agricultural implements.—A communication from L. J. Chateau, of Paris.

2876. J. Wardill, of Commercial-road East, Engineer. An improved stopper or controller, to stop and control the running out of chains and ropes.

2877. G. Bell, of Wandsworth, Gentleman. An improvement in matches and fuses.

2878. T. Moss, of Gainsford-st., Islington. Improvements in printing bank notes, bills of exchange, and other documents requiring like security against being copied.

2879. W. Morgan, of Witton-park Iron Works, near Darlington. Improvements in the manufacture of iron.

Dated December 16, 1858.

2881. W. H. Carmont, and W. Corbett, of Manchester, Iron Manufacturers. An improved mode of constructing furnaces for the production of wrought iron and steel, and manufacturing such metals into ingots and other forms.

2882. A. and J. Stokes, of Birmingham, Manufacturers. New or improved machinery for the manufacture of screws.

2883. R. Mushet, of Coleford, Gloucester, Metallurgist. A new or improved manufacture of cast steel.

2885. J. W. Edge, of Manchester, Gun Maker. A certain improvement in balls, bullets, or other projectiles to be employed in fire arms or ordnance.

2886. J. W. Friend, of Freemantle, Southampton, Watch Maker. Improved apparatus for ascertaining and registering the depth and flow of liquids and the distances run by ships at sea.

2887. A. Mackenzie, of Glasgow, Mechanist. Improvements in sewing machines.

2888. J. J. Marquis, of Paris, Civil Engineer. Improvements in galvanic batteries.

2889. W. White, and J. Parlby, of Great Marylebone-st., Architectural Decorators. Improvements in the preparation or treatment of "carton pierre," and such like com-

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position, and in the application thereof to the coating or covering of walls and other surfaces.

2890. R. A. Brooman, of 166, Fleet-st., London, Editor of the "Mechanics' Magazine" and Patent Agent. An improvement in plating and gilding forks, spoons and other metal articles.—A communication from Messrs. De Sauvigny, of Paris.

2891. W. Clark, of Chancery-lane. Improvements in submarine electric telegraph cables or conductors.—A communication from F. M. Baudouin, of Paris.

Dated December 17, 1858.

2892. J. J. Aston, of the Middle Temple, Barrister-at-Law. Improvements in machinery or propellers applicable for the propulsion of ships boats and other vessels on and through the water, and in the propelling of all such vessels on and through the water by means of such propellers.

2893. W. J. Johnson, of Manchester, Manager. Improvements in machinery or apparatus for preparing for joining the rails of railways.

2894. J. and J. Inshaw, of Birmingham, Engineers. An improvement or improvements in locomotive engines.

2895. A. Hinde, of Wolverhampton, Manager. Improvements in treating or preparing the cinder or slag from puddling furnaces for the purpose of facilitating the manufacture of iron therefrom.

2896. J. Kerr, of Bedford-terrace, Southwark, Engineer. Improvements in the construction of revolving fire-arms.

2897. J. Clegg, of Keighley, Engineer. Improvements in lubricating the valves and pistons of steam engines.

Dated December 18, 1858.

2899. J. Aitken, of Edenfield, near Bury, Manufacturer, and J. Brooks, of the same place, Overlooker. Improvements in looms.

2901. A. Mitchell, of Glasgow, Machinist. Improved apparatus for registering the speed of engines and other machinery.

2903. A. P. How, of Mark-lane, Engineer. Improvements in cocks or stop valves.

2905. J. Soutter, of Edinburgh, Turner. Improvements in apparatus for drying or airing linen or other articles of wearing apparel.

Dated December 20, 1858.

2907. T. S. Woodcock, of Salford. An improved index or book and paper marker.—A communication from J. Johnson.

2909. R. Maclehouse, of Ayr, Bookseller. Improvements in stereoscopes.

2911. A. V. Newton, of Chancery-lane. An improvement in lanterns.—A communication.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

Dated December 27, 1858.

2953. M. A. Mennons, of Paris. An improved composition for the protection of certain metallic surfaces.—A communication.

2975. J. Shaw, of Manchester, Mechanic. A new mechanical combination, called an indefinite feed movement.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1896. P. Spence. Alum.
1897. J. L. Piggett. Syringe.
1905. W. Henson. Knitting frames.
1909. F. Puls. Distilling coal.
1910. F. Puls. Distilling bituminous matters.
1913. L. Higgins. Reefing sails.
1917. J. H. Robinson. Improved shirt.
1918. W. H. Harfield. Windlasses.
1923. H. Wilson. Mounting band-saws.
1927. T. Hill. Punching and shearing metals.
1931. J. H. Johnson. Bellows. A communication.
1933. J. Black. Motive power.
1935. S. N. Rodier. Regulating gas.
1938. T. Trotman. Hair-pins.
1939. J. Ellisdon. Reading chairs.
1943. H. W. Hart. Chandeliers.
1947. W. Kempe. Winding fabrics on rollers.
1948. J. Fowler, jun., and R. Burton. Carriages.
1950. R. Knight. Aerating liquids.
1953. G. Coode. Adjustment and manufacture of hose; gathering and puckering, &c.
1954. J. D. Brabazon. Propellers.
1960. G. Davies. Billiard tables and cues. A communication.
1965. J. L. Clark, F. Braithwaite, and G. E. Preece. Telegraph cables.
1966. E. Lindner. Fire-arms, ordnance, and cartridges.
1969. J. H. Johnson. Steam-engine governor. A communication.
1988. A. V. Newton. Alumina. A communication.
1992. J. Walker and J. Barnes. Blankets and lappings.
2001. G. T. Bousfield. Knitting machinery. A communication.
2006. W. H. Child. Hair and skin brushes.
2014. J. Fielden. Cops.
2049. W. Clark. Dyeing and printing. A communication.
2057. W. E. Newton. Water wheels. A communication.
2090. F. Fowke. Fire-engines.
2187. M. Hipp. Electric telegraphs.
2240. A. Nichols and T. Walker. Spring-hook.
2494. A. H. Dendy. Breakwaters.
2633. C. F. Vasserot. Fire-arms, ordnance, and projectiles. A communication.
2657. J. Fairweather. Weaving tubular fabrics.
2701. C. Burrell. Traction engines.
2720. C. Bedells. Elastic fabrics.
2757. W. Robinson and J. G. Orchar. Winding yarns.
2776. E. A. Servier. Indicators.
2799. C. Williams and W. Ellison. Bottle stoppers.
2835. A. Barclay. Telegraph ropes.
2839. G. F. Wilson. Lubricating oils.
2867. J. Pendlebury. Bleaching.
2868. D. Rowan. Steam-engines.
2877. G. Bell. Matches and fuses.
2905. J. Soutter. Drying linen, &c.
2953. M. A. F. Mennons. Metallic surfaces. A communication.
2957. J. Shaw. Feed movement.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1855.
2938. G. Chisholm
2949. S. Lees, E. Lees, and G. H. Newton
2952. Sir J. S. Lillie
1856.
5. W. B. Johnson
25. C. Mather and C. Millward
27. J. Fowler, jun.
36. E. H. Bentall
50. C. A. Hanson and J. Wormald
87. W. Smith
136. J. Schloss.

LIST OF SEALED PATENTS.

Sealed December 31*st*, 1858.

1476. T. Whiteley.
1471. T. Blinkhorn.
1480. T. Riddell.
1487. P. R. Hodge and G. Spencer.
1492. D. Le Souëf.
1493. T. Scott.
1494. J. Billing.
1497. T. Restell.
1498. W. Bond.
1500. J. G. Jennings and T. Culpin.
1502. J. G. Jennings.
1504. J. G. Jennings and J. Lovegrove.
1505. E. Haeffely.
1507. R. A. Brooman.
1516. W. E. Newton.
1536. P. R. Hodge.
1555. W. Langshaw.
1633. J. Shand.
1661. R. P. Walker.
1921. H. B. Barlow.
1929. R. A. Brooman.
2103. J. H. Gresham.
2255. A. Miller.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this magazine from official copies supplied by the Government, and are therefore the property of the proprietors of the Magazine. Other papers are hereby warned not to produce them without acknowledgment.

STEAM ENGINES, &c., 969, 973, 976, 989, 995.

BOILERS AND THEIR FURNACES, 979, 988.

ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 978, 997, 1004.

SHIPS AND BOATS, including their fittings, *None.*

CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 975.

FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 980, 1001.

FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 967, 970, 981, 984, 998, 1000, 1012.

BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c., 992.

LIGHTING, HEATING, AND VENTILATING, 985, 99

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 966. 990, 991, 994, 1008, 1010.

METALS, including apparatus for their manufacture, 971, 983, 1006.

CHEMISTRY AND PHOTOGRAPHY, 977, 981, 1013.

ELECTRICAL APPARATUS, 986, 1002.

WARFARE. *None.*

LETTER PRESS PRINTING &c., *None.*

MISCELLANEOUS, 968, 972, 974, 977, 982, 987, 993, 995. 996, 997, 999, 1003, 1005, 1007, 1009, 1011.

966. J. C. FAUCON. *Improvements in bedsteads, bed bottoms, seats, and articles for lying and reclining on.* Dated April 30, 1858.

Elasticity is here obtained by forming the part on which the mattress, cushion, &c., is to be placed, of a trellis, lattice, or framework, resting on strips or bands of steel curved into a peculiar stirrup-like shape, and so connected at their lower ends to the frame of the bedstead or seat, that they may be removed or folded down when not in use. At top they are attached to the trellis by forming them with a slot into which a key or pin takes. *Patent abandoned.*

967. J. CHAPMAN, Jun. *Producing a substance entitle felted woody-fibre, convertible into useful articles, and applicable to the internal fittings and decorations of dwelling houses.* Dated April 30, 1858.

Here the woody-fibre which the roots, leaves, and stems of all vegetables (including weeds) contain, is separated from the mucilaginous parts by trituration, washing, rinsing, boiling, dyeing various colours, pressing and drying. The woody-fibre is thus produced in a hard, compact felted state. *Patent abandoned.*

968. G. H. ELLIS. *Improvements in cleaning boots and shoes by machinery, and an apparatus for the same, and which is also applicable to cleaning other articles in domestic use.* Dated April 30, 1858.

This invention consists in mounting brushes or other surfaces on springs, levers, slides, or other parts, and imparting thereto reciprocating motion for cleaning boots, shoes, and plate, or plated articles by machinery. *Patent completed.*

969. W. CLARK. *Improvements in obtaining motive power, and in the apparatus connected therewith.* (A communication.) Dated April 30, 1858.

This invention is not described apart from the patentee's drawings. The following is a literal copy of the patentee's first claim:—"First, using as motive power the gases resulting from the combustion, and from the air which produced the same, these gases being by said combustion increased with heated air, or with vaporised steam—this being done by the means hereinbefore described, and further specified in the following claims." This is followed by other strange claims, such as "producing the said motive power by the combustion of known fuels in closed fire-places without grates; also the faculty of regulating the vaporisation, the temperature, and the combustion in its various stages, according to the nature of the fuel employed, and of changing the proportions of the motive mixture,"—vaporising the water employed by its projection in a subdivided state "in the gaseous current resulting from the combustion, or in the fuel in ignition,"—introducing the air into the fire-place from "three parts or regions," viz., underneath the fuel, above it, and "in the current after the combustion"—"introducing the water injected in the blowing cylinder during the aspiration or compression of the air, or it may be during both states of action of the blowing engine," to prevent the heating of this air, to diminish the force of the current of air going to the fire places, &c., and specially to lubricate the friction surfaces in contact with the burnt air. *Patent completed.*

970. P. A. GODEFROY, P.A. *Improvements in the mode of separating vegetables from animal fibres or fabrics.* Dated April 30, 1858.

This invention consists, 1, in a process for decomposing and separating cotton or other vegetable matter. The inventor submits the fabrics to a heated solution of acid to decompose in part the vegetable matter. 2. When the fabrics are taken out and well rinsed, they are consigned to a steam jacket boiler, (recommended to be egg-shaped,) having a perpendicular shaft in its centre, with arms attached, and driving gear to give it motion. The fabrics (wrung as dry as possible after the above process) are placed in the boiler, and kept in perpetual motion whilst under treatment by the armed shaft aforesaid. The steam is then allowed to escape by a tap in the boiler, and the fabrics are left in the open boiler to dry. When dried, they are taken out and subjected to the action of a winnowing machine, which completely removes all vegetable dust from the animal matter. This finishes the operation. The next part is a process to decompose and separate wool in connexion with vegetable matter. 1. When a highly bleached article is desired, he submits the vegetable and animal substances to a solution of potash or soda, and stock-washes them well. When thoroughly rinsed they are passed through a weak solution of sulphuric acid and water, and again well rinsed. Then he charges the boiler with chloride of lime and potash, of sufficient strength for decomposition of the animal matter, which takes place by immersion of the fabrics in this compound. When removed from the boiler the fabrics are to be well rinsed, then dried for use. When not required to be very white they may be submitted at once to the boiler containing caustic lime, caustic potash, or caustic soda. 2. A boiler without a jacket will serve, but should have a shaft, &c., as in the jacketed boiler. *Patent abandoned.*

971. C. A. J. DEMANET. *The extraction of coals and minerals from mines.* Dated April 30, 1858.

Two strong iron screws extend from the bottom of the shaft, (where they turn in steps) up to the surface of the ground, where their upper extremities are set in bearings in a head frame, and are provided with pinions taking into a large toothed wheel mounted between them on the shaft of a horizontal wheel, which is driven by a crank rod actuated by a steam engine. The two screws thus have rotary motion communicated to them in the same direction. Upon these screws are mounted two platforms provided at each of their extremities with a strong female screw, through which the long vertical male screw passes. The platforms form the top and bottom of a cage, which may be divided into several compartments horizontally, upon which are to be placed the trucks or boxes containing the minerals. On rotary motion being imparted to the screws in one direction, the cage will be raised with its charge, and *vice versâ*. *Patent abandoned.*

972. J. H. JOHNSON. *Improvements in suspension bridges.* (A communication.) Dated April 30, 1858.

Here the suspending chains are rendered rigid by the application thereto of diagonal braces. Two or more chains are suspended on each side of the bridge, at different elevations, so as to form concentric curves, and the intervening spaces are occupied by the diagonal braces referred to, which are connected at each end by pins or bolts, to the upper and lower chain, and are so arranged as to subdivide the space between the chains into a succession of triangles having their apices alternately above and below, whilst the hypothenuse of each angle is formed by the corresponding link of the upper or lower chain, as the case may be. The links of the lower chain should be, of course,

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of a greater length then those of the upper chain, to allow for the greater radius of its curve. *Patent completed.*

973. A. SMITH. *Improvements in valves.* Dated April 30, 1858.

The improved valve under one arrangement is made of brass telescope tubing. The valvular apparatus (for a horizontal pipe) consists of a vertical piece of tubing with a branch diverging from each side, through which the steam or liquid passes. The passage is shut off by a cylindrical valve within the central vertical part. This valve consists of a piece of spring tubing cut through longitudinally. The vertical tube is closed at its ends by metal plates, but in the upper plate there is a small aperture for the tubular valve rod. This rod passes through a stuffing box at the upper part of the valve casing, and its inner end is connected to a piece of metal which is soldered to the internal surface of the valve. A knob or handle is fitted to the outer end of the valve rod; upon pressing this knob the cylindrical valve slides down, and closes the steam or liquid passage. In this arrangement the entire area of the pipe is open to the passage of steam or liquid, the valve offering no obstruction to the flow of it. *Patent completed.*

974. J. PHYMONT.—*Improvements in apparatus for catching fish in tidal rivers and other watercourses.* Dated May 1, 1858.

The inventor digs a trench (which may be lined) in the bed of a tidal river. He places over the trough a cover extending beyond the sides of the trough, to partially shut out the light. He raises the cover by cross bearings to allow the water to flow under, and the fish to secrete themselves within the trough. When necessary he places bait in the trough. When required, he places along the sides of the trough, against the apertures, a lattice (say, of wire) so hung as to raise and fall and close the aperture against the egress of the fish. After every tide he raises the cover, and with a landing net takes out the fish. *Patent abandoned.*

975. R. WARDELL.—*Improvements in reaping machines.* Dated May 1, 1858.

This relates to a former patent, dated 1st Oct. 1857, and consists, 1, in a mode of transmitting motion to the conical endless belt or travelling platform (on which the corn or other grain is conducted after it is cut). 2, in a mode of connecting the knives or cutting blades to the machine for reducing the friction thereof, whilst they are being moved laterally. This is effected by supporting and guiding the bar to which the knives are affixed between anti-friction rollers. 3. In a mode of transmitting motion to the delivery rollers employed for keeping up the heads of the corn or other grain. 4. In a self-acting tilting platform, in lieu of rotating sheaf-delivery prongs. The invention is not described apart from the inventor's drawings. *Patent completed.*

976. R. ILLINGWORTH.—*Improvements in safety-valves.* Dated May 1, 1858.

This invention is not clearly described apart from the inventor's drawings. It may be stated, however, that it consists of a valve so constructed that the outlet afforded to the steam increases as the steam pressure is increased. Also of a water-indicating valve, which may be used either with or without the improved safety-valve, and which is so arranged as to give signals should the water get either too high or too low in the boiler, and so as to let all steam escape should its pressure get dangerously high. *Patent completed.*

977. W. SPENCE. *Improvements in the production and application of a material called French purple, and in the process employed in obtaining it.* (A communication.) Dated May 1, 1858.

This consists in the preparation of raw colour-producing acids from a mixture of "evernic, lecanoric, orsellic, erythric acids," &c. 2. In "the change that is produced on these acids by the combined action of ammonia, air, and heat, and their transformation into colouring matter." 3. In treatment by means of which the colouring matter is brought into a solid state. *Patent completed.*

978. L. TALABOT. *Improvements in rolling railway and other bars.* Dated May 1, 1858.

In rolling bars when what are called "three high rolls" are employed, the middle roll is formed, according to this invention, with alternate groves and projections—the projections on the middle roll enter into groves in the lowest roll, and the projections on the highest roll enter into groves in the middle roll. The metal is passed alternately through the spaces between the middle and upper, and the middle and lower rolls. Thus the spaces through which the metal is passed are always enclosed, except when passing a railway bar for the last time through the rolls, when in order to round off the top of the rail, the space between the rails is inclosed by groves in each roll. The distance between the rolls are adjusted by wedges acted on by screws, and placed between the bearings. The bar coming from the lowest groves is raised by a lever suspended from the axis of a wheel which runs on a rail above the rolls. The rail is connected with levers so that it may be raised and lowered. The bar may thus be moved sideways, as well as raised and lowered. In rolling round bars, the bars are rolled in the way now used, only in place of finishing the bars by rolling with guides, which makes it necessary to turn the bar quarter round between each passage, the bar is finished (after first drawing it down without guides, and then rolling it with guides) by again rolling without guides, the bar being turned to a greater or less degree between each passage under the rolls, according to the judgment of the roller. *Patent completed.*

979. W. HOPKINSON, and J. DEWHURST. *Improvements in apparatus for consuming smoke.* Dated, May 1, 1858.

Here the furnace is divided longitudinally in the middle, but the partition does not come to the front, a space being left for the smoke, &c., to pass from one compartment over the well-ignited fuel in the other compartment. At the back of the furnace, or in the bridge, there are two dampers, each capable of closing one compartment, and each actuated by a bell crank and rods. Previous to feeding either compartment with coal, its damper is raised to close the back of the furnace, that all the products may pass to the front, and then over the fire in the other compartment. The novelty here consists in the peculiar combination of apparatus above described. *Patent completed.*

980. F. M. GREGORY. *Improvements in chaff-cutting machines.* Dated May 1, 1858.

The Inventor proposes:—1st. to employ a cylindrical frame provided with a disc at each end, through the centre of which he passes horizontally a shaft, which carries at its end a fly-wheel, the whole being mounted on a framing. Upon the outer periphery of the discs, and attached to the framing, he places two knives diagonally, so that the first end of one of the knives begins to cut at the moment the last end of the second knife has completed half a revolution of the cylindrical frame. 2nd. He employs, in combination with the cylindrical frame, two sets of rollers actuated by bevelled and multiplying wheels to regulate the length of the substances to be cut. He also employs a clutch affixed to the bevelled wheel shaft to throw the same in or out of gear while the knives are in motion. The mouth of the box or tray is curved in order to take the circular motion of the knives. *Patent abandoned.*

981. J. A. HARTMAN. *Improvements in preparing and combining colours for printing cotton cloth.* Dated May 3, 1858.

This relates to producing purple or violet colours on cotton cloth from the colouring matter of madder by the steaming or vaporising process, and it consists in using an organic volatile acid, by preference acetic acid, with a salt of iron as a solvent for, and as a means of fixing the colouring matter of madder used to produce the said purple or violet colours. *Patent completed.*

982. C. SCHLEICHER. *An improved machine intended to make the points of needles, pins, and all other similar articles.* Dated May 3, 1858.

This consists in an apparatus to take the place of the hand in making the points of needles, pins, and similar articles. The apparatus is not described apart from the inventor's drawings. *Patent completed.*

983. S. ETCHELLS, A. CONSTELDINE, and S. CATTELL. *A reversing water tube iron, to work with single blast or double blast, as occasion may require, and an arrangement of water tube irons and parts connected therewith.* Dated May 3, 1858.

This consists of a reversing tube iron to work with single or double blast, and an arrangement of water tube irons and parts connected therewith to be used for a smiths' forge, hearths, or furnaces. A reversing water tube iron fixed horizontally passes through a cistern, and another tube iron fixed perpendicularly passes through another cistern; one cistern is placed at the back of the hearth, the other under the hearth, the front of the top cistern forming a fire plate. A pipe conveys the cold water from the upper cistern to the lower, and another pipe conveys the hot water from the lower cistern to the upper. The upper is supplied with water, and has an overflow pipe near the top. A tube passes through the cistern, which is held water-tight by a stuffing-box embracing a handle. By this handle the slot in the tube iron is placed to blow a vertical or horizontal blast as required. There is a blast pipe in an angular position, and an upright pipe in a vertical position, with a valve to let off the dirt or slag from the blast pipe. There is also a valve to the upright tube iron so as to shut off the blast and keep out the dirt when not in use. *Patent abandoned.*

984. E. S. THOWER. *Improvements in apparatus for treating flax, hemp, and other fibrous matters requiring like treatment.* Dated May 3, 1858.

When acting upon flax, &c., by grooved rollers, caused to move such matters alternately forward and backward (the forward motion being the greater), motion is given to the rollers by two straps, one crossed, the other not. These straps are caused to act alternatively on the driving drum of the rollers by a sliding bar or moveable instrument, which causes one strap to be moved on to the driving drum or pulley when the other is moved therefrom, and such bar or instrument is actuated by projections in the fly-wheel, so formed as to continue the driving strap for the forward motion a longer time in action than the driving strap for the retrograde motion. *Patent completed.*

985. J. TAYLOR. *Improvements in stoves and fire-places.* Dated May 3, 1858.

This consists in so arranging them that they may either be worked as ordinary stoves or fire-places, the smoke and products of combustion rising from the ignited fuel passing directly to the chimney; or that the direction of the draft may be so changed that the smoke, &c., are in part caused to pass down through the ignited fuel and between the bars, or through openings at the bottom of the grate, whilst a portion still rises from the top of the fuel. The part which passes downwards enters a chamber which becomes heated partly thereby, and partly by the heated fuel lying against the back of the grate, which forms one of the walls of the chamber. The smoke, &c., which rise from the fuel are also caused to pass into the heated chamber before escaping to the chimney. *Patent completed.*

986. J. G. APPOLD. *Improved apparatus for laying submarine telegraphic cables.* Dated May 4, 1858.

This consists in adapting to the shafts of the paying-out pulleys a drum, on the surface of which an uniform friction is maintained by binding bands or straps, connected with a weighted vibrating or moveable lever. This lever may be weighted to any desired extent, according to the friction required. The weights determine the friction on the rotating drums, and consequently the strain on the cables. *Patent completed.*

987. W. CLARK. *Improvements in separating and in otherwise treating matters in a state of fusion, and in apparatus for the same.* (A communication.) Dated May 3, 1858.

The apparatus above mentioned is intended to effect as much as possible the insulation of each molecule of the body in a state of liquefaction. It consists of two principal parts, I. A strong horizontal metal disc; 2. A perpendicular axis of iron. The two parts are firmly fixed to each other, so that rapid rotary motion may be communicated to the shaft without the disc flying off. If a flow of metal in fusion, or any other liquefied body, be directed on to the surface of this disc, the centrifugal force will spread the metal out towards, and project it from the circumference, and this metal will escape in large quantities if the movement is slow, but in drops if the movement is rapid, and in almost imperceptible particles if the speed be very high. *Patent completed.*

988. J. SMETHURST. *Certain improvements in boilers for generating steam.* Dated May 4, 1858.

This consists in constructing steam boilers of a series of spherical or other vessels in a line or above each other, and connected to a steam dome. The products of combustion are conveyed around these vessels. Another part of the invention is applicable to boilers in which flues are employed, and consists in applying within the flues spherical or other vessels connected to the inside of the boiler by pipes. *Patent abandoned.*

989. J. SWAIN and M. CERTAIN. *Improvements in metallic pistons.* Dated May 4, 1858.

This consists in the use of an internal elastic ring acting as an annular wedge, for the purpose of expanding the split packing rings of the piston, whether the connexions forming part of such elastic ring be made circular, oval, or in any other shape. *Patent completed.*

990. W. H. MORRISON. *Improvements in means or apparatus employed in the manufacture of bonnet and cap fronts, vouches, and such like articles of millinery.* Dated May 4, 1858.

These improvements relate to means of folding goffered or fluted lace or net, and to the application to the back or folded part thereof of bands or tapes. The band or tape gummed, is first placed over a groove in the table, and between a pair of sliding bars in position, for the edge of a blade or knife acting as a presser to come down thereon as operated by a treddle, and give a crease or fold thereto. Above these bars there is a pair of sliding plates which have a tendency to approach (by spring or other pressure) to within a short distance of each other, but are caused to separate as required by a treddle; and so soon as the tape is correctly laid over the groove, those parts which the treddle kept back are allowed to approach, and prevent the tape rising with the knife, and then analogous operations succeed. *Patent completed.*

991. H. L. MEALL. *Improvements in spring fastenings suitable to be used for dresses, brooches, and other purposes.* Dated May 4, 1858.

This consists in adding to an ordinary dress hook a spring tongue, to prevent the eye or loop through which the hook is passed when in use from accidentally coming off the hook. *Patent abandoned.*

992. W. E. NEWTON. *Improved apparatus for mixing and moulding materials for the manufacture of fuel, parts of which apparatus are applicable to moulding bricks and other analogous articles.* (A communication.) Dated May 4, 1858.

This relates to a former patent dated 20th March, 1858. The apparatus consists principally of, 1st, a mixing apparatus and, 2nd, a moulding and pressing apparatus. In the mixing apparatus the pulverised ingredients of the fuel are intimately combined by a rotating stirrer kept constantly in motion, while they are fed into the upper part from hoppers kept constantly supplied by a screw or endless series of buckets. Steam or hot air, or gas, is admitted to the lower part of the mixing chamber, and by the ingredients being kept in constant motion by the stirrer, the hot vapour will be brought into intimate contact with the carbonaceous matters, and will soften and cause them to agglomerate. By the continued rotation of the stirrer they are in a soft state forced out of an aperture at the bottom of the mixing chamber into a series of moulds, which are brought in succession under the aperture by a horizontal wheel or frame to which an intermittent rotary motion is communicated by gearing. In these moulds are fitted moveable pistons which are worked by a vibrating lever below, which has bowls or rollers to act against the under side of the pistons, and force them up to form, compress, and force out the blocks. This lever is actuated by a piston in a steam cylinder. *Patent completed.*

993. D. THOM and G. A. PHILLIPS. *Improvements in apparatus for bleaching and raising oil and fat.* Dated May 5, 1858.

This consists in bleaching oil and fat in high pressure vessels, and in conveying the vapours arising therefrom through a pipe into a closed vessel partly filled with water or other liquid, and from this vessel by another pipe into an open fire-place or flue. The patentees claim, 1, the use of high-pressure vessels in bleaching oil and fat. 2. The application of a closed vessel containing water or other fluid, through which the vapours rising from oil or fat during the process of bleaching pass before entering the fire-place, flue, or chimney, as described; and, lastly, the application of water or other liquid under pressure for raising fat and oil, as described. *Patent completed.*

994. R. SHARP. *Improvements in pianofortes.* Dated May 5, 1858.

This relates 1, to a peculiar application of tension braces to the ordinary braces or framework that sustain the tension of the strings, which render such braces less liable to warp or give way. The number of wood braces may therefore be reduced, or they may contain less wood than usual. 2. To a cheque action for upright pianos, and also to a particular application of the dampers. The details are not described apart from the inventor's drawings. *Patent abandoned.*

995. W. ROSS. *Improvements in taps or valves.* Dated May 5, 1858.

According to one form of these improvements, suitable for water-cranes or swan-neck taps, the crane or swan-neck is formed at its inner end with a hollow cylindrical valve piece, which works in a box or enlargement formed on the supply pipe. When the tap is open the fluid enters the crane or swan-neck through perforations round the cylindrical valve piece, the inner end of this piece being closed,

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In closing the tap the cylindrical valve piece is moved longitudinally, and the perforations are covered by a ring of caoutchouc, or other flexible material, shaped spherically or conically, so as to tightly embrace the cylindrical valve-piece and at the same time serving as a stuffing for the aperture in which the crane or swan-neck works. The motion for the opening or closing the tap is obtained by a groove and pin, so arranged that on turning up the crane or swan-neck, an inclined part of the side of the groove causes the cylindrical valve-piece to move longitudinally. The improvements are susceptible of various modifications, and are applicable to various kinds of taps or valves. *Patent completed.*

906. C. D. ARCHIBALD. *A new and improved mode of treating air and gases, and applying the same for purposes of motive force.* (A communication.) Dated May 5, 1858.

The object here is to lessen the diameter of the pump of caloric engines by so treating the air or other gas that its volume will be greatly increased when in contact with heated surfaces above the same quantity when worked in its normal condition. The invention consists in saturating air or gas with water to its full capacity of retaining the fluid in a separate condition, previous to its contact with the heated surfaces. *Patent abandoned.*

907. J. H. JOHNSON. *Improvements in signal and indicating apparatus for railways.* (A communication.) Dated May 5, 1858.

This consists, 1, in a mode of notifying to the engineer or driver the approach of the train to various stations, crossings, switches, drawbridges, &c., and also of warning the attendants stationed at such points that the train is at hand. 2, To a mode of notifying to the passengers of a train the name of the different stations and localities to which they may be approaching. The first part consists in opening and closing the whistles of locomotives by projections placed between or outside the rails, and acting upon a pulley carried by the engine, and attached to a lever which transmits motion for sounding the whistle. A similar arrangement of projections is used for actuating a pulley and lever arm carried by each carriage for putting in motion when requisite an endless band of plates having the names of the several stations, &c., marked thereon, such band being situated within a case inside the carriage, and having an opening in front. *Patent abandoned.*

908. T. PRESTON. *Improvements in the manufacture of cut pile fabrics in warp machines.* Dated May 5, 1858.

The lower guide bar has, according to this invention, as many guides as there are needles, and the pile threads or yarns are carried by such bar, and are lapped alternately to the left and to the right over one needle, and the forming and cutting of the pile is arranged to work as described in the specification of a patent granted to C. Nichols, 12th Feb., 1849, but the cutting is caused to take place after the completion of each second course, and before the third course. The upper guide bar for carrying the yarns or threads for producing the back of the fabric is arranged to "shog," or move, so as to pass each of the threads or yarns under two, three, or more needles, and to lap on one needle, the lapping of the yarns or threads being caused to take place in the same direction as the lappings of the pile yarn or threads. The work is called "lap and press." When making fringes of printed or party-coloured, or other yarns or threads, the lower guide bar is caused to lap its yarns or threads as above explained. The forming and cutting of the pile is also as above described. Two upper guide bars are used; one is caused to pass under one needle and to lap on one needle, the lapping being in the same direction as the pile threads or yarns. The second upper guide bar is caused to traverse two needles in the opposite direction, that is, under and over one needle, the lapping being in the same direction as the thread or yarns of the lower bars. By the use of hard twisted looping threads, as described in the specification of a patent granted to C. Nickels, 9th Dec., 1848, the pile fringe made as above described will be caused to curl and become a chenille fringe. *Patent completed.*

909. W. S. HOLLANDS. *Improvements in extracting and purifying oils and fatty matters.* Dated May 5, 1858.

The matters containing the oils or fatty matters are placed on filters in a vessel surrounded with a jacket, to admit of the use of steam heat when desired. The filters consist of discs of wire cloth, or of perforated metal and felts, or filtering fabrics fixed at their edges on a projection formed around the interior of the vessel. The vessel is covered by a moveable cover, and provision is made for introducing jets of steam when desired. Below the filtering surfaces the vessel is closed, provision being made to allow of the space below the filters being exhausted to produce a partial vacuum, by which means the oils or fatty matters will be pressed by the atmosphere through the filtering surfaces. The oil and fatty matters will thus be quickly extracted, and also purified. *Patent completed.*

1000. J. LAWSON, and T. ROBINSON. *Improvements in machinery for hackling and dressing flax, and other fibrous substances.* Dated May 5, 1858.

This has for its object the so constructing hackles and fixing them to vertical double sheet hackling machines, that the points of the pins of the hackles shall penetrate the strick of flax at right angles or nearly so, and that they shall operate upon the flax nearer to the nip of the holder than has heretofore been the case in like machines when the hackles have been fixed to and travelled with the sheet. The novelty consists in making the stocks or surfaces (to one edge of which the pins or points are fixed), of much greater breadth than heretofore, and in fixing them to the endless sheets or bands at a greater distance from the pins or points, so that as the stocks with their pins or points come into action, they assume more quickly a vertical position and the points a horizontal position. The extra distance of the points of the pins from the points of fixing them to the sheet enables the points to penetrate nearer to the holder than heretofore. *Patent completed.*

1001. T. HOLSTEAD. *Improvements in machinery for the manufacture of certain articles of confectionery, which are also applicable to the manufacture of biscuits and the like, and to other articles from plastic substances.* Dated May 5, 1858.

This consists in several arrangements of apparatus for cutting, stamping, and perforating the paste or plastic substance of which such articles are formed. The details are very numerous and cannot well be described apart from the inventor's drawings. *Patent abandoned.*

1002. D. E. HUGHES. *Improvements in the means of and apparatus for transmitting signals and electric currents.* Dated May 5, 1858.

This relates, 1, to a former patent, dated April 27th, 1858, and consists in applying to such apparatus a treadle arrangement for winding up the clock work, whereby all risk of inconvenience from the clock work running down during the transmission of a message will be avoided. 2, To the working of electric telegraphs with feeble or attenuated currents, which result it is especially important to attain when submarine cables are used to convey the currents to distinct electric stations. To this end, in addition to the magnetic arrangement with which the receiving telegraph instrument will necessarily be provided, he proposes to work such instrument through the agency of a galvanometer, which, by the deflection of its needle or armature, will bring a local battery to act upon the receiving or recording instrument. 3, To certain means for enabling both the positive and negative currents (which are required to be transmitted through the cable in succession) to work recording or signalling instruments. These means cannot be described apart from the inventor's drawings. *Patent completed.*

1003. J. RICHARDS. *Improvements in rotary pumps.* Dated May 6, 1858.

This consists of a hollow cylinder to which is affixed a solid shaft, working through a hollow shaft carrying a cam, or two or more wheels affixed to a frame or the sides. On the surface of the cylinder are plates or flaps of equal width, but varying in breadth, according to the number, covering the entire periphery. These plates are all hinged on one side to the face of the cylinder and about their centre. On their sides slots are cut into the cylinder equal to the width of each flap, through which passes a quadrant, one side of which is secured to the under side of each flap or valve. On rotating the cylinder the enclosed wheels or cam remain stationary, and one portion of each quadrant in succession passes over the top surface of one and lower surface of the other wheel or cam, thus causing the flaps to rise and fall in succession in two portions of the case enclosing the whole. The case or cistern containing the water to be forced, has two inlet and two exit pipes. *Patent abandoned.*

1004. M. DAVIS. *Improvements in carriage wheels, and in means of retarding their motion.* Dated May 6, 1858.

The patentee claims putting the felloes together by edge plates of metal inserted in the ends of the felloes; the method of applying the spokes to the felloes by inserting metal plates as described; the formation of the caoutchouc band with a rounding bottom and lip, or with a rounding bottom or other figures as described; the iron tyre, the skid pan, and the making of wheels by the several methods as a whole, as described. The invention is not described apart from the inventor's drawings. *Patent completed.*

1005. J. S. WILLWAY. *An improved arrangement of apparatuses for ringing bells.* Dated May 6, 1858.

This invention was described and illustrated at p. 466 of the MECHANICS' MAGAZINE for Nov. 13, 1858, No. 1810. *Patent completed.*

1006. J. WHITLEY. *Improvements in the manufacture of iron, which improvements are also applicable when obtaining other metals from their ores.* Dated May 6, 1858.

In carrying out these improvements the air required to pass through the smelting or other furnaces employed in the manufacture of iron or other metals, in place of being forced through by a blast as heretofore, is drawn through by suitable exhausting apparatus. *Patent completed.*

1007. W. HEAP. *Improvements in pipe joints or couplings.* Dated May 6, 1858.

According to this invention when applied to soft metal a nut or loose collar having an external screw thread formed upon it is first passed on to each of the pipes to be joined together. The two contiguous ends of the pipes are then expanded, and an internal screw-threaded ring or ferrule is passed on to one of them. The two ends of the pipes are now brought in contact by screwing the ring or ferrule on to the opposite collar, so as to form a flush or pump joint, and they are then forcibly tightened up or drawn together by further screwing (by means of a spanner) the two loose collars into the ring or ferrule above referred to. No packing is required other than a little white paint. In the case of hard metal pipes the externally screwed collars are screwed on to the ends of the pipes to be joined, in place of being loose thereon. *Patent completed.*

1008. E. J. SCOTT. *Improvements in the manufacture of boots and shoes.* Dated May 6, 1858.

This invention consists in effecting the attachment of the sole by means of gutta-percha pegs, which are by preference shaped like screws to give them sufficient hold. *Patent completed.*

1009. H. ASHWORTH. *Certain improvements in machinery or apparatus for cutting hides or skins.* Dated May 6, 1858.

This invention was described and illustrated at page 578 of the MECHANICS' MAGAZINE, for Dec. 18, 1858, No. 1815. *Patent completed.*

1010. T. W. THACKER. *Improvements in the construction of the finger-keys of pianoforte, organ, and harmonium keys.* Dated May 6, 1858.

This consists in forming the finger keys of the natural notes with their ends tapered in a circular form. The black keys, or sharps and flats, are also made to taper towards the player, so as to give more room for the ends of the fingers to work on the natural keys between them. *Patent completed.*

1011. J. BRIDGMAN. *Improvements in cooling fluids and in the application of cold.* Dated May 6, 1858.

For producing a low temperature the inventor employs a mixture of ice with common or other salt, or with acids, or with salts and acids. He cools wort, or brine, or other liquids, by passing the cold liquids resulting from the freezing mixtures through tubes or passages immersed in, or in contact with the fluid to be cooled. The fluid to be cooled and the cooling liquid may be made to flow in opposite directions. He also conducts the cold liquid through pipes in the wort or in the brine. He also stores and preserves articles which require to be kept cool in chambers supplied with air artificially cooled by causing it to pass through the freezing mixture. *Patent abandoned.*

1012. J. CASEY, and J. HUGHES. *Improvements in looms for weaving velvet ribbons.* Dated May 6, 1858.

The object here is to weave two or more velvet ribbons simultaneously and in the same loom, with ordinary selvages. The inventor uses several shuttles, and limits their traverse movements to the traverse through their respective warps. These shuttles they mount in a race which is capable of sliding up and down in guides formed for it on the face of the batten or slay. This movement they require in order to prevent the weft threads from lapping round the pile wire and forming loops in the selvage. To facilitate the cutting out of the wires they provide a cutting board, which rises up to the fabric to sustain the down pressure of the cutting knife. The rise and fall of the shuttle race and of the cutting board may be effected by treadles, or by the Jacquard apparatus. *Patent abandoned.*

1013. W. E. NEWTON. *Improvements in the manufacture of saltpetre.* (A communication.) Dated May 6, 1858.

This invention is based upon the greater affinity possessed by nitric acid for potash than for soda, and the deliquescence of hydrate of soda, which allows of this hydrate being separated from nitrate of potash by simple washing. In carrying it out, potash is first rendered caustic by its own weight of newly slacked lime, and at least ten times its weight of water, keeping it boiling quickly in a closed vessel until a small quantity well precipitated or filtered is no longer acted upon by lime water. The potash lye thus obtained is allowed to settle, kept from the air, and decanted into a closed boiler containing a solution of nitric of soda well clarified by settle. The contents of this second vessel, after the chemical change has taken place, must be evaporated so as to obtain the greater portion of the saltpetre, which is crystallised out of the solution by cooling in a closed crystallising vessel, to which the boiling liquid is supplied by a cock or valve adapted to the second boiler. The mother liquor, which still contains saltpetre, is to be evaporated to a high degree of concentration, and again crystallised, and the solid matter thus obtained must be well drained (free from contact with the atmosphere) and may be a second time crystallised. The liquid portion remaining will be found to consist of a strong solution of caustic soda, containing scarcely any traces of saltpetre. This may, if required, be evaporated and run off to render it more portable. Instead of washing out the alkali it may be neutralised by the addition of a few drops of very dilute nitric or hydrochloric acid, leaving traces of nitrate of soda or chloride of sodium, the greater portion of which will run off in solution before the saltpetre is carried to the drying apparatus. As an accessory product, caustic soda will be found as a residuum after the process is complete. *Patent completed.*

PRICES CURRENT OF METALS.

London, 7th Jan., 1859.

	£ s. d.		£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N. of England ..... pr ton	6 15 0	to	7 0 0	nett
Welsh Bars, in Wales .. „	6 5 0	„	6 10 0	„
Staf. Bars at the Works „	7 5 0	„	7 10 0	2½
„ Hoops ..... „	7 10 0	„	8 10 0	„
„ Sheets, Singles .. „	8 15 0	„	9 0 0	„
„ Nail Rods ..... „	7 5 0	„	7 10 0	„
„ Boiler Plates ..... „	8 10 0	„	9 0 0	„
Scotch Pig, M.Nos. Warrants, at Glasgow ..... „	2 13 9	„	2 14 0	nett
Do. Nos. 1, Good Brands „	2 15 6	„	2 14 6	„
Scotch Bars ..... „	7 5 0	„	8 0 0	3
Swedish Bars, in London „	13 10 0	„	14 10 0	2½
COPPER, Sheet and Sheating .. per lb.			0 1 0	3
Tough Cake and Tile „ ton	107 0 0	„	110 0 0	„
Best Selected..... „	110 0 0	„	110 0 0	„
Australian ..... „	113 0 0	„	111 0 0	„
South American .... „				„
Yellow Metal Sheating ..... per lb.			0 0 10	„
STEEL, Swedish Keg ..... pr. ton	20 0 0			2½
„ Faggot ..... „	None.			„
TIN, English, Block ..... pr. cwt.	6 3 0		0 6 0	2½
„ Bar..... „	0 0 0		6 4 0	„
Foreign, Banca ..... „	6 7 0	„	6 8 0	nett
„ Straits ..... „	6 6 0	„	6 7 0	„
TINPLATES, Charcoal, I.C. .. pr. box	1 12 0	„	1 13 0	3
„ Coke, I.C. ..... „	1 5 0	„	1 7 0	„
LEAD, Pig, English ..... pr. ton	21 5 0	„	22 0 0	2½
„ Spanish ..... „	20 10 0	„	21 0 0	„
„ Sheet ..... „	22 5 0		0 0 0	„
SPELTER, on the spot ..... pr. ton	23 5 0		0 0 0	nett
„ for arrival..... „	23 5 0	„	23 10 0	„
ZINC, English, Sheet ..... „	30 0 0		0 0 0	1½
QUICKSILVER	0 2 0		0 0 0	1½

REMARKS.—Railway Bars are firm and in fair demand. For other kinds of manufactured there is moderate enquiry, but prices are firm at quotations. Copper is firm and the demand good, particularly for manufactured. Tin is in request, and the tendency of price seems upward. Spelter is firm at quotation. In metals generally the business of the week has been limited.

LAWRIE AND HAGGER, Metal Brokers,
33 Lombard-street, E.C.

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THE
MECHANICS' MAGAZINE.
LONDON, FRIDAY, JANUARY 14, 1859.

THE STEAM NAVY OF FRANCE.*

On the 1st of January, 1850, the steam navy of France consisted of 20 frigates, and 86 corvettes and despatch vessels. Of the frigates two were of 650, two of 540, and 16 of 450-horse power each; of the smaller vessels one only was of more than 320-horse power, and most of them were of less than 200. There was not a single line-of-battle steamship then afloat in any harbour of France, but during the year the *Napoleon*, of 900-horse power, was launched, and the *Montebello*, a sailing ship, was converted into a steamer, with engines of 140-horse power only. Two smaller vessels—either corvettes or despatch vessels—were likewise launched in 1850. During the year 1851 no ships of the line and no frigates were added to the French navy; four small vessels formed the only increase of that period. In December, 1851, therefore, the number of vessels composing that navy was 114 in all. In 1852 three ships of the line were added—the *Austerlitz*, of 500-horse power, and the *Charlemagne* and *Jean Bart*, each of 450-horse power. Beside these, one frigate, of 260-horse power, and two smaller vessels, each of 400-horse power, were launched. In 1853 four more ships of the line floated in French ports, each of 650-horse power—the *Fleurus*, the *Prince Jerome*, the *Duquesne*, and the *Tourville*; and to these were added seven corvettes and despatch vessels, three of them of 400-horse power each. The next year, 1854, brought an increase of five line-of-battle ships; one of them, the *Bretagne*, a new ship of no less than 1,200 nominal horse power, and the other four each of 650-horse power, comprising the *Ulm*, the *Navarin*, the *Wagram*, and the *Souverain*. The number of smaller vessels remained stationary during that year. In 1855, the increase in the line-of-battle ships was six: viz., the *Eylau*, the *Redoutable*, the *Arcole*, and the *Algésiras*, all new ships, with engines of 900-horse power each, and the *Tilsitt* and *Breslau*, converted ships of 500-horse power each. This year, the most active year of the late Russian war, also brought into existence five floating batteries, 28 gunboats, and 14 screw transports. (We may, in passing, correct an error in the article from the *Conversations Lexicon* respecting the floating batteries. The writer says:—"The English batteries were complete failures, and could not even be propelled; the French, on the contrary, were excellent, and answered their purpose." The truth is, the English and French floating batteries were, to the number of four or five, built from precisely the same lines, and were, in all their main features, alike.) In 1856 seven additional line-of-battle ships were floated; of these the *Imperial* and the *Alexandre* were new, and of 900 and 800-horse power respectively; while the *Louis Quatorze*, the *Tage*, the *Duguay Trouin*, the *Donawerth*, and the *Duguesclin* were converted, and fitted with engines varying in horse power from 600 to 450. During the same year, 12 frigates, five of them of 800-horse power, were added, and the number of corvettes and despatch vessels was reduced by 10. The number of floating batteries and gunboats remained the same as in 1855, and has, indeed, continued the same until now. The screw transports were not added to this year. The *Ville de Paris* and the *Turenne*, each of 600-horse power, and the *St. Louis*, of 450, were the only line-of-battle ships added in 1857. The frigates were increased by four, the corvettes by one, and the transports by six, in that year. In 1858 the *Ville de Nantes*, of 900-horse power, and the *Fontenoy*, of 650, both new ships of the line, with four corvettes and three transports, were launched.

If the foregoing numbers be brought together, they give these results, viz.: that during the last seven years—that is, since the flash of the *coup d'état* prepared the world for the Empire's thunder—the number of French steamships of war has been more than doubled (being 114 in January, 1852, and 230 in January, 1859), and the number of steam line-of-battle ships raised from two to 32. To complete the statement of the case it is necessary to add, that at the present moment eight ships of the line and 25 frigates and smaller vessels are building in the French dockyards. The line-of-battle ships are the *Intrepide*, the *Ville de Bordeaux*, the *Ville de Lyon*, the *Gloire*, the *Invincible*, and the *Normandie*, 900-horse power each; and the *Massena* and *Castiglione*, 800 each. The *Gloire*, the *Invincible*, and the *Normandie* are building on the lines of the Napoleon razéed, and are to be sheathed with thick iron plates. The order for the conversion of two other ships of the line, the *Friedland* and the *Bayard*, has been issued, but the works have not yet been commenced.

From the foregoing facts, it appears that since the supreme power of the French nation has been in the hands of Louis Napoleon the French navy has received an average increase of from four to five steamships of the line annually; and the number of similar ships now on the stocks gives an unmistakeable proof of his intention to exceed that average this year. In an article in the *Times* of Saturday last, the Editor has shown with perfect clearness that, notwithstanding these great strides, we have the strongest steam navy in the world; and we endeavoured in the Society of Arts' paper to prove that with an efficient Channel fleet we should stand in no peril of invasion. But the steady and enormous increase of the French steam navy in large ships, appears to point to something very different from a sudden and unsupported descent upon our coast. Two-deck and three-deck steamships are by no means the most fitting vessels for effecting such an operation. They are intended, as their name implies, for the line of battle, and their production in large numbers by the French Emperor is equivalent to a declaration that if we have to meet his forces at all, it will not be on our coast or in our harbours alone. He is manifestly preparing to meet us, if need be, or if occasion serve, on the open sea, and to contend there for a mastery of infinitely greater value to him than any mere momentary advantage.

These are not alarmist notions, but plain matters of fact; and they raise the question,—Is England, with her home interests, her Mediterranean ports and islands, and her wide-spread colonies, to see herself surpassed, or even equalled, in her lines of battle, by a neighbouring Power which has but little save its own seaboard to defend?

E. J. R.

* The facts contained in the above article are so important that we deemed it our duty to send them for publication to the *Times* in a letter which appeared on Wednesday last.

SUBMARINE WARFARE.

Scarcely have Admiral Sartorious and Mr. Nasmyth allowed their "rams" to be driven to the fold, before an American gentleman has come hither with a still more remarkable fighting animal—an amphibious creature of so terrible a nature that it is to "put war steamers out of the question, and render of no avail the tremendous forts of Cronstadt or Gherbourg." This is not an ideal, but a veritable existent being—that is, if there be any truth in American oaths, for we have been favoured with the perusal of a roll of affidavits declaratory of its exploits. Indeed, we have seen drawings of it, and have, to some extent, examined its various powers and functions—with one exception: it has a secret power of loading cannon under water, the nature of which its proprietor will not divulge. There are some ingenious points about this—what shall we name it? say, dexterous hippopotamus; but, in the main, we do not discover any very remarkable novelties in its constitution. The account of it, which we are permitted to publish, however, is sufficiently startling. It is a submarine boat resembling a porpoise, but capable of containing 15 men if necessary. The inventor has, with others, sunk in Lake Michigan, and remained under water for four hours, without any communication from the surface, and has propelled the boat in and near the bottom of the lake for several miles, at three miles an hour. He has, while under water, by machinery working through the boat's side, sawed off timbers 14 inches square. He can sink his boat from the surface almost instantly, either to a few inches, or to 100 or more feet, and again rise quickly or slowly to the surface; go forward, back, or sideways, or come up bows first or otherwise, as may be required. He can carry powder torpedoes under water out to sea, in any weather, to an enemy's ship, fix or anchor the torpedoes under her bottom, set in motion clock-work to fire the torpedoes, and retire out of danger. He can enter an enemy's harbour under water and make surveys, only showing above the surface a sight tube half an inch in diameter, retire and make his report. He can go out to sea, meet a hostile fleet, go under their bottoms, fix torpedoes, or bore holes, and come away unseen. He can carry a gun so rigged that he can load in 100 feet of water, rise near to the surface, sight the horizon for an enemy's ship, proceed within a stone's throw of her, rise quickly, so as only to show the muzzle of the gun through the outside port-hole valve, aim at the ship, fire, then instantly sink to reload, and rise at another point to fire again. If required, he can remain under water with several men for several days, without landing, or showing his boat above water. For pearl fishing, he can work all day on a pearl bed, raking up and taking in pearls, and moving about and finding them where a diver would not. If required, on visiting wrecks, he can saw, bore, or make fast chains or ropes to any point of the wreck, go out of the boat through the side-hatches, enter the vessel, and return inside again without inconvenience. In our judgment, the submarine dress or case which the inventor has devised for these latter purposes, is a most complete and useful contrivance. We shall publish an illustrated description of it hereafter.

When the invention was first brought under the notice of the Secretary of the United States' Navy, he wrote to the inventor to say that the American ships were required in the water and never wanted to go under them. A proffer to the Emperor of the French received no answer. But when the invention was brought a few days since under the notice of the English Board of Admiralty it received full and prompt attention, and Sir Baldwin Walker has already had interviews with the gentleman to whose care the disposal of the patent is intrusted. But we doubt whether the system—so often commenced, but so seldom leading to any successful issue—of endeavouring to sell a secret, will in this case meet with any success. The means of doing all that this American gentle-

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man proposes are already within our power. The reason they are not used is, that they are attended with great cost, uncertainty, and danger; and it is difficult to believe that any secret can at a stroke remove these. The proposals themselves are by no means new. FULTON, in his day, proposed similar schemes. He had his "mute," which floated when he pleased, and sank below the surface when he pleased; and he had his submarine boats, which could go entirely down, and propel themselves horizontally and vertically by screws. But he was beaten in the end. On the other hand, submarine warfare will doubtless become a simple thing enough in the course of time, and we would offer no obstructions to its advent. Only, if we undertake to build a boat at our own expense, we should first assure ourselves that the invention is promising; and if our visitor undertakes to build one, we must stipulate for a really useful result before we agree to pay for it.

THE EXHIBITION OF 1861.

IT would be folly to suppose that all the great benefits which the arts and manufactures derived from the Great Exhibition of 1851 were contingent upon the novelty of the undertaking. The mere bringing together of the products of industry exerts a wholesome stimulus upon industry itself. If the collection be small, the stimulus is slight; if the collection be universal, the stimulus is equally so. The periodical exhibitions of agricultural, botanical, and other societies, never fail to produce good; and it is scarcely possible to believe that similar exhibitions of the works of art and industry, in the aggregate, would be less certainly productive of advantage. For these reasons we learn with satisfaction that the Council of the Society of Arts, bearing in mind the part which the Society took in originating the Great Exhibition of 1851, have considered it to be their duty carefully to examine the various suggestions for holding an exhibition in 1861, which have been submitted to them, and have resolved:—1, That the institution of decennial exhibitions in London, for the purpose of showing the progress made in industry and art during each period of ten years, would tend greatly to the "encouragement of arts, manufactures, and commerce." 2, That the first of these exhibitions ought not to be a repetition of the Exhibition of 1851, which must be considered an exceptional event, but should be an exhibition of works selected for excellence, illustrating especially the progress of industry and art, and arranged according to classes, and not countries; and that it should comprehend music and also painting, which was excluded in 1851. 3, That foreigners should be invited to exhibit on the same conditions as British exhibitors. 4, That the Council will proceed to consider how the foregoing resolutions can be best carried into effect.

If any one should be so astute as to suppose that ten years is a period in which no sensible advances are made in the arts and manufactures, he is egregiously mistaken. "Looking back for that period in England," says the *Globe*—and we see not how to put the case more effectively—"we find that several new arts and industries have arisen, and old ones have been extended. Scarcely more than ten years have passed since the submarine telegraphs were unknown; the screw propeller applied to our steam-vessels; the glass duty removed; the great improvements and advancement in the trade and products of the Staffordshire potteries effected; the manufacture of bricks left free to take such form as may be required; the excise duty on soap got rid of; photography and chromatic printing introduced and perfected as arts; gutta percha and many vegetable oils from our Colonies, such as the Bassia Latifolia and the Cahoun Palm, introduced as new raw materials in commerce; whilst the declared value of our exported manufactures has risen from 65,756,000*l.* in 1851, to 122,155,000*l.* in 1857. Add to the above the fact, that within ten years the resources of our Colonies have been largely developed, and the commercial world has acquired three additional emporia—two on the shores of the Pacific, and one on the Great American Lakes, viz., San Francisco, Melbourne, and Chicago, none of which are even named in the edition of Mr. M'Culloch's 'Dictionary of Geography,' published in 1849; also that China and Japan have now been opened to trade with England; and we cannot but come to the conclusion that ten years is a period fully sufficient to justify the Society of Arts in proposing to hold an Exhibition in 1861."

THE LONDON MECHANICS' INSTITUTE.

AFTER its thirty-six years of existence, the London Mechanics' Institution is not only heavily in debt, but the burden of its debt is about to be laid upon the illustrious BROUGHAM, who was associated with Mr ROBERTSON and Dr. BIRKBECK, in its formation, and who became one of its trustees. To prevent this result—which would, indeed, be a monstrous blur upon the intellectual splendour of the age—a statement has been put forward by the friends of the Institution to the following effect:—This Institution, the first of its kind, has been the parent of more than 600 similar establishments now in existence, and its founder has therefore a peculiar claim on the liberality of all friends of education. The premises required for the purposes of the Institute were demised to Lord BROUGHAM and others for a term of 146 years, at an annual rent of £229. For 30 years the voluntary contributions of the public and annual payments by the members enabled the Institute to meet all its expenses; but for the last three years and upwards, the receipts have been insufficient. In the event of Lord BROUGHAM'S co-lessee, who is of advanced age and in bad health, dying before him, the *whole* future responsibility would fall upon Lord BROUGHAM alone, and he, under the terms of the lease, can only be entirely relieved by purchasing the lease at a sum of £3,500. But it has been ascertained that if £2,000 could be raised at *once* arrangements might be made with the lessor not only to free Lord BROUGHAM from all future liability, but to enable the London Mechanics' Institute to continue its useful labours. It has occurred to Lord MURRAY and other friends of Lord BROUGHAM, considering the great public services he has performed, (more especially in the cause of education), and the heavy expenses he has already incurred, that he is fully entitled to be protected from further pecuniary loss. Contributions may be paid in to Messrs. RANSOM, BOUVERIE, and Co., 1 Pall Mall East, "To the account of the London Mechanics' Institute, *on behalf of Lord Brougham*." Surely we need add no word to an appeal like this! Surely every reader of this Magazine will cheerfully contribute his cheque or his note, his gold guinea or his silver mite, to help to save our common reputation!

EXHIBITION OF INVENTIONS.—The Society of Arts' eleventh annual Exhibition of inventions will open on the 25th day of April, 1859. The days fixed for receiving articles intended for Exhibition are, Thursday, the 7th, Friday, the 8th, and Saturday, the 9th of April. No charge is made for space, and the Exhibition is free.

LAYING-OFF;
OR,
THE GEOMETRY OF SHIP-BUILDING.

No. I.

MOST persons are aware that the art of ship building has three great divisions—construction, laying-off, and actual building. The first consists in designing and making a scale-drawing of a floating body, which shall answer all the required conditions as to carrying power, stiffness, speed, and whatever else may be necessary. This is, to a large extent, a mathematical operation. The second division, "laying-off," consists in forming upon a prepared floor, another drawing of this floating body, having her intended dimensions in full, to which drawing moulds of thin wood are cut, determining the forms and sizes of the several parts, that by them the workmen may perform the third and last process—*i.e.*, cut out the solid timber, so as to ensure that when the several parts are brought together their aggregate shall have the contour and magnitude intended by the constructor. The first of these divisions will be thoroughly considered in the series of articles concurrent with this. The second will be the subject of this series. The present text-book on the subject is that written by Mr. Fincham, late master-shipwright of Portsmouth Dockyard, and is a complete manual guide to all the details. Our object is quite remote from this—it is to show the dependence of all its problems upon the common principles of projection-drawing, and to give such an outline of these as shall render us intelligible in obtaining by their aid the required solutions.*

Presuming that the reader has a thorough knowledge of the constitution of a ship, he can find no difficulty, if he aid his conceptions with a few pieces of card-board, in comprehending all that we shall submit to him, and in reducing to practice the knowledge so obtained.

It will be our endeavour, by the avoidance of technicalities, and by careful definition, to render ourselves intelligible, not only to the ship-builder, but to every geometrician, to whose attention we commend the subject, as one of great interest, both from its importance in its relation to ship-building, and from the skilful adaptation of geometrical principles shown in many of its solutions.

Our first object, then, must be to describe the nature of a ship-drawing.

ON PROJECTIONS.

In landscape and other *perspective* drawings all the objects represented are placed in that relation to each other which they appear to bear when viewed from some one point; and where exact dimensions are not required, nothing further is necessary; but if we wish to apply a scale to the drawing, to discover the sizes and distances of the objects represented, we shall find that the perspective drawing will not serve our purpose. We must have a drawing which will give us the objects as they are with regard to position and magnitude, not as they appear to the eye of a spectator. We must get rid of the notion of perspective, and introduce that of *projection*, or orthographic projection, as it is frequently called.

Fig. 1 is a perspective drawing of the stern of a sailing frigate, representing truly enough the appearance of the ship viewed from a point on the quarter, but evidently having no value as a means of determining the sizes and relative positions of the parts. What we need to complete our knowledge of any solid, or group of solids, in these respects, is to have the means of observing them, not from one point alone, but from successive points immediately in front of each part, and from others immediately over those parts, having at the same time the power of seeing through the solids. A projection-drawing gives us these means, and this knowledge.

* More complete knowledge of this subject may be obtained from Dr. Woolley's admirable "Descriptive Geometry," Parker, West Strand—or from Binns' "Orthographic Projection," Spon, Bucklersbury.

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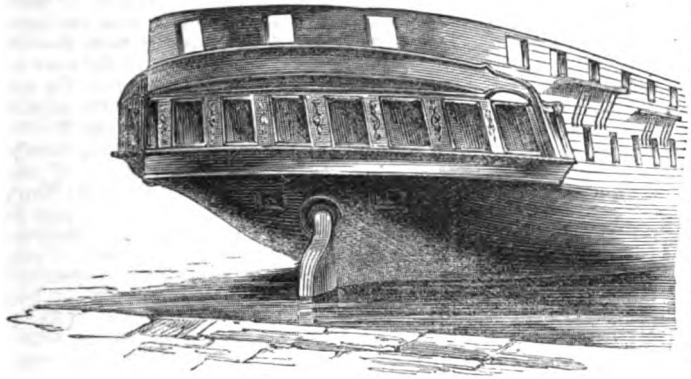
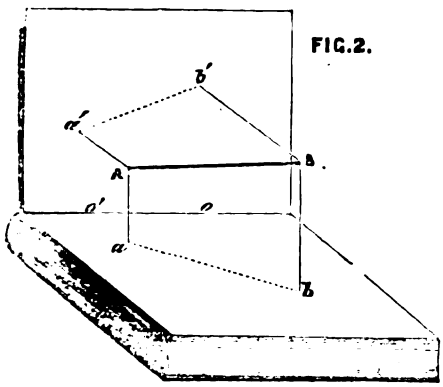
Fig. 1.



Projection means literally throwing forward, and the word is used here in some such sense. Let us see how to represent a line by its projections.

FIG. 2.



Take a book, fig. 2, and open its cover, as shown in the sketch, so that the *plane* of the cover may be at right angles, or square to the plane of the first leaf. These two flat surfaces, or planes, we shall call the *planes of projection*, because upon them we are going to *project* the line *A B*, held in front of one, and above the other as shown. Now suppose perpendiculars to be let fall from the point *A* upon the cover, and also upon the first leaf—in other words, let the line *A a'* be drawn from *A* square to the cover, and meeting it in the point *a'*; and *A a*, square to the first leaf, and meeting it in *a*. In a similar manner let perpendiculars *B b'*, and *b b* be drawn to the cover and leaf respectively from the other end of the line *A B*. Then *a* and *a'* are said to be the *projections* of the point *A*; *b* and *b'* of the point *B*; and it is evident that if these points were marked on the planes, we could always find the points in space which *A* and *B* had occupied by drawing perpendiculars to the planes from the projections, and finding where they intersect. We know in fact that—calling the line *o o'* in which the two planes intersect, *the axis*—the height of *a'* above the axis is equal to the height of *A* above the plane of the leaf, and that the distance of *a* from the *axis* is equal to the distance of *A* from the plane of the cover. We have similar knowledge with regard to the point *B*; and it is manifest that if we draw a straight line from *a'* to *b'*, and another from *a* to *b*, they will show us the position and length of the line *A B*, of which they are the projections. Both (*a*, *b*) and (*a'*, *b'*) are in this case shorter than the line *A B*, because this line is not parallel to either of the planes of projection. Had it been parallel to either, the length of the projection on that plane would have been the same as the length of the line; but it will be seen presently that the exact length can in any case be easily found from the projections. By these means, then, we have recorded upon two planes, at right angles to each other, the position of a line with relation to them.

If we suppose further that the two planes which we have chosen to receive our projections are not only perpendicular to each other, but are also the one *horizontal*, and the other *vertical*, we by this means, record also the inclinations of the lines projected to the vertical. As it is important to do this, it may be understood for the future that one of our planes of projection is horizontal, and the other vertical, and we shall designate them the *horizontal plane* and the *vertical plane* respectively.

There will not be much greater difficulty in representing a curved line by its projections than we have found in representing a straight line.

FIG. 3.

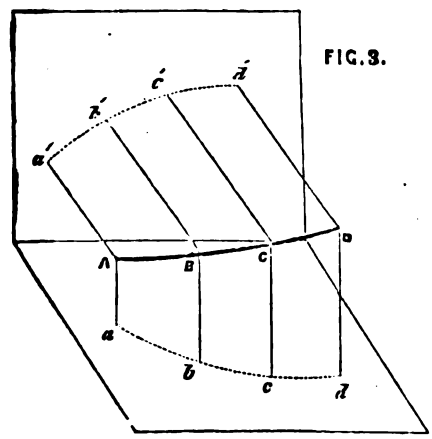
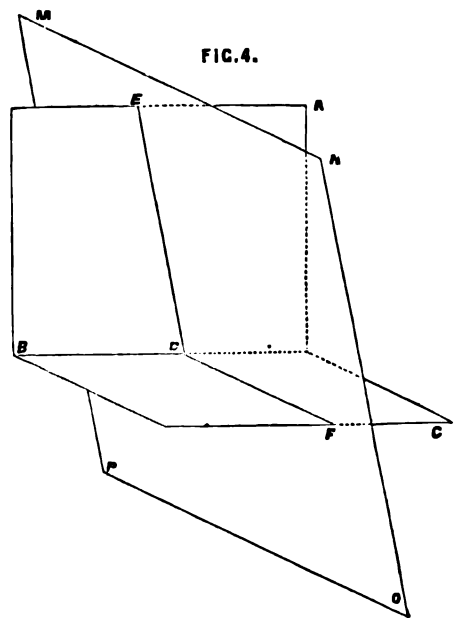


FIG. 4.



If the line is regular in form it will only be necessary to project a few of its points, *A*, *B*, *C*, *D*, on the planes, fig. 3; *a'*, *b'*, *c'*, *d'*, and *a*, *b*, *c*, *d* may then be joined by regular curves, and every point in them may be considered to be the projection of the corresponding point in the line. If, conversely, it is required to discover the curve, *A D*, from the projected curves (*a*, *d*), (*a'*, *d'*,) we have only to draw perpendiculars to the planes of projection from these and other points intermediate, and the points in which these perpendiculars intersect will be in the required curve.

These projections will not be similar in form to the line projected, unless the line *lie in a plane parallel* to one of the planes of projection. In that case its projection on the plane to which it is parallel will be precisely similar to itself, while that on the other plane will be a straight line.

Any point or line, and therefore any plane or solid figure bounded by lines or surfaces, may thus be represented by its projections.

If we wish to define the position and direction of a *plane* having no precise boundaries, it is sufficient to show the lines in which, when it is extended, it will cut the planes of projection. Let *M*, *N*, *O*, *P*, Fig. 4, be the plane to be represented. This representation might be made by obtaining the projections of any three points in it, not in the same straight line, but instead of doing this, the lines *E D*, and *D F*, are marked, and are called the traces of the plane. The position and direction of the plane are thus completely determined.

THE NAVIES OF ENGLAND AND FRANCE.

(From the *Times* of Saturday, Jan. 8, 1859.)

We promised our readers a little further notice of the comparisons instituted by certain German critics between the navies of England and France. This undertaking we proceed to fulfil. In so doing we shall direct our own remarks to a single important point, not simply for the sake of unity or perspicuity, but because much of the rest may really be dismissed without regard. We are not in the least disposed to fight over again the battles of the last naval war, nor shall we join Sir Charles Napier, whose letter will be found in another column, in analysing the elements of British victory. Still less shall we discuss at present the disparaging statements respecting our officers and men, to which the natural sense and information of the public will apply the best corrective. The comparative strength, however, of the English and French navies in actual material is a truly interesting subject of inquiry—all the more so, indeed, from being fairly debateable, and it happens that we have very lately been favoured with some instructive observations on the matter by very competent hands. Sir Howard Douglas, in his recent treatise on *Naval Warfare with Steam*, and Mr. Reed, late of the Portsmouth Dockyard, in a paper upon Naval Architecture, read before the Society of Arts, have each entered with considerable minuteness into the question before us, and in addition to these authorities, we learn from an article transferred to our own columns this morning what view is taken of the case in the United States. With these aids we think we can make the facts tolerably clear.

The German critic allowed 546 men-of-war of all rates to England, and 450 to France, gun-boats alone being excluded from the calculation. Taking ships of the line only, France was credited with 63 and England with 78, the proportion of steam to sail in either force being reckoned equal. After a decided superiority, however, had been thus assigned to England, it was presently demolished by the assertion that the advantage was merely nominal, since the French ships were mostly new and of prime capacity, while many of the English were old and of no real account. As a final conclusion, the Navies of the two nations, in respect of material, were pronounced to be pretty nearly on an equality.

Very different is the contrast exhibited by Mr. Reed, who broadly says, "Where we have 60 steam line-of-battle ships they (the French) have 30; where we have 330 steamships, they have 220; and where we have 600 ships in all, they have 400." In like manner the American journalist gives us a majority in screw ships of the line of 52 to 33; and, though he represents us in a minority as regards first-class steam frigates, this is because he omits paddlewheel vessels, and enumerates none but screws. Mr. Reed gives us exactly the number of these vessels assigned by the New York paper to the French—viz., 28, instead of 19,—remarking that they are "most of them powerfully, and some of them very formidably, armed, the engines of 16 of the 28 being at least of 600 nominal horse power." Sir Howard Douglas, in his recapitulation of the vessels of the British Steam Navy, also supplies a correction of the American estimate. He reports that we have 32 ships of 90 guns and upwards, 32 from 50 to 90, 27 from 20 to 50, and 127 with 20 guns and under, independently of our gunboat flotilla. Ordinary readers will probably be somewhat puzzled to understand how there can be such variations in a simple affair of reckoning, and will think that our ships ought to admit of counting and classifying without much chance of error. But there are two main sources of discrepancy in this matter. One is, that ships on the stocks, or under alteration, may or may not be counted, according to the views of the enumerator; and the other is, that a particular class of vessels—such, for instance, as our 60-gun block-ships—may sometimes be computed as line-of-battle ships, and sometimes be assigned to another division of the Navy. As regards the chief point taken—viz., the respective forces of the two Navies in good, sound, effective line-of-battle ships, propelled by screws,—we believe we can put the case plainly before the public.

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The French Navy contains 33 screw sail of the line afloat. Of these 21 have been launched since 1852, and the average age of the whole 33 is 7 1-3 years. On the stocks in the different dockyards there are six more vessels of this class, giving a total of 39. The British Navy comprises 37 screw sail of the line afloat, if we include six fitting for the screw. Of these 20 have been launched since 1852, and the average age of the whole 37 is 9¼ years. On the stocks we have 12 building and four ordered to be altered, giving a total of 53. That, according to the best of our information, is the true state of the case.

It is not to be denied that these figures admit of a deduction furnishing something very like a warrant for Lord Hardwicke's estimate of the two Navies, which occasioned so much sensation two or three months ago. Striking out vessels fitting or building, we find ourselves with 31 line-of-battle ships of the first quality, whereas France has 33, so that Lord Hardwicke was thus far justified in speaking of a positive inferiority on our part. But this, in reality, is giving us rather hard measure. It takes no note of ships coming on, though here we have decidedly the advantage, and the balance, in fact, might have been turned the other way before the calculation was well completed. It leaves out of the question our clear preponderance of strength in other classes of vessels, and in the general aggregate, taking no heed of blockships, heavy frigates, corvettes, or, above all, of gunboats. These considerations might have given a different turn to the conclusion, though we must needs admit, after all, that the comparison of force is too close to be agreeable to the British people. The truth of the whole matter seems to be this:—The definite recognition of steam as the essential power of a War Navy rendered old Navies, as it were, obsolete at a single blow, compelled all maritime Powers to begin shipbuilding afresh, and thus deprived England of the start which years of enterprise and outlay had given her. In this conjuncture of affairs, France, partly by patience, partly by judgment, and partly by well-directed vigour, did for a time gain a stride or two upon England. Wisely sparing herself all useless efforts, she took the benefit of our experiments, and then, by concentrating her expenditure upon one class of vessels and turning these out upon the very best model, she succeeded in making a better bargain than we did out of the new order of things. But since that time we have been steadily coming up, and it must be the fault of our rulers if we do not soon regain our position hand over hand.

Before we conclude, however, we wish, not to discuss, for there space would now fail us, but simply to open one or two questions, by the solution of which the whole case may be most materially modified. Are screw line-of-battle ships such all-important elements of a naval force that a comparison of numbers in this class of vessels alone becomes equivalent to a comparison of two marines? It is quite certain that frigates, corvettes, and especially gunboats, may not play parts of very great consequence in any future war! We may go a little further in our inquiries. Has it been really placed beyond all doubt that steam will stand for everything, and sailing for nothing, in maritime campaigns? Mr. Reed does, indeed, suggest that some of our 200 sailing vessels should be sold for merchantmen, as never likely to be useful; and Sir Charles Napier, it will be seen, also rejects these vessels from his estimate of our naval strength. Such views of the subject are doubtless correct, as far as the construction of any new sailing vessels is concerned; but Sir Howard Douglas has sagaciously pointed out that steam, in any long cruise or tedious operations, can only be looked upon as an auxiliary power, to be employed at the most critical moments. Men-of-war have but moderate capacities for stowage of fuel. Our best vessels of this class carry but six or eight days' consumption, and the Napoleon—the French type ship—could only go two days longer. In anything like a sea campaign steamers would have to depend, like land forces, upon some base of operations, and receive regular supplies of coals. Even under the most favourable circumstances they would have to economise their fuel whenever it was possible, and trust to their sails. This would not, it is true, bring mere sailing ships up to their level, but it shows that seamanship is not so obsolete a qualification as some have imagined, and that British sailors may still find a sphere for excellence peculiarly their own. Altogether, we think that steam has done less to injure the relative power of Britain than our foreign critics are pleased to assume. At this moment we have certainly the strongest steam navy in the world taken in the aggregate, and probably in any class of vessels taken singly. This force we shall continue to increase and maintain in the points where increase is desirable, while it still remains a matter of uncertainty whether in what we possess over and above steam power we may not find many of our old advantages yet remaining.

SCIENTIFIC PROGRESS IN AUSTRALIA.

As many necessarily vague ideas prevail with regard to the details of the progress of that portion of the Anglo-Saxon race which has "projected" itself on to the Australian continent, it may be interesting to afford a little information on such subjects as come within the scope of this journal. We are induced to do this because it is difficult to take up an Australian paper without meeting with complaints of the indifference and misapprehension which prevails in England on topics of absorbing interest to the colonists. For example. The north part of the province of South Australia has recently been reported to be teeming with yet undeveloped mineral wealth. The colonial journalist in "South" Australia refers to the discoveries "in the north;" some of his English contemporaries reproduce the observations without much care; and the home reader, if he troubles himself about the matter at all, and has any smattering of antipodean geography, is led to the conclusion that copper had been found somewhere in the neighbourhood of the Gulf of Carpentaria, instead of in the vicinity of Lake Torrens.

That the Australias are approximating more and more to the habits and system of the old country is seen in the rapid progress which the electric telegraph has made of late years in the three leading British settlements—Victoria, New South Wales, South Australia—and in Tasmania. A paper issued by "one" of the local parliaments—there appear to be too many legislative cooks on the continent—shows that the development of what the Indian mutineers call, we believe, the "lightning mail," has been very great during the last two years. A great intercolonial telegraph has been in hand for some time between the capitals of Adelaide, Melbourne, and Sydney. The line has been in operation since the summer between Adelaide and Melbourne, and the last advices state that it has now been finished between Melbourne and Sydney. There are now, therefore, 1,650 miles of telegraphic wire on the Australian continent and its island-satellite, Tasmania. Of this total of 1,650 miles, not less than 1,200 miles of wire have been put up within the last two years, showing an accelerated rate of progress due to the prosecution of th intercoloniale line. This last was, of course, a serious undertaking, and could not have been carried out without the co-operation of the various colonial governments. The wires are for the most part carried along standing trees, and fears were in the first instance entertained that the various disasters of the bush, and the wanton malice of the Aborigines, would prove fatal to the undertaking. At present the *contretemps* experienced have not been of a very serious character; and some provision has been made against the effects of bush fires by clearing the undergrowth away from the trees which have been pressed into the service as supports for the wires. It remains to be proved whether this will be a sufficient security against the wide-spread conflagrations, which are greatly favoured by the dryness of the climate; but with the advance of civilisation and cultivation these will probably become less frequent. Under any circumstances, however, for some time to come it will be necessary to devote much attention to the removal of the undergrowth, which will soon spring up again. Victoria, forced by its auriferous wealth into an importance unparalleled for the rapidity of its growth in colonial annals, has the greatest length of telegraphic communication, 735 miles; New South Wales comes next with 393 miles; South Australia has 338 miles; and Tasmania 160 miles. With regard to the future, a line is in progress from Castlemaine to Ballaarat, and another from Queenscliffe to Cape Otway, to meet the submarine cable, which is about to be submerged from Tasmania, in Bass' Strait. In South Australia a line is being pushed on to Kapunda, to the north of Adelaide. In New South Wales additional lines to Bathurst and the Hunter River have been sanctioned, and are expected to be carried out in 1859. In Tasmania a line from George Town to Cape Grim, between which point and Cape Otway the submarine cable is to be submerged, is also not yet constructed. The cost of the lines at present in operation has ranged at from £70 to £75 per mile. The rate of charges for messages is necessarily high, but between Adelaide and Melbourne, the pressure of telegrams has been found to be inconveniently great, so much so, indeed, that some despatches have not been delivered for 24 hours after their reception. The business between Melbourne and Sydney will, of course, be more extensive in consequence of the larger interests involved in New South Wales; and as there will be a constant succession of governmental and fourth estate despatches, the wires will, no doubt, be fully employed.

A recent American writer expresses an opinion that Australia must always suffer greatly from the inferiority of her rivers. This is, no doubt, true from an American point of view, and comes naturally enough from a traveller fresh from the Mississipi or the Ohio; but it is all the more important that the colonists should make the most of what inland streams they have. The most important and extensive of these are the Murrumbidgee and the Murray, and persevering attempts are being made to extend steam and other navigation on these rivers. Perhaps the Murray is almost the only reliable river in or near the settled districts; the other streams discovered being mere channels filled by occasional rains, which, in some cases, rush down comparatively naked hills, according to Sturt, without being absorbed more or less by vegetation as in Europe, and cause an accumulation of waters extraordinarily sudden, and soon carried off by evaporation. The waters of the Murray maintain throughout its course of many hundred miles a tolerable equilibrium; and the Murrumbidgee, which is connected with it, is also a fine stream, although variable. Captain Cadell, who has devoted considerable attention to this important Australian question, has succeeded in steaming along the Murray from the Goolwa, in South Australia and also in subsequently ascending the Murrumbidgee as far as Gundagai. As the channel is not well known at present, the progress of the steamer was slower than the speed which others will, no doubt, subsequently attain. The entire distance traversed was more than 2,000 miles, and the journey occupied 34 days. It should be stated however, that the steamer had in tow three barges. As a specimen of the barbarous character of Australian nomenclature, the log of the steamer is rather amusing:—Left Alexandrina on the 12th August with barges *Wakool*, *Eureka*, and *Milta-Milta* in tow; arrived at Moorundee 13th, Darling junction 21st, Murrumbidgee junction 27th (cast off the *Eureka*), Balranald 28th, Niela and Pika 30th (cast off the *Milta-Milta*). Lachlan station 1st September, Lang station 4th (cast off the *Wakool*), Yanko 10th, Wagga-Wagga 13th, and Gundagai 16th. Steam navigation is not a novelty this year on the Murray, as Mr. Randall, an enterprising agriculturist in South Australia, placed a small steamer on the river a season or two since; but the trip to which reference has been made, was the first of the kind witnessed on the waters of the Murrumbidgee, and it is almost impossible to overestimate the commercial importance of the expedition to the colonists. It is suggested that a similar attempt should be made on the Darling, but this stream is so uncertain that the success of such an enterprise would be doubtful; at any rate, the prospects of any permanent navigation on the river seem dubious. As an illustration of the uncertainty of Australian rivers—if such an expression is allowable—it may be worth while to compare the statements, no doubt *bonâ fide* in each case, but made under widely different circumstances, by Sir T. L. Mitchell, for some time Surveyor-General of New South Wales, and Mr. A. C. Gregory, the chief of the expedition despatched as a forlorn hope in search of the gallant Leichardt. Sir Thomas Mitchell, who visited the district through which flows the river which he named the Victoria in 1845, wrote as follows on his discoveries:—"The soil consists of rich clay, and the hollows give birth to watercourses, in most of which water was abundant. . . . The plains were verdant; indeed the luxuriant pasturage surpassed in quality as it did in extent anything of the kind I had ever seen. . . . New birds and new plants marked this out as an essentially different region from any I had previously explored. That the river is the most important of Australia, increasing as it does by successive tributaries, and not a mere product of distant ranges, admits of no dispute; and the downs and plains of Central Australia, through which it flows, seem sufficient to supply the whole world with animal food." Thus Sir Thomas Mitchell; but Mr. Gregory, who has just returned

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from his expedition, visited the same district, and writes: "The bed of the Victoria was scarcely ten yards wide (at one point), and perfectly dry, so that it was only after a prolonged search along its course that a small puddled water was found in a hollow. . . During the first two days' journey down the river only a few small pools of water were seen, and these not of a permanent character, while the rich vegetation on the open downs, which had excited the admiration of Sir T. Mitchell, on his discovery of the country in a favourable season, had wholly passed away, leaving little but a bare surface of clay, the deep fissures in its surface giving evidence of long-continued drought." Only at one or two points did Mr. Gregory see anything approaching to a fine river, although in his diary on the 21st of April, 1858, he writes that some good reaches of water were passed. It would seem that the nearer the centre of the continent is reached, the greater the tendency to droughts, although they are considered periodical; but it is clear that if steam navigation is to be carried on in the Australian rivers to any great extent, it will be necessary to employ steamers of very light draught.

THE SMITHFIELD CLUB SHOW.

(*Continued from page* 25.)

B. Samuelson, of Banbury, exhibited his well-known turnip cutter, which obtained the first and only prize at Chester; as also a new American reaper, improved by himself. This reaper is self-raking, and, by simple mechanism, leaves the cut grain in sheaves ready for binding, clear of the track of the machine. It is said to work well with one man and two horses, and, at an ordinary walking pace, to cut 5 feet wide and clear 1¼ to 1½ acres per hour. Its low price is a recommendation.

Holmes and Sons, of Norwich, exhibited their very recently-constructed portable seed-sheller, which received special award at the Cardiff meeting, and which has an entirely new arrangement of dressing apparatus. The shelling-barrel is placed under the dressing apparatus, and the power applied close to the ground, which causes it to work very steadily; the seed passes from the shelling-barrel into elevators, so as to be delivered into the dressing apparatus, which, being placed above, allows all the hard hulk being delivered into the hopper of the shelling-barrel, to be passed through again, so that no portion has to be lifted a second time to the feeding-hopper. This machine is adapted for 7, 8, or 9-horse engines. Messrs. Holmes also exhibited their very well-known manure-distributors, which have received eight or ten prizes. The delivery barrels of these machines are made entirely of wrought iron. The scrapers being hung from the top, and being made to clean four deliverers, each one separately has the whole weight of the scraper, thus saving a considerable weight of iron. The machines are also fitted with Messrs. Holmes' "semi-lateral" wheel-stirrers, which are moved without extra gearing or crank action.

Cottam and Co., of Winsley-street, Oxford-street, exhibited, amongst their usual assortment of stable fittings, &c., some cast-iron dairy buckets, enamelled on the inside, and apparently well adapted for the use intended.

George Robinson and Sons, of Barton-on-Humber, exhibited their improved and patented clod-crusher roller, the distinguishing feature of which is its non-liability to wear sideways. This is prevented by making the bushes or naves twice the width or length of the outer disc or periphery. By chambering the bushes, twice the bearing surface is given to the spindles, besides receptacles for grease being provided for keeping the spindles lubricated. The discs or rings are so constructed as to split the clods instead of burying them in the ground.

Priest and Woolnough, of Kingston-on-Thames, exhibited a new "pony"-drill for market gardeners and seed-growers, which is sold for ten guineas, and seems well-suited for those farming a small quantity of land; all kinds of grain or seeds being capable of being drilled by it as by an ordinary drill. We may also mention Rowley's Patent Blast Drill, exhibited by this firm, and intended for protecting the turnip crop from the fly, &c. This operation is with great difficulty, and very imperfectly, performed by hand, as the fly usually shelters and feeds on the under-side of the plant, where it is almost impossible to apply lime or other composition. The blast-drill overcomes the difficulty; as, by it, lime, soot, &c., are thrown by a powerful blast by means of fans or flyers upon all parts of the plant, covering both the under and upper sides of the leaves. The insects are drawn by the in-current into the fan, and are destroyed by being mixed with the lime or other substance. It is more than probable that some substance may be discovered by which, with the help of the blast-drill, the diseases of the potatoe may be effectually arrested; but there are very many purposes besides those named for which this implement can be used with great advantage, such as for light top-dressings to crops. Soot or guano distributed over turnips, especially when succeeded by a shower of rain, has been found to be very beneficial.

A. Lyon, of Windmill-street, Finsbury, exhibited, or rather intended to exhibit, his "noiseless" sausage cutting and making machine; but, owing to some unaccountable mode of classification adopted by the committee of the show, sausage and washing machines were ordered to be put out of the way, as not being strictly of an agricultural character, although barometers and butter prints were not excluded, nor was a certain washing machine, because it happened to be called a "flax-washer." Indeed, the sausage machines are intended and made really suitable for preparing food, both for poultry and pigs; and, therefore, in every sense of the word, agricultural. Churns were also exhibited in abundance, as well as egg-whisks, as indeed everything might consistently be which relates to the preparation of food for man or beast. By one of Lyon's large machines, that is, one 16 inches square, 57 lbs. of meal was cut in 25 minutes at a public trial in Newgate market. The small machines sold for 30s. cut and fill 10 lbs. of meat in a quarter of an hour.

Hill and Smith, of Brierly-hill Works, near Dudley, exhibited their improved pig-feeding trough, with shifting divisions for feeding any number of pigs, and giving them accommodation suitable to their ages, sizes, or dispositions. They also exhibited their "continuous" fencing, 25 miles of which have been recently fixed up on the London and North-Western Railway. This fencing is constructed of flat bars nicked out to fit the uprights, and then keyed in place, making the whole very secure; the depth of the flat bars preventing them from being easily bent, offering as they do their edges in the direction in which they are most likely to meet with rough usage.

James Tree and Co. (Charlotte-street, Blackfriars-road), exhibited a great collection of Ewart's cattle gauges—half-a-dozen varieties—by means of which, combined with a little judgment, the carcase weight of oxen may be computed with great accuracy from their dimensions, and that of sheep and swine from their weight alive. We notice this instrument not on account of its novelty, but rather from its great utility, and because we have reason to believe a "slide rule," which the cattle guage resembles, is looked upon as a mysterious instrument of torture by a very large class of graziers and agriculturists. The most approved method of estimating the weight of cattle appears to be to guess at it, and any aids to the formation of a correct judgment are looked upon with supreme contempt. This may be accounted for partly by the fact that without some judgment being exercised, the cattle gauge would not be very accurate in its deductions. A man must know whether an ox be "half," "moderately," "prime," or "extra" fat, as also whether it be well or ill-bred before he can estimate its weight correctly, even with the aid of the gauge; for it appears that beasts of the same dimensions may vary from 64 to 97 stones, according to their breed, fatness, and sex. On this account there are nine different index points on the scale of the guage to every pair of measurements, but when the guage point is decided upon, which every grazier can readily satisfy himself about, the weight of the beast may be very accurately arrived at by the use of the gauge. In the case of ten beasts measured and weighed at the show, and whose weights varied from 57 to 132 stones, the average difference between the estimated and actual weights was only about three per cent., some of them agreeing to within a single pound. This degree of accuracy, it is needless to say, is very rarely, if ever, arrived at by the guessing process. The modes of using the cattle guages are popularly explained in a book of instructions sold with them. We may also notice a very useful instrument for agriculturists, the "garden microscope," said to be "adopted" by the Society of Arts, and which is sold complete for 20s.

Hely and Co. (the Cosmopolitan Glass Company), of 206 Oxford-street, exhibited amongst a very great variety of architectural, horticultural, agricultural, scientific, and domestic glass wares, a new milk test, by which its quality can frequently, if not always, be accurately determined. For the provinces these tests may answer well, but we doubt if London milkmen will be much affected by them, being accustomed with their milk to make up in quantity, that is, in consistency, what it wants in quality. We would, however, recommend the milk test to every good housewife, as were it used *bonâ fide* "skim" could never be taken for the genuine article; in other words, "new milk from the cow" be confounded with that from the "cow's tail."

T. Wheeler and Co., of Oxford, exhibited their "Oxonian knuckle" washing machine, which, as its name signifies, attempts the cleansing of linen by an action closely resembling that of the knuckles. The machine consists of a revolving drum, having upon it half-round ridges running parallel to the axis, and a series of floating discs, which revolve at right angles to the drum. The clothes are carried round the drum and between that and the floating discs or "knuckle rubbers." Wet sheets of paper, and consequently muslin or other fine textures can be passed through the machine without damage. The form of the machines may be varied, the rubbers being sometimes fixed in horizontal frames, the upper one of which is made to move to and fro by means of a winch handle. It is not a little curious to see very delicate articles passed through these machines, which, when at work, appear admirably calculated to tear to fragments the strongest material. The fact of the discs floating, however, and thus readily giving way to the slightest pressure, satisfactorily accounts for the real delicacy of the work. The principle of the machines seems most ingenious, and we think they will be found formidable rivals to the celebrated ball-washing machines.

F. Edginton, of Northampton, exhibited tents 12 feet square, which are sold for £8, and constructed so as to dispense with the ordinary central pole. This is a great improvement, and renders a small tent on this plan as convenient as a much larger one on the old one.

In noticing Wallis and Haslam's stand we omitted to mention that they were manufacturers of Robey's patented beater for thrashing machines, which consists simply of a bar of iron, having semi-globular indentations made in it on one side, which, of course, produce corresponding projections on the other. These projections, as they wear, may be readily set up to the requisite height.

NEW FIRE ENGINE.—On Thursday, January 6, a trial of a new fire engine, constructed on the principle of Mr. Robert's pumps, (illustrated on another page) took place at the anchor and cable works of Messrs. Brown, Lenox and Co., Millwall. The result was highly satisfactory. We shall illustrate the engine shortly.

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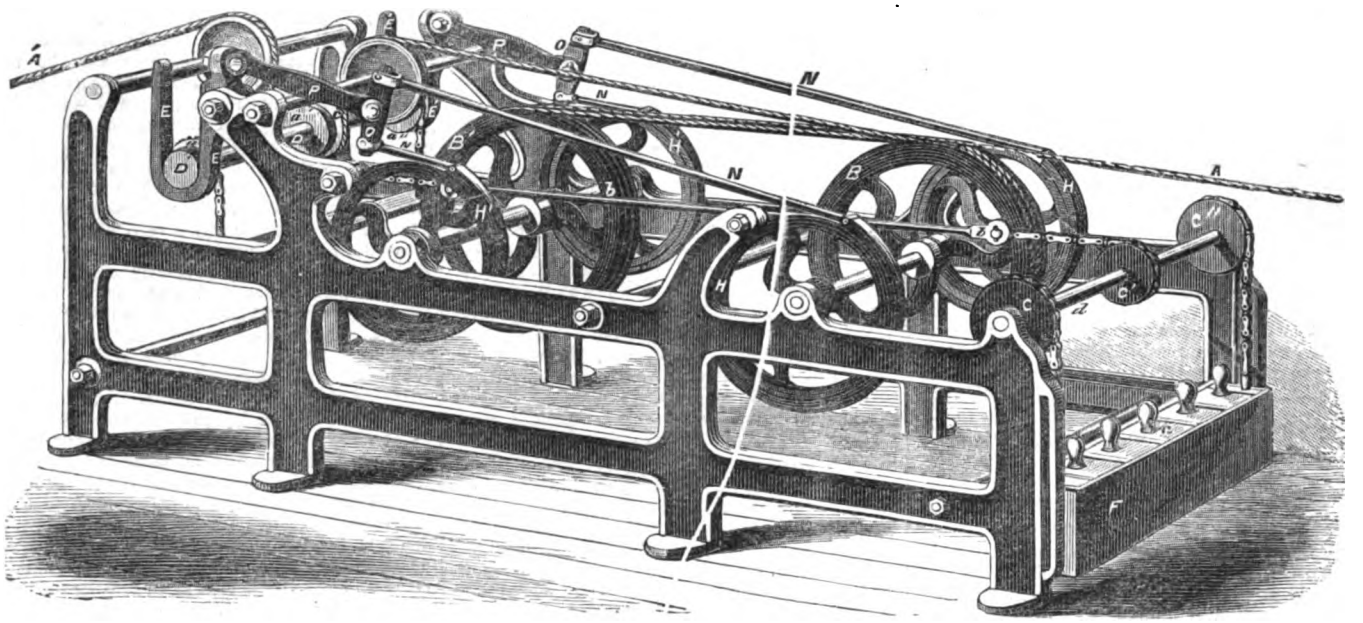
MOXON, CLAYTON, AND FEARNLEY'S APPARATUS FOR PAYING OUT TELEGRAPH CABLES.



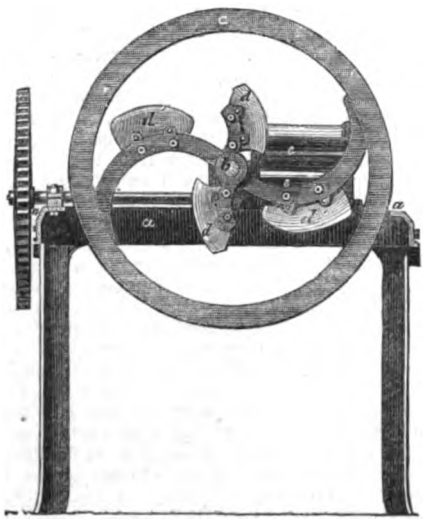
MOXON, CLAYTON, AND FEARNLEY'S APPARATUS FOR PAYING-OUT TELEGRAPH CABLES.

MESSRS. Moxon, Clayton, and Fearnley, engineers, of Blue Pits, Lancaster, have devised a most ingenious and effective apparatus for the purpose of preventing undue strain upon telegraph cables during the paying-out of the same. They so arrange the paying-out machine that as soon as an excessive strain is exerted — that is, a strain exceeding any given amount decided upon as the maximum strain consistent with safety — the breaks are slacked up and the cable allowed to run out without receiving any additional strain. That their apparatus will effect this object there can be no doubt in the mind of any one who understands its action. This we will now endeavour to make plain:—

The above engraving is a perspective view of a model of the improved machine. *A A'* are the two opposite ends of the cable passing round the paying-out drums, *B B'*, several times, and thence to the pulley, *C*, which runs loose on the shaft, *D*. This shaft carries three other pulleys, *a a' a''*, which are keyed upon it; and its enlarged ends, *D'*, rise and fall between the two upright arms of the bent levers, *E E'*. Connected to, and leading partially around the pulleys, *a a''*, are chains, the other ends of which lead down to a fixed part of the framework; and a third chain, having one end connected similarly to the pulley, *a'*, has its other end attached to one end of the rod, *b*. The other end of this rod has attached to it a chain, *c*, the other end of which passes around and is connected to the pulley, *c'*, on the shaft, *d*. This shaft also carries the pulleys, *c* and *c''*, which have connected to them chains, passing down to a box, *F*, carrying as many weights, *G G*, as may be desired, or found necessary. *H H*, *H' H'*, are the break-drums, keyed on the same shafts respectively as the paying-out drums, *B B'*. *L* and *L'* are the breaks, one end of which is attached to the brackets *M* and *M'*. The other ends of the break straps are attached to the connecting-rods, *N N*, the said rods being connected at their opposite ends to the cross links, *O O*, the centre rods, *P P*, passing through the upper ends of the arms of the levers, *E* and *E'*, which turn on a pin or stud attached to the frame-end Q. After the weights, *G G*, have been placed at the end of the chains to give to the cable a certain amount of strain, should any irregularity in the strain of the cable take place, the regulator acts instantly; the pulley, *C*, on the shaft, *D*, rises and carries with it the pulley, *a'*, on which the pull of the weights, *G G*, comes. Before this takes place, the weights, *G G*, draw against the levers, *E E'*, and at the upper ends of these levers is attached the connecting rods, *N N*, which are connected to the breaks, so that a given friction is put on the breaks; but when, as we have said, the friction becomes too great, the ends, *D'*, of the shaft, *D*, travel nearer the fulcra of the levers, *E E'*, and thus diminish the strain on the breaks. Instead of the weights, *G G*, before described, which would be very liable to prove objectionable in a rough sea, the inventors sometimes apply springs, in other cases they retain the weights, but cause them to work in suitable guides.

GARDNER'S CHAFF-CUTTING MACHINES.

THE accompanying engraving illustrates the improved chaff-cutting machines of Mr. Joseph Gardner, of Banbury. The figure is a front elevation. The chief object of this invention is to



economise the power required to drive the machines by the use of a peculiar adjustment of the knives, so that, instead of each cut being completed by one and the same knife, or by two knives acting in succession from opposite sides of the material under operation, two or more convex knives constituting a set act in succession, and in the same direction to make one cut through the material fed to the mouth-piece. *a*, *a*, is the main framing of the machine, carrying at its upper part the bearings for the shaft, *b*, of the fly-wheel, *c*, to the arms of which the knives, *d*, *d'*, are bolted. Two sets of these knives are shown as applied to the fly-wheel arms, but more or less may be used, if thought desirable, according to the diameter of fly-wheel employed. The knives, *d*, have a radius that permits of their passing through and cutting about one-half the breadth of the feed presented by the mouth-piece, *e*, to their action, and the knives, *d'*, have a radius that enables them, as they revolve, to complete the cut through the material fed up to the mouth-piece. The knives may be mounted on the same or on opposite sides of the fly-wheel or disc employed to carry them; the feed motion, whether intermittent or continuous, being adjusted to suit the action of the knives. Whether the knives of different radius be fixed on the same or opposite sides of the fly-wheel or disc, Mr. Gardner proposes to set them in different planes; and in order to render them more efficient in their action, he provides a stepped mouth-piece, or a mouth-piece with one part projecting beyond the plane through which the knives of small radius move. By this means the material, while under the action of the knives of larger radius, is held more firmly up to the cut than it would otherwise be. The invention is patented (No. 1,083, 1858).

CONCUSSION FUZES.—In the *Times* of yesterday, under the head of Naval and Military intelligence, Colonel Wilford, R.A., in his lecture at Woolwich, is made to say:—The concussion fuze of the late Quarter-Master Freeburn, is the best. In the official letter to me, signed Hardinge, lately recorded in your Magazine, he is called Captain Freeburn. The intelligent mechanics who read your Magazine, and who, from the teachings of their mental labour, learn to compose and reason by *induction*, will be anxious to know the difference between my concussion fuze of 1841, which was in 1843 reported by the Select Committee at Woolwich, to be "simple, safe, and efficacious, being well adapted for horizontal fire with high velocities," and that which Quarter-Master Freeburn adopted in 1845, while I was lying on a sick bed in Dublin. Will Colonel Wilford at any time be pleased to favour the public with a drawing of the Freeburn fuse? J. NORTON, Park-villas, 4th January.

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AN IMPROVED METHOD OF DRYING BUILDINGS, &c.

WE bespeak the careful attention of our readers to the following practical remarks "on some economic applications of the chloride of calcium," by Mr. Desmond G. Fitzgerald, one of the most observant and enlightened of our rising chemists:—

It might well be a matter of surprise that the chloride of calcium, so valuable an auxiliary in the laboratory for depriving gases of their hygrometric moisture has not found many important applications of general practical utility. Cheap, easily prepared, free from all deleterious emanations, and lasting indefinitely for the purpose required, its powerful attraction of moisture gives to it a dissiccating property which in many instances may advantageously and economically replace the combustion of fuel. In drying the walls of newly-built houses, for instance, a few pounds of this substance, contained in iron pans, may obviate the expenditure of many hundred-weight of coals, the combustion of which acts very inefficiently for the purpose in view. In the usual condition of our atmosphere, the draught of a very large fire can remove from the walls of a newly-plastered room but a comparatively small amount of moisture, the radiated heat being almost ineffectual. But pans of the deliquescent salt, placed in various parts of the room, rapidly abstract the moisture of the air, which, in its dry condition, as rapidly removes the water of the porous plaster. We recently had occasion to point out this fact to an eminent builder, who probably has been the first practically to apply the chloride of calcium to an economic purpose. The iron pans are removed from time to time, as the salt becomes saturated with water, and this is driven off by the application of heat, which is continued until the salt fuses. It may then be broken up with a chisel, and again made use of.

Many similar applications of this substance suggest themselves. In wet weather it may serve the laundress as a substitute for expensive fuel by drying linen, &c, suspended in a close room. It is important that the salt should always be contained in a vessel to which heat may readily be applied. An ordinary fire place answers very well the purpose of drying and fusing the dissiccating agent.

The chloride of calcium may be prepared by adding muriatic acid to chalk or limestone in the open air until the effervescence ceases, and then evaporating and fusing the salt by the aid of heat. 100 parts of it may be made to absorb 124 parts of water from the atmosphere. It has been employed for freeing oil of turpentine and alcohol from water.

We will proceed to point out an important application of the chloride of calcium in the manufacture of tobacco. The principal cause of the inferiority of home-made cigars to those of foreign manufacture is the difficulty of removing the water employed in "making up" the leaf after its exportation. Many varieties of tobacco will not "stand" the application of moisture, losing their fragrance, and becoming friable by fermentation, whether the moisture be allowed to remain or is partially driven off by heat. In this instance, the rapid abstraction of water, attended with a *reduction* rather than *increase* of temperature, is peculiarly valuable. We have, on several occasions, found cigars of English manufacture kept for several weeks in an atmosphere perfectly dried by means of chloride of calcium, to be perfectly equal to the high-priced cigars of foreign make. The plan we adopted was to keep the newly-made cigars in a chest fitted with a tray constructed of metal, and having a perforated cover; the tray being filled with fragments of fused chloride of calcium.

The judicious employment of this agent may often prove extremely beneficial in a sanitary point of view. A moderately dry atmosphere is the best preservative in cold weather against sudden chills, the effects of which, especially in the case of a weakly constitution, are so dangerous. The result of passing from a sleeping apartment charged with heated vapour—condensing upon the window-panes, and preventing a free perspiratory evaporation—into an atmosphere which quickly chills the skin and closes the relaxed pores, too often manifests itself in inflammatory symptoms, especially upon the lungs. The air of such an apartment may be freed from unwholesome moisture to any determinate extent by the exposure of a proportionate surface of the chloride of calcium. We recommend this agent to the attention of the medical profession; feeling confident that its employment would, in very many cases, obviate the painful concomitants of a trying and changeable winter.

DESMOND J. FITZGERALD.

SHIPPING STATISTICS.

(*Continued from page* 24.)

ON the important question as to the extent to which the ordinary smooth-water trial of a steamer affords a criterion of the general average performance that may be expected of the vessel at sea, this committee has not been able to obtain such an extent of returns of the comparative smooth-water trials and sea performances of the same ships as enable them fully to respond to this part of the inquiry, and they refrain from expressing any speculative opinion, because they have adopted the principle which they desire to recommend to the notice of the British Association, that shipping improvement is to be discovered by statistical record and analysis of the constructive elements of ships that have practically shown themselves to possess good sea-properties, rather than by assuming the mere theories of opinionative speculation, from whatever source such opinions may emanate; in short, that experience of actual performances at sea, statistically recorded and utilised by being made the basis of comparison, is the most reliable base on which to construct an inductive system of progressive improvement in naval architecture and marine-engine construction. This committee, however, have much satisfaction in being enabled to commence this inquiry by recording the sea-performance of the before-mentioned vessel *Bremen*, on a passage from Bremen Haven to New York and back, during the months of June and July last, during the whole of which passages indicator cards were frequently taken, and the indicated working power of the engines ascertained. On the out passage the mean displacement was 2,878 tons, the mean indicated horse-power was 1,078, and the mean speed 10·28 knots per hour, giving a co-efficient by the formula referred to = 301; but on the return passage the mean displacement was 2,990, the mean indicated horse-power 1,010, and the mean speed at the rate of 11·92 knots per hour, giving a co-efficient = 318. Hence, the mean co-efficient of the out and home passage = 276, being about 13 per cent. below the co-efficient (319) obtained on the smooth-water test-trial of the ship. The state of the weather and the sea was also recorded daily; it appears to have been adverse on the out passage, but favourable on the home passage. The committee are, therefore, of opinion, that by following up this course of statistical record of the smooth-water trial and subsequent sea-performances of ships respectively, a tabular statement might be compiled, showing the probable ratios of the co-efficients of smooth-water and sea-performance, corresponding to the various rates of speed for which steamers may be respectively powered, whence the smooth-water test-trials of ships may be made available as approximately indicative of the sea-service capabilities of ships as respects their dynamic properties.

Such are the statistical data of the constructive elements and dynamic capabilities of the *Bremen*, and if all steam-vessels engaged in the mercantile transport service of Britain were equally effective as respects the mutual relations of displacement, speed, and power, that is, capable of producing a co-efficient of dynamic capability = 319, by the formula referred to, it is probable that the prime cost expenses of steam-ship transport per ton weight of cargo conveyed on long passages would, on the aggregate of the foreign trade of Britain, be reduced not less than 25 per cent. as compared with the prime cost expenses incurred by steam-vessels of the average dynamic capability in present use.

The effect of improved type of build on the economy of steam transport per ton weight of goods conveyed, is such as shows the inquiry to be of vital importance in connection with the management of steam shipping affairs.

The public importance of improved type of build in a national point of view (for it is the public and not the shipowners who ultimately bear the brunt of expensive transport service), may be judged of from the statistical fact published by the Board of Trade, that no less than 899 steam-vessels (of which 511 are sea-going ships) were employed on the commercial transport service of Britain in 1857. The ratio in which the transport service of the country is performed by the aid of steam appears to be constantly on the increase, and as it is to be expected that mercantile competition will always cause the cost of freight on the general aggregate of the trade of the country to be proportionally ruled by the prime cost expenses that may be actually incurred in doing the work, it appears manifest that the public economy dependent on the general realization of shipping improvement, is a consideration that involves public interest to the extent of millions sterling per annum.

To demonstrate the vast importance of this subject an appendix has been compiled from the returns of the Board of Trade, to show the amount of trade between the United Kingdom and foreign countries during the year 1855. This compilation shows that the tons weight of cargo actually carried in the foreign trade of the United Kingdom in the year 1855 amounted to—

Imports.....	6,254,259 tons.
Exports.....	8,370,363 „
Total.....	14,624,622 „

Nearly 15 millions of tons weight of sea-borne cargo conveyed at probably 25 per cent. extra cost beyond what would be incurred if ships of the high order of dynamic merit exemplified by the *Bremen* were only and exclusively employed.

By aid of the appendix, showing the amount of trade between Great Britain and all foreign countries respectively, parties conversant with shipping affairs will be enabled to estimate approximately the gross amount annually involved in the goods transport service of Britain. Thus public interests require that the statistical records of shipping should embrace such data as will be availably conducive to shipping improvement, by affording the means of approximately estimating the dynamic capabilities of ships, whereby every ship-constructor and ship-owner, and the directors of steam shipping companies, may be enabled to test the dynamic merits and condition of their ships respectively; a system which would gradually lead to the adoption of such types only as develop a high order of dynamic duty, and would obviate some of the most serious hazards to which private and public interests are now exposed from vessels being employed on commercial and postal services for which they are not fit.

Only let it be publicly known, as exemplified by the *Bremen*, that steam-ships and their machinery may be so constructed, that on being subjected to a test-trial the cube of the speed in knots multiplied by the square of the cube root of the displacement, and divided by the indicated horse-power, ought, in the present day, irrespective of future improvement, to produce a quotient or co-efficient of dynamic duty equal to the number 319, and that the co-efficient deduced from the rule thus enunciated constitutes (*ceteris paribus*) a criterion of the cost price at which steam-ships perform their work, and we shall then soon find that this test of dynamic merit, or the numerical co-efficient deduced therefrom, will enter into the calculation of the pecuniary value of steamers to such extent, that ships of a low order of dynamic capability will not be built because they will not sell.

(*To be concluded in our next.*)

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ROBERTS'S SHIPS' PUMPS.

FIG. 1.

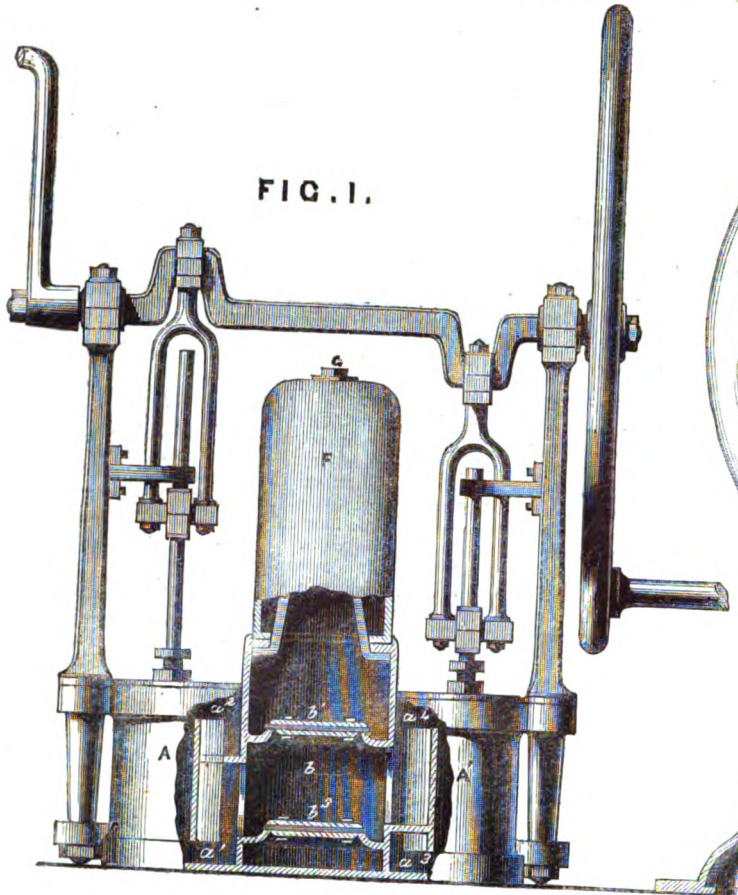
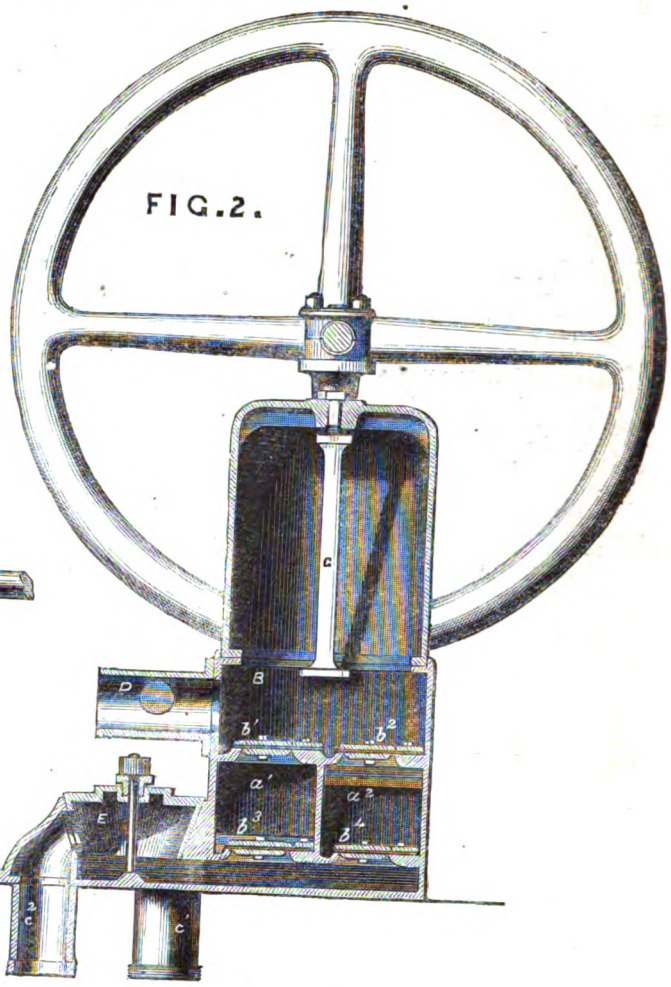


FIG. 2.

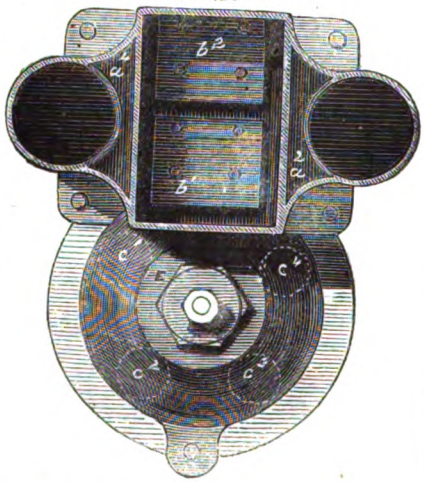


ROBERTS'S AND DOWNTON'S SHIPS' PUMPS.

WHEN we undertook—as we did some weeks since—to publish an article of our own upon the relative merits of the Downton pump, which has been so long in use in the navy and elsewhere, and the new pump which Mr. Roberts has lately brought forward, and which has been favourably reported upon to the Admiralty, we undertook a task which is neither easy nor pleasant. A writer knowing very little of either pump might readily satisfy himself in pronouncing an opinion, and another knowing very much about both might do the same; but a writer having a necessarily imperfect knowledge of the two machines, in so far as their actual operation is concerned—which is our case—must find, and must expect to find it difficult to deal with the subject to his entire satisfaction. This will be considered, we know, a damaging admission by some persons, but it is one which we make without hesitation, and which sensible men will construe properly.

Being perfectly well aware that sound practical men attach infinitely more importance to matters of fact than to the mere opinions of the ablest editors in the world, we have, in the first place, been careful to present them with illustrations of the actual constructions of the pumps themselves. The Downton pump, although in very general use for many years, has never before, we believe, had its internal construction publicly described; and Mr. Roberts's pump, although kept less secret than the other, is more perfectly illustrated in the annexed engravings than it has hitherto been. Upon the merits and defects of the respective modes of construction of the two pumps the reader can, therefore, judge for himself. In the

FIG. 3.



engravings of the Downton pump, fig. 1 is a section through the centre of the pump; fig. 2, a section through the line of the crank-shaft and suction-plate; fig. 3, a plan of the suction-plate, with three suctions; and fig. 4, a plan of the bucket, showing the manner in which the bucket-rods go through. *A A* is the cylinder; *B*, the suction-plate; *C*, the goose-neck; *D*, the foot-valve; and *E*, the crank-shaft. F^1 F^2 F^3 are cams, and G^1 G^2 G^3 are the rods. *H* is the upper bucket, worked by the rod G^1, at its side, having two stuffing-boxes for the rods G^2 and G^3 to work through. *I* is the middle bucket, worked by the rod G^3, also at its side, and having one stuffing-box in the centre for the rod G^2 to work through. *J* is the lower bucket, worked from the centre. k^1 k^2 k^3 k^4 k^5 k^6 are the valves, and *L* is the suction-pipe, leading to the hold. *L' L''* are cap-nuts, covering other suction-pipes, not shown in the section. *M* is a pipe leading from the suction-plate to the pump. *N* is the delivery-nozzle. c^1 c^2 are fly-nuts, that have to be taken off when the goose-neck is shifted; *e e* are stuffing-boxes, to make the crank-shaft air-tight.

In the engraving of Mr. Roberts's pump, fig. 1 is a view of the pump, having the suction-plate and part of the front removed to show the valves and water-passages; fig. 2 is a section through the centre, or nearly so; and fig. 3 is a plan of the pump, having the top removed to show the valves, &c. *A* and *A'*, the cylinders; *B* is the valve-chamber, having a partition, *b*, shown in fig. 2. *C* is the suction-chamber; *D*, the delivery; *E*, the plug in the suction-plate; *F*, the air-chamber; and *G*, a bolt for holding the air-chamber down. a^1 a^2 a^3 a^4 are passages leading to the cylinders; b^1 b^2 b^3 b^4 are the valves; and c^1 c^2 c^3 c^4 are suction-pipes leading to the hold, the sea, &c. These figures are engraved from the pump lately tried at Woolwich.

The manufacturers and supporters of these pumps have conducted a prolonged and bitter controversy on their respective merits, and have devised a most ingenious arithmetical labyrinth, into which we by no means purpose entering. For, in our judgment, the method of conducting comparative trials of pumps now in vogue, and pursued during the late trials at Woolwich, are by no means of a satisfactory character. How is it to be supposed that any reliable result can be ob-

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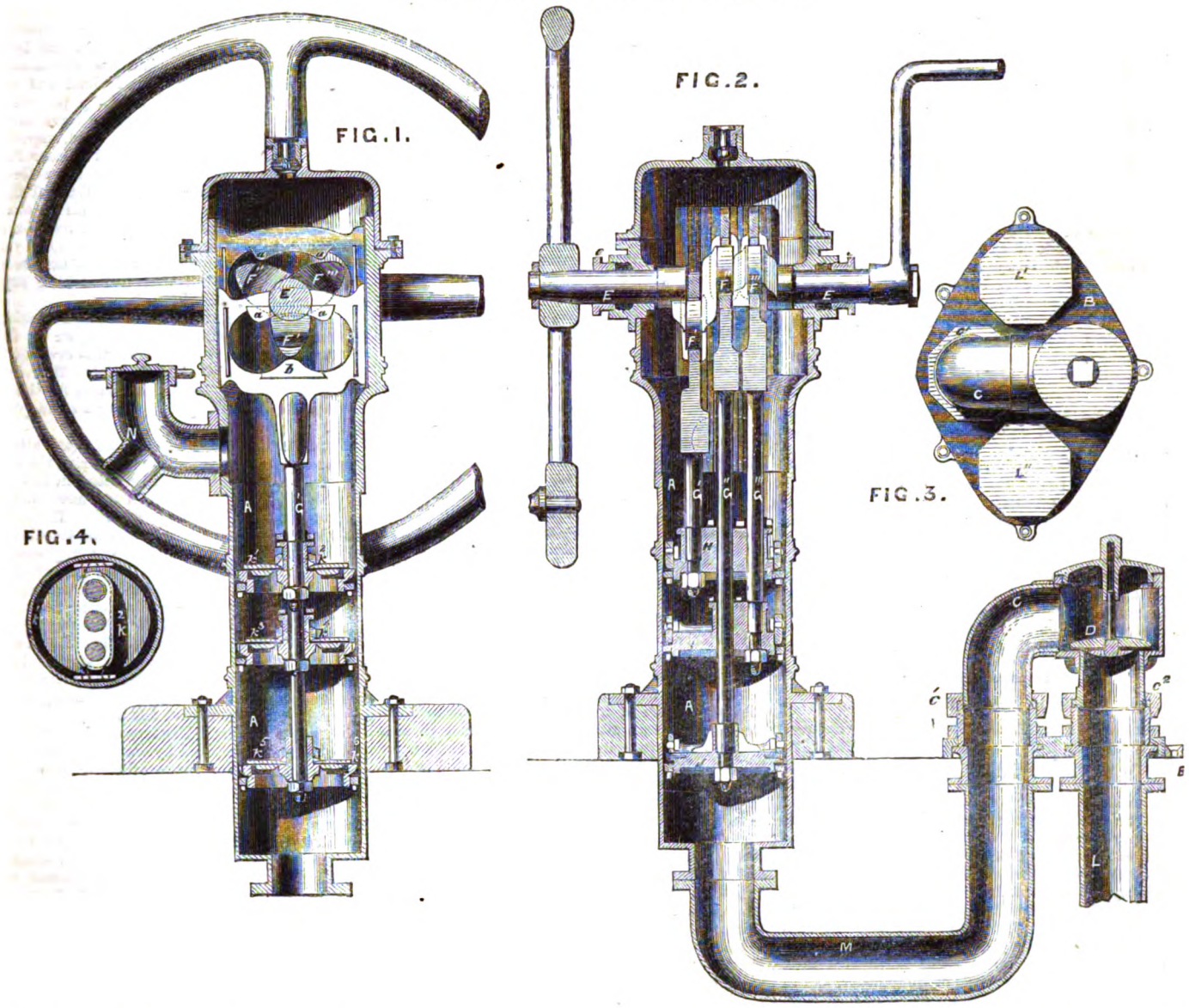
DOWNTON'S SHIPS' PUMPS.



tained by merely clapping a half-dozen or dozen men upon the handles of first one pump and then another, and observing the height to which the water is thrown, or the time occupied in transferring a body of water from one vessel to another? Who is to tell whether the work done by the men upon the one pump is equal to that done upon the other? The mere glance of an officer—to say nothing of bribery, in its many forms—may mar the most careful experiments made by such means. Nor is the mere observation of the number of strokes made per minute sufficient to correct the results by. An average number of strokes may be made with a pump, and yet the volume of water passed through the machine in one minute may be very different from that passed through in another. For, in order to get like results in equal times the velocity of revolution must be uniform throughout the periods. If some pumps are run, for example, at very high speeds, they will deliver less water than when the speed is moderate. The only truly satisfactory way to test pumps comparatively is to put some uniform hydraulic or other like force upon them for equal periods. And if manual trials of pumps are in themselves unsatisfactory, newspaper reports of their results are much more so. We doubt not that the official trials lately made and reported upon at Woolwich have a certain decided value; but until their results, as officially reported, are before us, we are in no position to discuss the relative per-centages of gains and losses.

Apart from the arithmetical questions in dispute between Mr. Roberts and the gentlemen who write on the opposite side of the subject, there are others in respect to which, we think, some want of fairness has been shown. In the first place, Mr. Roberts brings against the Downton pump the facts that it is not a portable pump, and that it cannot be itself used as a syphon for running water into the hold to extinguish fires in cargoes. Now, of the Downton pump, as at present fitted in Her Majesty's ships, these statements are quite true, and Mr. Roberts has an undoubted right to adduce them. But, when the alleged deficiencies are urged as important defects, which it is of immense importance to get rid of, and the rival pump is extolled because it is portable and can be used as a syphon, some risk is run of falling into unfairness; because portability and a capability of syphonic action, are qualities with which the Downton pump can be supplied if desired, and the want of them is incidental, and not necessary, to its use. We do not wish to imply that Mr. Roberts is without great credit as the first who has supplied these qualities; on the contrary, he has here a just ground for recompense. But, since the makers of the Downton pump are prepared to supply these qualities without in any way changing the essential features of the pump, it is not right to push this matter very far, especially as the qualities themselves would be of use in exceptional cases only. On the other hand, the theoretical considerations adduced by "J. S. H." in antagonism to the Roberts pump, have been pressed too far. As theoretical considerations, and as guides to practice, they are of the utmost importance; but when they are urged as of themselves conclusive evidence against the utility and value of a machine, they are pushed beyond their sphere. It is doubtless desirable that the form and velocity of the water should be preserved as nearly uniform as possible in its passage through any hydraulic machine, whether pump or not; but curious facts of a contrary tendency are observable. For example, if the valves of a pump be examined (through a glass side, or otherwise) while the pump is in action, it will be found that the internal forces are of such a character that the valves seldom open very considerably, however free to open they may be. The fluid, by preference, passes through a small rather than a large

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channel—a fact which no theoretical reasoning would, we think, have led us to, and which should teach us to apply theoretical truths, even when deduced in the first place from experiment, with moderation. And beside this, the Downton pump is open to objection on the self-same ground.

For our own parts, we feel that it would be mere pedantry to pronounce definitively upon the merits of the two machines. The verdicts of the many practical men with whom we come in contact, who have used the Downton pump for a series of years, and of others who have now had experience with Mr. Roberts's, are variable There are features in the former which, on the face of them, appear very objectionable; such as the rods of two out of the three buckets or pistons being out of the centre, the use of cams and cross heads, or frames, in the manner shown in the engraving, &c.; but then, if these arrangements are not found, in practice, to be great evils, it would be fallacious to pronounce them such. And, again, there are features in the latter (*i. e.* the Roberts pump) which also appear objectionable—such as the tortuous nature of the fluid passages pointed out by "J. S. H;" but if these again are not found, by experiment, to be evils, it would be equally fallacious to insist upon them.

To conclude:—It is satisfactory to know that the practical use of the new pump in the Royal service, to a sufficient extent to test its merits under all circumstances, is either decided upon, or likely to be decided upon speedily. This is a perfectly legitimate, and indeed a necessary result of the reports made by the officers at Woolwich Dockyard, and ought, we think, to give offence to none. Every good ship's pump is a valuable thing, and if both of those under consideration are good, there will doubtless be found uses for both.

INDIAN ITEMS.

THE *Indian Field* directs attention to the resources of India as an iron-producing country. The *Field* hears, on good authority, that the best Indian iron can be manufactured into rails and sold at Calcutta at £4 per ton; while English rails cannot be sold at the same market for less than £8 per ton.——A "spark baffler," designed to prevent the escape of sparks from the funnel of a locomotive, has been tried on one of the Indian railways, by Captain Sim, deputy-consulting engineer to Government in the railway department, and some other gentlemen. The locomotive to which the baffler was applied drew a train comprising twelve open trucks laden with jute, wood-shavings, and a trifle of gunpowder, and in a twenty-four miles run not a spark escaped from the funnel of sufficient magnitude to ignite these highly inflammable materials. The invention emanates, we believe, from Mr. Gower. ——Sir William O'Shaughnessy, chief superintendent of electric telegraphs in India, reports that the Ceylon line has been much injured by violent gales; and writing on the 21st of November stated that it could not be brought into good working order for a month or six weeks. The English cable for the submarine telegraph between Kotree and Hyderabad has arrived, and Mr Smith, superintendent of electric telegraphs in Scinde and the Punjaub, has proceeded to Roree to lay it down. The communication between Roree and Sukkur is to be carried on by means of posts from Roree to Bukkur and from Bukkur to Sukkur. Active exertions are being made to complete the line between Hyderabad and Mooltan. The greater portion of the wire has been laid down at different places, and eight inspectors with their staff of workmen are engaged in carrying out the undertaking.——The extension of the Great Indian Peninsula Railway to Decksal, 65 miles from Poonah on the Bheema river, is almost ready for traffic.——Tenders are invited for the performance of the mail service between Bombay and Keamaree Bunder, Kurrachee, by efficient steamers, for five years, from Jan. 1, 1860.

PARIS NOTES.

(FROM OUR PARIS CORRESPONDENT).

MEASURE OF SPECIFIC GRAVITIES.—A new method of ascertaining and verifying specific gravities has been laid before the Academy of Sciences of Paris, by M. A. Meyer, who says:—"The present methods employed for ascertaining specific gravities are very exact, but complicated. In fact, the whole consists in facilitating the means of measuring exactly the volume of water displaced by any given body of which the specific gravity is to be ascertained. The problem," he says, "may be solved in the following manner:—After having filled a vessel with water, place therein the long leg of a syphon. When the water is quite at rest, plunge the body of which the specific gravity is to be measured into the vessel. The water displaced will escape by the syphon, and being caught in a receiver, will represent exactly the volume of the body immersed." The arrangement is spoken of as peculiarly applicable to the measuring of minerals and other substances which cannot be got into the hydrostatic balance.

SENSATION OF HEAT CAUSED BY CARBONIC ACID.—A communication has just been made to the Academy of Sciences of Paris on this subject. One of the most singular properties of this gas, says the report, is its decided effect upon the skin. All parts of the body that come in contact with it feel immediately an extraordinary increase of heat, which is not exhibited by the thermometer. A person placed in a room heated to 20° centrigade, and plunging his naked arm into a receiver full of carbonic acid gas, feels as though he had put his arm into something 15 or 20 degrees hotter than the air of the chamber. This property has been turned to account medically in thermal establishments where baths and *douches* of the gas, sometimes pure and sometimes mixed, have been administered to invalids, but we are not told with what effect. M. Boussingault says that in a trench of an old sulphur-mine in New Grenada, he was almost suffocated and thrown into a violent perspiration by this gas, the heat of which he believed, at the time, to be equal to 40°, but his thermometers, after being left an hour in the trench, only marked 19°, three degrees, in fact, less than the temperature of the surface in the shade. The Professor also felt a pricking sensation in the eyes from the effect of the gas, and he was assured by the miners that they almost all suffered from weakness, and that blindness was a common result of constant exposure to this gas.

PRODUCTION OF ALUMINIUM.—M. Corbelli, a French chemist, has discovered a more simple and economical mode than that heretofore practised, for the extraction of aluminium from clay. By his mode the metal is obtained directly from clay or argillaceous earth. The material is first washed free of all impurities and foreign matters, such as stones, leaves, morsels of wood, &c. Two or three ounces of it are then dried, and submitted to the action of acid, to get rid of the iron contained in it. For this purpose, M. Corbelli uses highly-concentrated sulphuric acid; but nitric, hydrochloric, and other acids have the same effect. The earth is dissolved in six times its weight of acid, the earthy matters are allowed to subside, and the clear liquid is then poured off. The residue is dried, heated to 450° to 500° centigrade, and afterwards mixed with 200 grammes (between six and seven ounces English) of yellow prussiate of potass, well-dried and pulverized—the quantity of the latter being increased or diminished in proportion to the amount of silex contained in the clay. To this mixture are added about five ounces of sea-salt, and the whole is placed in a crucible and heated until a white colour is produced after cooling. The aluminium is found at the bottom of the crucible.

WATER TELEGRAPH.—At a meeting of the *Club of the Scientific Press* the other day, a young engineer, named De Lucy, explained a plan which he had conceived of substituting tubes of water for electricity in submarine telegraphs. He proposes to produce his signals by means of percussion; each end of the tube being provided with a cistern of water, covered with very thin sheet copper or India-rubber. Of course a blow struck on the covering of one of these cisterns is very rapidly communicated to the other. Such an apparatus, established between Calais and Dover, would, it was said, transmit its vibrations in eighteen seconds, and between Ireland and America in half-an-hour. M. De Lucy proposes to record the vibrations by means of a lever moving a tracing-point against a paper band, moved by clockwork as in Morse's system. Professor Faure being present at the meeting, drew the attention of the inventor to the fact that General Morin had touched upon the subject in his *Leçons de Méchanique Pratique*, and had there recorded the fact that a tube of water more than 5,000 yards long had been used for signals on the London and Blackwall Railway, but that it had been superseded by the electric telegraph.

GAS-LIGHT IN RAILWAY TRAINS.—Portable gas has been introduced, experimentally, on the Paris to Strasbourg railway. A first-class carriage was lighted with it on the 10th instant. It was used with the ordinary lamps, and burnt for thirteen hours without interruption, giving a steady white light.

PEDO-MOTIVE CARRIAGE.—One more attempt has been made to enable people to drive their carriages without horses. The inventor, in this case, is a M. Salicès, a lieutenant in the navy, and the carriage is called *Barotrope-voiture*. The motive machinery consists of hand levers and treadles. An experiment was made the other day in presence of a number of scientific men, and the report is highly laudatory. It is said that the carriage ran well on stones, macadam, and up hill; that it performed at the rate of 14·530 metres (rather more than 15·700 yards) per hour, and that the exertions of the travellers were extremely light. It remains to be seen whether this new mechanical carriage will succeed where so many similar promising inventions have failed.

GILDING TEXTILE FABRICS.—Gold stuffs are generally manufactured by weaving gold thread, which renders the tissue stiff and heavy. M. Burot has just discovered a method of gilding stuffs by means of electrical agency. The piece to be gilt, whether made of silk or any other material, is dipped into a solution of nitrate of silver and ammonia; after remaining in this solution a couple of hours, the stuff is taken out, and, when dry, exposed to a current of pure hydrogen gas, which reduces the salt, and leaves the silver in a metallic state on the stuff. A silvered surface is thus obtained, which is easily gilt over by the usual galvanoplastic methods. Beautiful specimens of gilt and silvered lace were exhibited in London some five years since. They were of French origin, but the process was not made known.

WATERPROOF STUFFS.—The following process has just been published, for rendering clothes and all kinds of stuffs waterproof:—Take of gelatine and soap 1 lb. each, dissolve them together in 30 quarts of boiling water, and add by degrees 1¼ lbs. of alum; then continue the ebullition for another quarter of an hour. When the milky liquid thus obtained has cooled to the temperature of 122 degrees Fahrenheit, the stuff is dipped in and allowed to soak well. It is then taken out and left to dry, after which it is carefully washed and mangled. The process is explained as follows:—When the gelatine and soap are brought into contact with alum, the sulphuric acid contained in the latter converts the soda contained in the soap into sulphate of soda; the animal acids of the soap are thus set at liberty, and form with the gelatine a kind of jelly which is insoluble in cold water, and therefore renders the stuffs waterproof. This, however, is only the case with soap made with tallow.

LIST OF NEW BOOKS.

Aikin and Barbould's Evenings at Home, 18th ed. ill. 3s. 6d. Andrew's His. of British Journalism, 2 vls. p. 8vo. 21s. cl. Cambridge University Examination Papers, 1858, 8vo. 2s. Johnson's Dic. by Todd and Rees, nw. ed. 18mo. 2s. 6d. bd. Lowe's Ferns, British and Exotic, Vol. 4, 8vo. 18s. cl.

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NOTICES.

Numbers 1845 and 1846 of the MECHANICS' MAGAZINE original series), containing the paper read at the Society f Arts, Dember 15, 1858, "ON THE MODIFICATIONS WHICH HE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING HE PRESENT CENTURY IN RESPECT OF DIMENSIONS, FORM, LANS OF PROPULSION, AND POWERS OF ATTACK AND EFENCE," by one of the EDITORS of this Magazine, gether with the discussion upon the same, are still on le.

The MECHANICS' MAGAZINE will be sent free by post to l subscribers of £1 1s. 8d., annually, *payable in advance.* l st Office Orders to be made payable to R. A. Brooman, at t e Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column a charged at the rate of 6d. per line for any number of in sertions less than 13; for 13 insertions, 5d. per line; and fo 52 insertions, 4d. per line.

Each line consists of 10 words, the first line counting as tw o. Wood-cuts are charged at the same rate as type for th space occupied.

Special Arrangements for larger or Serial Advertisements. T ensure insertion, Advertisements must reach the Office by 6 o'clock on Thursday evening each week. None can b received after 9 o'clock on Friday morning for the ensuing number.

TO CORRESPONDENTS.

☞ The practice of publishing a vast quantity of fictitious Notices to Correspondents has become so general in the cap journals, that the public, who are not in the secret, have come to consider it the duty of Editors to answer any and every question that may be put to them by readers. This cannot, however, be done in a journal like our own without entailing an immense amount of labour (often of a very unnecessary character) upon us. We, therefore, beg most respectfully to decline the task. But in order that our correspondents may not be deprived of all advantage in this respect, we shall, as a rule, publish such queries as may be sent in good faith to us, though not such as appear to be sent merely for the sake of giving trouble. To the published queries other correspondents will, we hope, reply, and their replies shall likewise be published. By this arrangement we shall save ourselves much inconvenience, and at the same time secure, we trust, to our readers all the information they may desire. All questions must be stated simply, clearly, and without circumlocution of any kind; and we shall feel grateful to those correspondents who kindly take the trouble to send such information by way of reply as they may possess. Mere questions of business we shall of course answer ourselves; but whenever calculation, reference to published works, &c., are necessary, we shall dispose of the questions sent as stated above.

CORRESPONDENT'S QUERY.

GENTLEMEN,—Will any of your readers be so kind as to inform a constant reader, in your next number, where a new metal can be had, which has been introduced to this country from France? It is a white metal, not so hard as copper, nor so soft as Brittannia metal, and is a nearer approach to silver in appearance than German silver. Also, if there has not been a patent lately taken out for cementing all kinds of metals. I should feel obliged by seeing the number and date of the patent in your journal. T. S.

RAFT SHIPPING.

MR. CHARLES ATHERTON, of Woolwich Dockyard, an officer of great experience, under date 10th January, 1859, addresses us as follows:—

Many suggestions have of late been brought before the public on the construction of gun-boats, mortar-boats, and floating-batteries, with a view to making them invulnerable; and I now beg to add my views on that subject. Why not make the floating body for such especial services up to the line of its load displacement a solid mass of material of such specific gravity lighter than water, that it shall not sink, however much it may be perforated by shot? It appears to me that a solid combination might be made of cork-shavings, light wood, saw-dust, rush stems, cotton waste, flocks, hemp, and other light material, which, by the aid of a solution of gutta-percha, or other chemical process, would form a solidifying mass so tough that it could not be knocked to pieces by shot, and so light that it would be only one half the specific gravity of water, and therefore unsinkable, however perforated by shot, and capable of carrying armament and naval equipment to the extent of nearly one-half the weight of its own displacement in tons. Such vessels of light draught accompanying fleets of war as tenders to line-of-battle ships, whence they might be manned and stored as occasion may require, would, I submit, form a useful auxiliary available for shore service, or attacking land batteries which deep-draught ships of the line cannot approach, and would be sunk if they could. I may observe that this idea was first broached by me two years since, as being applicable to the construction of vessels for carrying treasure and valuables, as diamonds and gold dust. They might be wrecked ashore, but the treasure would be recoverable.

LENOX'S IRON FLOATING DOCK.

MR. G. W. LENOX, of the Chain Cable and Anchor Works, Millwall, Poplar, under date Jan. 10th, 1859, writes:—

Thanking you for the prominent position you have given my "Floating Dock" in No. 2 of your New Series, I observe I have omitted, in my fear of occupying too much of your valuable space, to describe the essential, yet most simple point in its construction for management. As it is now before the public, for the benefit of any person or company willing to take it up, and after your remark that "The publication of Mr. Lenox's letter and illustration may tend to promote the adoption of the dock in many parts where it is much needed," I may be justified in the hope that, to make it better understood, you will again bear with me while I repair the omission in my first letter. The portion of the dock sunk is, as I stated, "double-sided." The bottom is also double. The space between the cases is divided into six air-tight compartments, each having a valve to admit and discharge water, and each a communication with the air or water-pump (as may be applied) which pump is worked by a steam-engine. I may name these compartments as two bow, two midship, and two stern-water chambers. Thus, when a vessel is to be docked, all six valves are opened, and, when the air-taps are turned on, the air escapes and the water enters, sinking the dock to the exact depth required to dock the ship; the air-taps are then turned off, the dock remains at that depth until the ship is floated in and secured. The air-pumps are then applied, when the water is forced out, and the dock rises, ship and all; the air-taps are again turned off, and the dock remains upon the water as long as required. The stern-gates are divided half-way horizontally, so that the upper half may be opened to admit light. By dividing the water-spaces into six or more parts, it will be seen that the trim of the dock can be regulated to a nicety by admitting more or less water on the starboard or larboard side, or into the head or stern-chambers. I trust you will think the whole affair simple and deserving this explanation.—Apologising for so soon troubling you again, I am, &c.,

GEO. W. LENOX.

MACHINERY FOR THE LADIES.—An ingeniously constructed arrangement of machinery has been invented by Mr. Tombs, of Islington, for manufacturing ruche and other trimmings for ladies' apparel, cap fronts, &c. The inventor employs a table on one end of which are two rollers. In a part of the table, in a framework, four fluted rollers are placed; at the other end is a drum working on an axis, and in a slot. The two pieces of ribbon to be made into a trimming, are taken up under guide rollers on the table between two other rollers which are affixed to the standards or framework of the four larger rollers, where jets of steam impinge on them for damping them. The top or narrow length of ribbon, and the lower or wider, are kept separate, and passed under upper and lower rollers. Having been damped, the ribbons are conducted through rollers placed in a framework or standard, and corrugated or fluted like goffering rollers, but in addition thereto, the under rollers are recessed or grooved in the middle, and the upper rollers are made in the corresponding part convex, or rounded, so as to take into the grooves or recesses, to press the ribbon into them, thus causing indentations for the reception of the gummed string. The ribbons then pass out and are conducted under guide rollers to a point where they meet with lengths of gummed string, which are brought up by any mechanical action under two rollers from a pot containing gum. As the ribbon passes from the creasing rollers to the drum, the string is carried forward simultaneously, and attaches itself to the ribbon on coming into contact. The two ribbons, having gummed strings attached, pass on to a drum on the periphery of which the smaller or upper ribbon is made to press on the lower ribbon and so to adhere. The drum is heated by gas for drying the material. The drum is worked by an endless band, which passes round it and takes on to a roller, which derives motion from the central goffering or creasing roller, and thus uniformity of motion is attained. It has also a reciprocating or excentric action given to it to prevent the overlapping of the ruche as it comes on. When taken off the drum the trimming is ready for use.

MISCELLANEOUS INTELLIGENCE.

IRON SHIPS.—Mr. J. Westwood, of the ship-building firm of Westwood and Baillie, Isle of Dogs, recently obtained provisional protection for several improvements in constructing iron ships. To ensure great stiffness with a comparative lightness, he proposed to use hollow beams, which he forms of vertical plates of metal, having solid liners between them, and angle iron bolted to their outside faces at their upper and lower edges. The lower angle irons continue beyond the ends of the beam proper, and are bent round and bolted to the opposite sides of the stiff angle iron constituting the ship's frames. In like manner the ends of the vertical plates are bolted to the ship's frames. For the purpose of ensuring a good firm joint in the plating of iron ships, he proposes when using a double thickness of plates, to arrange them so that they shall present three thicknesses at the point. Thus he takes two plates, and places them so that their edges will form a butt joint. Over this joint he laps a plate which will form with the under plate a double thickness of plating in one direction; and under this butt joint he lays another plate, which will form with the plate which it overlies a double thickness of plating in the opposite direction. Thus for each butt joint he has two overlapping plates (one at each side of the abutting plates,) and by passing bolts through the whole on either side of the butt joint he secures a firm fastening. In order to secure the exposed parts of the hull of ships of war against shot, he proposes to plate the upper part with thick plates (by preference of steel), formed with a rebate at their edges,, into which the adjacent plates will fit and produce a flush joint. This joint he covers with a strip of metal, and then by three lines of rivets fastens the whole firmly together. Mr. Westwood did not complete his patent.

IMPROVED GASELIERS.—Mr. J. Allardice, brass-founder, of Glasgow, and Mr. W. Miller, Manufacturer, Blantyre, have brought forward a method of constructing pendant gaseliers (either fixed, like crystal, or sliding, like bronze gaseliers) with a sliding tube bearing additional burners, and so that the latter may be brought considerably below the level of the main burners, when desired—for reading, say. This sliding tube is never detached, but is pushed up inside the central tube when out of use. In crystal gaseliers the burners of the sliding tube may be concealed in the crystal ornament when out of use, the burner branches folding up. These branches may be so contrived as to turn the gas on and off as they are unfolded or folded, thus dispensing with stop-cocks.

THE PRODUCTION OF SILK.—Dr. Tarlirana of Milan, who has just set out on his journey to Central Asia—undertaken partly for scientific, and partly for industrial purposes—is at this moment at Berlin, in order to solicit the advice and recommendations of Baron Humboldt, Karl Ritter, and Prof. Dove. The expedition is to extend as far as the Chinese frontier, with the object of there investigating the production of silk.

PATRIDGE'S APPARATUS FOR SUPERHEATING STEAM.—The following letter has been received at the Dockyard, Woolwich, from the chief engineer of the steamship Prince Alfred, relative to the working of the Admiralty apparatus fitted on board that vessel for superheating the whole of the steam required for working the machinery:—

Cape of Good Hope, Nov. 9.

"Dear Sir,—I am glad to inform you that your patent apparatus has given me great satisfaction, and I have had no trouble in the tropics with the temperature of the steam. There have not been more than 10 degrees difference since we left Milford, which happened when the tubes were nearly full of soot. We had them swept, and the steam came to the old mark on the gauge—namely, 330 degrees, which is about the mean temperature. The highest temperature we have ever had is 350 degrees, which occurred on the 2nd of November, the thermometer at 70 degrees. We have had the thermometer up to 120 degrees in the tropics, on

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which occasion the steam was at 325 degrees, the tubes being clean at the time. We have been 700 hours under steam and have had no trouble with the cylinders, trunks, stuffing boxes, &c. The same stuffing that we left London with is in now, and is in good condition. We save from 25 to 30 per cent. in fuel, and as coals are very expensive in the colonies the economy is important, and I am of opinion the apparatus will take well.

"JOS. LOWES.

"To D. Patridge, Esq.

PUMPING SOVEREIGNS.—The 20-horse power engine at the Mint has a double duty to perform; it pumps at once water and sovereigns! This engine is on the high and low pressure principle, and was invented some ten years since by the Messrs. Rennie. As regards the water-pumping arrangements, it may be said that a spur pinion on the fly wheel shaft gives motion to a wheel attached to a three-throw crank shaft, which again works the pumps beneath. The well is 420 feet in depth, and the pumps, of 9 inches diameter, throw water into a large cistern fifty feet from the ground; thence the water flows to every part of the establishment. Pumping sovereigns, however, is a different thing. In order to accomplish this, a very large double acting air pump—designed a few years since by a subordinate officer of the Mint, who was not rewarded for his pains—is placed below the beam, and worked by a rod dependent thereon. This pump exhausts (in both the up and down strokes) a tube 220 feet in length, connected with a vacuum chamber near the coining press room. Necessarily the vacuum chamber—fifty feet in length, and three feet six in diameter—is exhausted, too, and on the upper part of this stands eight pneumatic pumps ingeniously fitted with valves, levers, springs, and other fitments, and attached by means of rods to the hollow upright shafts of the presses themselves. The pumps of the presses are forced down by the intermittent action of the atmosphere upon the pistons, packed with leather, with which they are supplied, and carry with them the screws of the presses themselves. Boys feed the presses with gold or silver blanks, and have complete command over them and the pumps. Motion is given to both at the rate of from 60 to 70 per minute, and the dies deliver into trays provided for the purpose streams of gold coins at the same speed, and which have a most tempting appearance. Thus are sovereigns *pumped* into existence. Some day we may explain this operation more fully.

HARRISON'S ELECTRIC LIGHT APPARATUS.—Mr. C. Weightman Harrison, of Woolwich, who has had much experience in the production of the electric light, has patented the following improvements. They relate to the use of mercury or other fluid or semi-fluid as an electrode in obtaining light by electricity, and consists, 1, in the employment within the lamp of a burner fed with a supply of the electrode, so that it shall remain full or nearly so during waste or consumption by the light. 2, In controlling the supply of fluid electrodes by a tap, &c., worked by electric action. 3, In forming a fluid positive compound electrode by dividing the stream so that a number of separate lights may be produced from it. 4, in maintaining by self-acting means a constant degree of separation between the point where the stream of one electrode breaks, and the reservoir of a second electrode into which the stream falls or forms contact. The patentee accomplishes this by connecting the reservoir of the second electrode to a float which is placed on the first electrode contained in another reservoir, from whence the stream issues, whereby as the float descends, the second reservoir is advanced in exact proportion to the length which the stream is diminished by reduced pressure. He also effects the same object by causing the waste or condensed fluid forming a descending stream electrode, to elevate the lower electrode or reservoir; this may be done by placing it on a float under which such waste fluid is allowed to collect. 5, In forming the reservoirs for holding fluid electrodes of a combination of lamp black or other form of carbon and silica, or of lamp black and china clay, rotten stone, &c. 6, In preventing the condensation of vapours upon the glass or case of electric lamps by a stream of liquid or air being made to flow over or upon the interior surface of the glass or case. Also by partly or wholly filling the glass or case with water, alcohol, bisulphuret of carbon, &c., and in causing it to circulate around the light, or to pass away through apparatus by which it may be filtered, and then returned to the lamp again by a pump, &c., worked by electric action. 7, in preventing the rise of vapours from the waste fluid of electrodes by the introduction of a stratum of water or other liquid into the waste pipe or reservoir.

CURRENT EVENTS IN THE CENTRES OF THE IRON, COAL, MACHINE, AND SHIPPING TRADES.

(COMPILED BY OUR OWN CORRESPONDENT.)

In re Wm. Riley and Son, ironmasters, Wolverhampton—A Trade Civil War between masters and men amongst the Coventry weavers, the flint-glass makers, the brick-makers, and the shoemakers of Stafford—Introduction of machinery to that town—Remarks on Trades' Struggles—The proposed great bridge over the Trent at Burton—Hollow Hurdles—Shocking death of an engine boy.

Mr. W. Riley, who failed for so large a sum during the late crisis, and whose affairs have been in the Birmingham Bankruptcy Court as "W. Riley & Son, Millfields, Wolverhampton," has at length succeeded in passing his last examination.

A trade civil war appears to be threatened between the masters and their men in two or three prominent branches of the manufactures of the West Midlands. The conflict between the silk weavers and their employers at Coventry terminated a short time ago in success to the former.—War to the knife is now waging between the glass-makers and their men, the former determining by a mutual combination to rid themselves of the dictation of the workmen's trades union, and the latter determining not to yield. As a consequence there is now a lock-out.—The Operative Brickmakers' Union has been felt by the masters to be obnoxious for some time past. They have just taken steps with the view of stopping its further encroachments.—Generally in the North the colliers have come off tolerably well in the struggle with their employers. It was not so, however, in South Staffordshire. Feeling this, their fuglemen are again summoning them to a renewal of the strife. At Wigan the colliers are meeting a thousand strong, demanding a rise of wages of 2d. in the shilling.—The notable shoemakers of Stafford are raising their backs, and assuming amazing contortions upon the faintest whisper of the introduction of machinery into their quiet little assize town. The employers have been intimidated by these tricks for some time past, but a familiarity with the "danger" has bred contempt for it. Accordingly they have smuggled some machinery into the town, and it will shortly be at work. With the exception of the last-mentioned case, we regard these contests as proceeding from a sense of rights and privileges entertained by the men as attaching to their grade, and are not disposed to look upon them with hopeless regret. To us they indicate a kind of self-respect which the progress of temperance and education will make really valuable to themselves and the community. For the present, all know that the working masses are not able to profitably discuss the important relative proportions of the rights of labour and the rights of capital. And we are by no means prepared to say that capitalists are on their side much more distinguished. But the schoolmaster is abroad.

Over the Trent at Burton there is a bridge built originally for pack-horses, and which is now in a very dangerous state. Its owner, the Marquis of Anglesea, who possesses the greater part of Burton, and whose property there is rapidly increasing in value, proposes to apply to Parliament for powers to erect a new bridge, and to borrow for the work £30,000 on mortgage, the original expense to be borne jointly by himself and the counties respectively of Stafford and Derby in which the bridge is situated, the counties to keep the bridge in repair. The magistrates of Derby have instructed their clerks of the peace to oppose the bill in Parliament, as have also the magistrates of Staffordshire, by one of whom it was stated in Quarter Sessions that the proposed bridge would cost £62,400.

The Blyth and Tyne Railway is soon to be extended to Warkmouth-on-the-Cocquet; and in connection with it, it is proposed to construct a branch to Tynemouth. As large a quantity of coal as 4,000 tons a day is being carried over this line.

Coals have begun to be shipped from Jarrow Docks. The opening of that port for such a purpose is regarded as likely to tend to a considerable increase in the coal trade of the north.

One of the many children employed in South Staffordshire in the serious and important duty of working colliery engines was oiling the machinery of his engine whilst it was in motion on Tuesday at Darlaston, and slipping, fell amongst the machinery and was killed instantly. The deceased was fourteen years of age!

NOTES FROM THE EASTERN DISTRICTS.

(FROM OUR OWN CORRESPONDENT.)

Flax Works at Gainsborough—Norfolk County Surveyorship: Estimates and Expenditure—Gas at Boston and Louth—Bedford and Cambridge Railway—Wisbeach and the River Nene—Water supply of Chelmsford—Steam Engine for the Norfolk Lunatic Asylum.

FLAX works are in progress at Gainsborough.—On Friday the Norfolk magistrates continued some time in high debate—the principal subject of their deliberations being an excess on the estimates delivered by Mr. John Brown, county surveyor, with regard to extensive works which have been for a long time in course of execution at the county lunatic asylum. There were complaints expressed on the matter at a previous session, and Mr. Brown was directed to deliver in a statement on the subject. The "visiting justices" of the asylum do not consider that Mr. Brown has altogether explained to their complete satisfaction the excess which has occurred on the estimates; but it appears to be granted on all sides that the works have been well executed, and that Mr. Brown has paid close attention to them. The magistrates on Friday appointed a committee to consider the duties and emoluments of their surveyor, and resolved that Mr. Brown should be re-appointed at Easter for six months only, and that at the expiration of that period the office should be considered open. The appointment will probably be placed in a better position for the future. Mr. Brown's remuneration has been considered inadequate from the first.—At Boston the Gas Company propose to add to their works a large gas-holder, exhauster, &c. Plans and estimates are to be delivered by Mr. R. P. Spice. At Louth the Gas Company have made an additional charge of 5s. per annum for each public lamp.—The Cambridge town council have been discussing a project for a new railway between that town and Bedford. The parliamentary committee recommended, and the council endorsed the opinion, that a new passenger station would be necessary at Cambridge, the present station of the Eastern Counties Company being inconvenient, and far too distant from the town. The committee generally approved of the undertaking, which the council resolved to support.—The Wisbeach town council—after all said against country "corporations," it cannot be denied that their proceedings frequently afford the most reliable insight into what is passing in their respective neighbourhoods—have been further considering the state of the river Nene, and the works of the Nene Valley Drainage and Improvement Commissioners; and, after a protracted discussion, have resolved to invite Mr. T. Page, engineer, of Middle Scotland-yard, to confer with them upon the state of the river. The council have also resolved to take proceedings against the commissioners with a view to secure the removal of the dams placed in the river, which the Wisbeach public consider detrimental to their trade and port—if they are not taken away at the expiration of a certain period specified in a notice recently served. The commissioners, if we may judge from their recent proceedings, are not likely to concede the claims of the council very readily.—At Chelmsford, the town surveyor, Mr. F. Chancellor, has been reporting to the Local Board of Health upon the water supply of the place After mature consideration, he recommends as a source of supply, an artificial lake formed at the time the railway (Eastern Counties) was constructed. It is described as abounding in springs, while the water is of tolerable quality. Mr. Chancellor suggests that the water should be conducted in iron conduit pipes to a filtering tank, to be constructed in the board of health yard. He suggests Ransome's filtering slabs as the filtering medium, remarking that, although more expensive at first, they are easily cleansed, a circumstance which leads to a large annual saving. Mr. Chancellor enters into minute details, and states that he proposes the erection of a water tower eighty feet in height. The Local Board of Health have complimented Mr. Chancellor on the ability of his report, which is to be further considered after the levels of the lake and of the river (Chelmer) have been taken, when the water in the river has been tested, and when other inquiries have been made.—The improvements and alterations at the Norfolk Lunatic Asylum, to which reference has just been made, include a six-horse power steam-engine, supplied by a ten-horse power boiler, which is also to furnish steam for washing, drying, cooking, heating apartments, &c.; Mr. W. Naylor, C.E., has been concerned in the superintendence.

NOTES FROM THE SOUTH WEST.

[FROM OUR OWN CORRESPONDENT.]

Exeter and Yeovil Railway—Baths and Wash-houses at Bristol—A Beacon for Dartmouth—Progress of the Public Drinking Fountain Movement—Bills in Parliament—Bristol Shipping—The Price of Gas—Improvement of the Port of Bristol—Smoke Consumption at Southampton—Steam Engine for the Hampshire Lunatic Asylum—Larking on a Railway.

THE works on the Exeter and Yeovil Railway are progressing rapidly, and the line is expected to be opened for traffic in July or August. A large tunnel at Honiton, to which reference is made as the "governing work of the line," was cut through about three weeks since. This tunnel is about a mile in length. Another short tunnel at Lion's Holt will also be soon cut through.—It is stated that the town council of Bristol loses £150 per annum by its baths and wash-houses; and it has been suggested that they should be "farmed out." Mr. Herapath expressed an opinion, on this suggestion being made, that the baths were a great boon to the public, there having been as many as 26,000 bathers in a year. The town clerk stated that there had been a decrease. Engineers were great bathers, and the decrease arose in consequence of a large factory in the neighbourhood of the baths not having been in full operation during the year. The council has not resolved to make any change on the subject.—An influential meeting has been held at Dartmouth with the view of memorializing the Admiralty, or Board of Trade, to erect a beacon at the eastern entrance of the harbour. A unanimous feeling was manifested on the subject. Captain Shtringham, R.N., Admiralty Surveyor, was present, and is reported to have observed that Dartmouth would be the best harbour on the coast both for vessels of the Royal Navy and the mercantile marine, if the proposed beacon were erected.—Mr. R. Lane, a member of the Bristol town council, has offered to give £100 towards the erection of a drinking fountain opposite the Fine Arts Academy, near the Victoria Rooms, Queen's-road, in that town. At Plymouth the local press is also directing attention to the subject.—At Glasgow the Water Commissioners are engaged in erecting two public fountains in each of the sixteen wards of that city.—Among the private bills to be promoted in the forthcoming session, are the following:—Dartmouth and Torbay Railway, Somerset Central Railway, Falmouth Docks and Harbour, Bridport Railway, Tavistock Markets and Improvement, Kingsbridge and South Devon Railway.—The number of vessels entering Bristol from foreign ports in 1858 was 846. Of these 452 were British, and 394 foreign vessels of an aggregate tonnage of 199,119 tons.—The Somerset county magistrates are dissatisfied with the price paid for gas at the county gaol at Taunton, viz., 5s. 6d. per 1000 cubic feet. The gas company offer to make a reduction of 9d. per 1000; this does not satisfy the justices, and the company declining to

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make any further abatement, they threaten to take the matter into their own hands. At the county sessions a lengthened discussion has taken place on the matter. At the previous sessions, the visiting justices were requested to ascertain whether it would be advisable to have gas works erected on the gaol premises, and whether it would be beneficial to the county. It appeared that the probable cost of the works would be about £600, the whole of which, it is estimated, would be saved in the course of four years. The justices, therefore, reported that they considered that the county money might be properly applied to the purpose, while the supply of gas would be superior. A question was asked whether the erection of a gasometer would not be prejudicial to the health of the governor and the inmates of the gaol; and it was replied that at Pentonville this was not found to be the case. Reports presented to the visiting justices by Mr. Williams (of Bath), Messrs. Barrett, Exall, and Andrews, and Mr. Cockey (of Frome), exhibited a considerable agreement. The effect of them was that gas could be supplied for about 3s. per 1000. It was proposed and seconded that £600 should be granted to the justices, and that they should be authorised to enter into a contract for the necessary works; and it was stated that the surgeon at the gaol had expressed no objection to the erection of a gasometer on the premises. One justice even observed that the medical man had stated that it would be an advantage rather than otherwise—a remark which excited some laughter. The proposition thus far proceeded swimmingly, but here it encountered opposition from Mr. W. Moody, who expressed his objection to such a "fearful experiment" as the erection of a gasometer within the immediate precincts of the gaol. Mr. Moody stated that to the erection of a gasometer between Blackfriars Bridge and the Temple, the residents of the district had objected; and in the case of a gasometer close to a farm of his at Glastonbury, the neighbours stated that once a week there was such a stench as they could scarcely endure. He considered that experiments to conduct gas-works without smell had failed. Another magistrate expressed his doubts on the economical aspect of the question, which was postponed for further consideration to the next sessions.——The Bristol town council has been discussing the accommodation afforded at that port. The docks' committee reported that they had received great complaints of the want of shed accommodation on the public quays and wharves, and that they felt that the provision hitherto made in this respect was altogether inadequate to the requirements of the port. A great difficulty in the way of supplying the defect arises from the fact of the wharves being held by the Society of Merchant Venturers under a lease which will not expire until December, 1863. The result of this is, that the society cannot be expected to make a large outlay on property held on so short a tenure, while the town council would not be justified in spending the public money on property not in their possession. The docks' committee recently appointed a deputation to wait on the standing committee of the Society of Merchant Venturers, but that worshipful body required a resolution of the council before they would treat for the surrender of the lease. The requisite resolution has been passed by the council, which was informed by one of its members, Mr. R. P. King, that an important document had been received by the docks' committee with reference to dock and river improvements. The cost of carrying out the necessary improvements somewhat exceeded the anticipated estimates; but vessels of much larger size would be enabled to enter the port if the improvements were carried out.——At Southampton a smoke prevention apparatus (Mr. O'Regan's) has been applied to the furnaces in connection with the steam dyeing works of Messrs. Carter and Son, East Street, it is said, with considerable success.——A steam engine of six-horse power has been erected in the Hampshire county lunatic asylum by Messrs. Easton and Amos, for the purpose of pumping the water-supply into tanks.——A sad result of "larking" on a railway occurred on Friday on the Bristol and Exeter line. Five lads who were about to join one of Her Majesty's ships at Plymouth, left Bristol by the down express. One of them persisted in sitting on the edge of one of the windows, with his head and body outside. Near Taunton his head struck one of the bridges, and he was killed instantly.

METAL AND COAL TRADES, &c.

(FROM OUR OWN CORRESPONDENT.)

Quarterly Meeting of the Iron Trade, Cheering Prospects---The Coal Trade of South Staffordshire---Colliers' Movement---The Iron Trade of South Durham and North Yorkshire---Stockton and Darlington Railway---New Furnaces---Staple Trade of South Wales---The Iron of Ebbw Vale---The Report of the Government Inspectors---Birmingham Business---Railway Carriage and Building Trade---The Metal Market---Tin and Copper---Advance in Prices---Iron Exports from Liverpool, and Average Prices for the last Two Years.

The usual Quarterly Meetings of the Iron Trade were held in Wolverhampton on Wednesday, in Birmingham on Thursday, and will be continued to-day in Birmingham, and to-morrow (Saturday) in Dudley. The reports of the various members of the Association showed that the prospects of the Trade are of a cheering character. Prices are looking up. Pig iron has an upward tendency, and some members of the Trade consider that no difficulty will be found in obtaining 10s. per ton extra for merchant iron of first-rate quality; in proof of this we may mention that Mr. Smith, Lord Ward's principal agent, has issued circulars declaring an advance of 10s. per ton upon finished iron. It should be borne in mind that this notice of an advance only raises the prices of iron to their recent standard. The market price of bars originally stood at £8, but 10s. per ton was taken off some time ago upon export orders, and no doubt many parties effected sales at £7 10s. for home deliveries; but now, as symptoms of prosperity have become so manifest, and pig iron firmer, £8 for bars of good quality is alleged to be a fair and legitimate price. One large house in South Staffordshire has received a foreign order for the supply of £800,000 worth of large pipes or tubes. The trade as a whole did not resolve to follow the course which Lord Ward's agent has taken, but prudently resolved to adopt the recommendation of the preliminary meeting, and keep prices at last quarter's level. The coal trade of South Staffordshire is reported as tolerably brisk. The colliers there have began a movement by which they contemplate an appeal to their employers for an advance of 6d. a-day upon their present wages. If their demand should not be conceded, they have announced that they will strike for a return to the 1s. a-day that was taken from them at one sweep before the late strike.

The iron trade in South Durham and North Yorkshire shows, it is stated, indications of improvement. Of 65 furnaces 58 are in blast, and only seven out. The receipts of the Stockton and Darlington Railway are getting back to their former high level. Several new furnaces are also in course of construction.

Considerable satisfaction is felt by persons interested in the staple trades of South Wales, from the reflection that so few houses, comparatively, have been severely affected by the commercial disasters of the past year. The reports from that part of the kingdom speak of an improvement in the trade having been commenced which will become more decided as Spring advances. The large iron works at Ebbw Vale, Blaina, Blaenavon and Nant-y-Glo, are working full time. The Welshmen trust that to them will be awarded the laurels in the competition with the men of the North, on the comparative merits of the coal of those two districts for the evaporating of steam. They therefore wait confidently for the appearance of the report of Mr. Taplin, of Woolwich, and Mr. Lynn, of Portsmouth, the Government Inspectors who conducted the investigation.

In Birmingham, business generally is improving. The workshops are moderately well employed. In the railway carriage and waggon building trade, which now employs a large number of hands in the town and district, business during the past year was good, and present prospects are very satisfactory.

No material change has occurred in the general aspect of trade in Wolverhampton during the past week. A few orders have been received from the travellers who have just commenced their journeys, but not in such numbers as to afford any index to the position which trade is likely to assume during the current quarter.

The metal market is very unsettled. Tin, which has for the few past weeks shown symptoms of an upward tendency, was on Saturday last advanced 3s. per cwt., making common blocks 123s. 6d. per cwt.; refined ditto, 133s. 6d. per cwt.

An advance of a halfpenny per pound took place in the price of this metal on Tuesday, making tough cake and tile £112 10s., and best selected £115 10s. per ton.

By the last annual trade circular of Mr. F. Robinson, of Liverpool, we find that there was exported from Liverpool, in the year 1857, 287,408 tons of iron, which was distributed as follows:---Bars, 132,563; rods, 13,904; hoops, 22,095; sheets, 29,335; plates, 11,738; pigs, 16,267; rails, 61,506. In the year 1858:---Bars, 130,030; rods, 15,974; hoops, 23,398; sheets, 24,592; plates, 8,807; pigs, 28,872; rails, 33,945. Total, 265,618. In 1857 the average price of merchant bars was £7 18s. 9d.; in 1858, £6 12s. 5d. The average price of Staffordshire rails was in the former year £8 4s. 9d.; last year, £7 7s. 9d.

Respecting the Scotch iron trade in the past two years, we gather from the circular of Mr. F. Robinson, of Liverpool, referred to elsewhere, that in the year 1857, the stocks in Scotland amounted to 100,000; in 1858, 340,000 tons; that the furnaces in blast in the former year was 123; those in 1858, 131; that the make of malleable iron in Scotland was 100,000 tons in 1857, and 90,000 last year; also that the average price of bars in Glasgow for the year 1857 was £8 10s.; in 1858, £7 10s. Mr. Robinson also gives the following as the average price of Scotch pigs, No. 1, G. M. B., in 1857, as £4; in 1858, £3 1s. 4d.

PROVISIONAL PROTECTIONS.

Dated September 25, 1858.

2134. M. A. F. Mennons, of Paris. The separation of iron and steel from their combination with certain foreign bodies.—A communication.

Dated November 9, 1858.

2506. M. Henry, of Fleet-st. Improvements in, and in the manufacture of locks and fastenings, and keys for the same.—A communication.

Dated December 7, 1858.

2804. J. V. Scarborough, of Belfast, Boot Maker. Improvements in apparatus for the manufacture of boots and shoes.

Dated December 9, 1858.

2830. E. L. Pensuete, of Dunkirk. Improvements in apparatus for driving or for drawing up piles by steam.

Dated December 21, 1858.

2913. R. M. Livingston, of Manchester. An improved self-detaching safety hook or coupling.

2915. J. H. Bolton, of Dukinfield, Chester, Warp Dresser, and C. Garforth, of the same place, Engineer. Certain improvements in drying yarns or fabrics, and in the apparatus connected therewith.

2917. W. S. Yates, of Leeds, Brush Maker. Machinery or apparatus for dragging bristles and drawing hair and vegetable fibre.

2919. W. Mainwaring, of Brimfield, Hereford, Surveyor. Improvements in brakes for common road vehicles.

Dated December 22, 1858.

2921. R. Mushet, of Coleford, Metallurgist. An improvement or improvements in the manufacture of cast steel.

2923. J. Nicholson, of Halifax, Jacquard Machine Maker, and D. Crossley, of Brighouse, Joiner. Improvements in Jacquard machinery or apparatus employed in weaving.

2925. W. Spence, of Chancery-lane. Improvements in granaries or apparatus for preserving grain.—A communication from C. J. E. Pavey.

2927. E. Green, of Wakefield, Engineer. Improvements in tables.

2929. F. Ransome, of Ipswich. Improvements in the manufacture of grinding and rubbing surfaces.

2931. J. J. Welch, of Cheapside. Improvements in the manufacture of neckties, scarfs, or cravats.

Dated December 23, 1858.

2933. J. Ronald, of Liverpool, Merchant. Improvements in, and machinery for, the manufacture of hard-topped and soft laid twine, mill banding strands, for ropes and other purposes, and cordage generally from hemp, flax, cotton, and other like fibrous material.

2935. J. Broom, of Glasgow, Iron Manufacturer. Improvements in the manufacture of steel.

2937. A. Barclay, of Kilmarnock, Engineer. Improvements in obtaining and distributing or applying electricity and magnetism, and in obtaining motive power therefrom.

Dated December 24, 1858.

2939. J. T. P. Newbon and T. Smith, of Fenchurch-st., Naval Architects, and J. Brown, of Follit-st., Engineer. Improvements in machinery or apparatus for raising and lowering, or otherwise moving heavy weights.

2941. J. W. Child, of Halifax, Engineer. Improvements in the manufacture of fabrics adapted to be used for curtains, coverings of furniture, table covers, and such like uses.

2943. L. D. Owen, of Tottenham-court-road, Engineer. Improvements in manufacturing horse shoe nails. A communication.

2945. D. Edleston, of Halifax, Dyer. Improvements in preparing and finishing textile fabrics, and in the means or apparatus employed therein.

2947. E. Humphrys, of Deptford. Improvements in brazing metal tubes in tube plates and other metal surfaces to each other.

2949. J. Little, of Glasgow, Ironmonger. Improvements in lamps.

2951. R. L. Giandenati, of St. Paul's Churchyard, Merchant. Improvements in ornamenting leather cloth.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

Dated January 3, 1859.

26. M. A. F. Meanons, of Paris. Certain improvements in steam generators.—A communication.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1955. G. Weedon and D. W. Rice. Knife cleaning machine.
1963. J. Oxley. Baths.
1975. J. Stoneman. Fibrous materials.
1984. W. Hobbs. Ordnance and projectiles.
1991. S. Laing. Gas.
1994. J. Bleakley. Railway signals.
1999. W. Harkes. Plough and pulverizer.
2010. H. Hyde. Carriage springs. A communication.
2016. R. A. Brooman. Printing, &c.
2020. J. Pyfe. Stop cocks or valves.
2024. F. W. Brind. Sewing machines. A communication.
2026. L. Pellissier and J. Puytorac. Railway breaks.
2027. B. Hockin. Dock gates.
2031. A. Lamb and J. White. Life boats.
2035. J. U. Faessler-Petzi. Silks.
2052. J. Knowles. Preparing fibrous materials.
2064. J. M. Courtauld. Silk crapes, aeroplanes, &c.
2089. W. E. Cochrane. Fastenings of railways.
2109. A. Turner. Looms.
2222. J. Ridsdale. Fountain pen.
2256. J. Holroyd. Shearing cloths.
2312. J. P. Gillard. Generating hydrogen.
2362. A. Shaw. Raising nap on sheep skins.
2381. G. Kent. Churn. A communication.
2589. E. Mellor. Spinning.
2612. W. S. Hayward. Dextrine.
2791. G. Snell. Cutting fabrics.
2815. A. Lamb and W. A. Summers. Superheating steam.
2848. W. E. Wiley. Everpointed pencils.
2862. J. Wade. Weaving.
2883. R. Mushet. Cast steel.
2892. J. J. Ashton. Propellers.
2897. J. Clegg. Lubricating steam engines.
2921. R. Mushet. Cast steel.
2935. J. Broom. Steel.
2941. J. W. Child. Fabrics adapted for curtains, &c.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

44. H. Bessemer.
53. S. C. Lister and W. Tongue.
55. R. A. Brooman.
71. J. Ashworth, jun.
77. M. Billing and F. A. Harwood.
86. W. Pole and F. W. Kitson.
108. J. and T. I. B. Hostage and J. Tatlock.
116. J. Abraham.
117. J. Hamilton, jun.

LIST OF SEALED PATENTS.

Sealed January 5, 1859.

1508. G. J. Newbury.
1510. T. Woolner.
1515. H. Hughes.
1517. J. Davis and T. Evans.
1518. T. Buchanan.

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Sealed January 7, 1859.

1519. W. A. Smith.
1520. H. C. Schiller.
1524. W. Clissold.
1531. J. Marland and J. Widdall.
1532. H. Gidlow.
1534. P. F. Demoulin and J. Cotelle.
1535. T. T. Chellingworth.
1537. R. Smith.
1541. R. G. C. Fane.
1543. G. Collier.
1546. G. Parsons.
1548. F. Sang and T. W. Rammell.
1549. C. N. Kottula.
1551. J. M. Rowan.
1554. G. H. Wain.
1588. T. Wheeler.
1608. A. P. Price.
1622. H. Smith.
1635. J. C. Hill.
1674. D. Adamson.
1690. J. Scott.
1756. T. Greenhalgh.
1782. J. Henderson.
1809. T. Ingram.
1825. S. F. Cottam.
2000. E. Cocker.
2050. J. L. Chester.
2080. W. Riley.
2350. C. W. Williams and G. Eyton.
2430. C. Vero and J. Everitt.
2449. N. S. Dodge.
2549. D. Auld.
2579. F. A. Gatty.
2581. M. A. Muir and J. McIlwham.

Sealed January 11, 1859.

1563. R. A. Brooman.
1567. T. Earnshaw.
1572. J. Edwards and T. Newey.
1573. J. J. Field.
1585. E. Owen.
1591. J. Fowler.
1595. C. P. Aston.
1607. P. Arkell and A. Melhado.
1611. W. A. B. Bennett.
1637. C. Doley, E. Bigland, and T. H. Worrall.
1649. J. W. Giles.
1655. W. L. Thomas.
1739. E. J. M. Cetti.
1775. L. Hall.
1805. J. H. Johnson.
1869. A. V. Newton.
2141. J. Wilson.
2605. J. Oakes.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this magazine from official copies supplied by the Government, and are therefore the property of the proprietors of the Magazine. Other papers are hereby warned not to produce them without acknowledgment.

STEAM ENGINES, &c., 1017, 1018, 1063.

BOILERS AND THEIR FURNACES, 1026, 1033.

ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1014, 1020, 1030, 1036, 1072.

SHIPS AND BOATS, including their fittings, 1031, 1036, 1044, 1066, 1077.

CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 1040.

FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 1048, 1064, 1073.

FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1015, 1016, 1021, 1034, 1045, 1046, 1047, 1051, 1052, 1058, 1059, 1060, 1070, 1075.

BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c., 1024, 1067.

LIGHTING, HEATING, AND VENTILATING, 1026, 1028, 1029.

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1023, 1025, 1036, 1039, 1053, 1054, 1065, 1074.

METALS, including apparatus for their manufacture, 1019, 1043, 1049, 1061.

CHEMISTRY AND PHOTOGRAPHY, 1015, 1051.

ELECTRICAL APPARATUS. *None.*

WARFARE. *None.*

LETTER PRESS PRINTING &c., 1050, 1056, 1060.

MISCELLANEOUS, 1015, 1017, 1019, 1022, 1024, 1027, 1028, 1032, 1035, 1036, 1037, 1038, 1041, 1044, 1055, 1057, 1062, 1068, 1069, 1070, 1071, 1073, 1076.

1014. W. CLARK. *Improvements in bits for horses bridles.* (A communication.) Dated May 6, 1858.

The arrangement consists of an ordinary bit, to which the patentee adds a nose band carrying two small steel pallets which press on the nostrils of the horse to close or stop them. The nose band is furnished throughout the inner surface with small knives or teeth, which aid in making the horse obey. The movement of this nose band is produced by a supplementary rein. *Patent completed.*

1015. J. WRIGHT. *Improvements in treating madder for printing and dyeing, and also in the substances and processes used in printing and dyeing with the same.* (A communication.) Dated May 6, 1858.

The patentee mixes madder in the raw state with water, or bran water,—1 by weight of madder to 5 of water. After a little time he puts the mass into a coarse calico bag and presses it in an ordinary press, receiving the expressed liquor into a vessel, which, after standing, forms a jelly, and afterwards separates into a solid and liquid. He then washes thoroughly the resulting colouring with clear water, and strains it off. This, upon being reduced to a proper consistency with gum or mucilage, as usual, is ready to dye or print with. Or the jelly may be treated with dilute sulphuric acid, or any vegetable substance containing an acid, or even with common salt. Afterwards it must be thoroughly washed so as to remove all trace of the acid, then strained and pressed so as to get rid of the water. Upon being reduced to the proper consistency, as before, it is ready to dye or print with. Or the water may be all evaporated and a dry powder formed. He takes the refuse madder left from the last operation and treats it in a similar manner,—that is, obtaining a jelly extract. Finally, he mixes the refuse madder remaining after the the two operations with warm water, allows it to stand, then boils it; a precipitate is thus formed, which, after running off the clear supernatent water, he treats with caustic potash, then washes well and strains. He precipitates the colouring matter from the mass of water by sulphuric acid, after boiling. The residuum or precipitate thus obtained may be added to the products of colouring matter obtained as above described. The invention includes other details. *Patent completed.*

1016. H. JACKSON. *Improvements in machinery for dressing and cleaning flax, hemp, and other fibrous substances requiring like treatment.* Dated May 6, 1858.

Here a cylindrical drum is used, having elastic projecting blades or beaters on its circumference, parallel with its axis. This drum revolves within a fixed case closed at the ends and back. In front of the case is an opening, through which the fibrous material (which is held by a holder) is introduced, and as the blades rotate they strike the fibres; the air also brought round by the blades has a tendency to drive the fibre away. Below the opening there is another some distance down, having at the lower part an adjustable guard, to deflect off the air. In front of it is a grid or frame of bars through which the air can get away, but which prevents the fibrous substances escaping. *Patent completed.*

1017. W. WALLIS, W. LANGFORD, and J. SLACK. *Improvements in pressure guages.* Dated May 6, 1858.

In connexion with a boiler or other vessel (sustaining pressure) is a metal cup with a flange at its upper edge. On this flange is a disc of thin sheet brass, or vulcanised India-rubber, &c., and over this is a second disc of tempered steel, in which a number of straight slits are made proceeding radially from the centre, and each equal in length to half the internal diameter of the cup on which the discs are laid. The discs are kept in their places on the flange of the cup by a metal ring, which rests on their edges, and is fastened by screw bolts. As the pressure in the cup increases so will the sections of the slit steel plate be deflected more and more from their natural position. To complete the instrument it is necessary to connect with one of the sections of the steel plate apparatus for indicating the amount of its motion,—say a rod giving motion to a toothed quadrant, which drives a pinion, on the axis of which a pointer moving over a dial. *Patent completed.*

1018. J. and J. G. BUNNETT. *Improvements in steam-engines.* Dated May 7, 1858.

This relates to a former patent, dated June 14, 1838, and consists in the employment of a solid annular piston rod working round a circular guide, instead of on a circular axis, as heretofore; also in placing the steam ways in the centre part of the engine, and working them by a single slide, which renders the two slide valves with their connecting gear, formerly employed, unnecessary, and enables the whole of the internal working parts to be got at by taking off one side covering plate, without disturbing any other parts of the engine. *Patent completed.*

1019. C. J. CARR. *Improvements in forge and other hammers.* Dated May 7, 1858.

This invention is not described apart from the inventor's drawings. *Patent completed.*

1020. J. CASTLE. *Certain improvements in breaks used for retarding the motion of carriages on ordinary roads.* Dated May 7, 1858.

This consists, 1, Of a rod jointed so as to permit it to revolve in its whole length when turned at one end, notwithstanding that certain parts be curved longitudinally when applied to the working of a brake for retarding the motion of wheels of carriages on ordinary roads. 2, Of a traversing nut, jointed to the lever of a brake, and arranged to work the same by the revolving of a screw on which it is placed. 3, Of two screws or threads and traversing nuts on the same rod, arranged to work the levers of a brake in opposite directions at the same time. 4, Of an arrangement for working a brake by handles from one or both sides of a vehicle. *Patent completed.*

1021. R. OPENSHAW. *Improvements in machinery for plating down or folding and measuring fabrics.* Dated May 7, 1858.

This invention is not described apart from the inventor's drawings. *Patent completed.*

1022. W. DUFF and J. GILCHRIST. *Improvements in apparatus for measuring water and other fluids, also capable of being used as a motive power.* Dated May 7, 1858.

The inventors use an ordinary direct acting engine so far as the framing, cranks, crank shaft, and excentrics are concerned, for working two slide valves in the ordinary way; but instead of the cylinder and piston they place a square chamber with inlet and outlet passages securely fastened midway in this chamber; they fix a sheet of elastic substance (say india rubber), to which they connect a rod through a stuffing box to the cranks above mentioned. The valves being adjusted, and the water turned on from the supply, it will flow into one of the chambers connected with the open valve; its pressure will then expand the elastic substance until it fills the chamber, the contents of which being known, each stroke of the piston acting upon the cranks will give motion to the shaft to which a worm and wheel are connected that acts on a common index or indicator. This index will show the quantity of fluid which has passed through the apparatus. *Patent abandoned.*

1023. J. M. DUVARD. *An improved bed-room vase.* Dated May 7, 1858.

The patentee describes a vase or utensil having an upper and lower chamber fitting closely into each other. The upper chamber is funnel-shaped, and pierced with a hole leading to the lower chamber, so as to convey to it the liquids or contents deposited in the upper chamber. He places in the upper chamber a ball having a cord passing through a hole to the exterior, to prevent any effluvia escaping through the said hole. He puts knots on the cord, which effectually stops the orifice. The ball acts as a valve, falling by gravity into the hole of the upper chamber, and preventing any effluvia arising. *Patent completed.*

1024. J. J. FIELD. *Improvements in evaporating or in extracting moisture from liquids, and from substances in a liquid state, and in apparatus to be employed therein.* Dated May 7, 1858.

This invention consists in the employment, for the evaporation, of dry gases or vapours of such nature as to prevent the oxidation of the matters acted upon (where it is desirable to prevent oxidation therein). The patentee drives or forces such dried vapours or gases through the liquids or substances, divided in numerous small streams, sheets, or jets; or he passes them over the liquid or substance to be acted upon. He then causes the moist vapours or gases to pass through or over chloride of calcium or other agent having a great affinity for water, whereby they are deprived of their moisture, and rendered fit to be used as before; or they may be passed into a mechanical drying chamber. This invention also consists in sub-dividing the liquids to be deprived of moisture into numerous small streams, sheets, or jets, so as to expose a larger surface to the action of the agent employed to deprive them of their moisture. The apparatus consists of a pipe leading from the drying chamber into a reservoir having one of its sides perforated with small holes or slits, through which the dried gases or vapours pass into a chamber wherein the liquid to be operated upon is presented to their action. The gases or vapours then pass through another series of perforations into the chemical or mechanical drying chamber, whence they are conducted to be used over again. After the fluids fall in the liquid chamber, he raises them by pump or otherwise, to be again divided into streams, and so continues. The process is particularly applicable to the obtaining of pharmaceutical extracts, and to the evaporation of sugar, gelatine, &c. *Patent completed.*

1025. A. NEILSON. *Improvements in the manufacture of boots, shoes, and other coverings for the feet.* Dated May 7, 1858.

This invention is described at p. 31 of last Number. *Patent abandoned.*

1026. W. E. NEWTON. *Improvements in the construction of fire-grates for furnaces, stoves, and other fire-places.* (A communication.) Dated May 7, 1858.

This invention consists in the employment, as a fire-grate for furnaces, stoves, &c., of a series of flexible bars, composed of chains, metal rope, or linked rods, arranged side by side, and attached by their ends at the back and front or side of the fire-box or furnace, with sufficient slackness to permit them to swing or be shaken. *Patent completed.*

1027. G. B. COGGAN. *A new portable apparatus to be called a "Stereoscopia," for exhibiting stereoscopic pictures.* Dated May 7, 1858.

This invention consists of a square platform, mounted on wheels, having fixed to it a box about 2½ft. square and 7ft. high, with a glass top. At the front and back of the box the inventor inserts sets of lenses, and in the interior places a cylinder of wood from side to side, having an axis at each end, upon one of which he places a winch handle for changing the subjects. In the lower portion of this apparatus he conveys photographic apparatus. *Patent abandoned.*

1028. C. BOTHEN, jun. and N. F. TAYLOR. *Improvements in means and apparatus employed in measuring and in regulating the flow of gas and other fluids.* Dated May 7, 1858.

This invention consists in causing the gas to be measured by dry meters having sliding valves to pass first into the valve chamber, so as to press on the outer surface thereof, to keep the valves to their seats. The outer rubbing surfaces of the valves, or those parts in contact with the outer edges of the seat, are made wide that at each extreme motion one of the rubbing surfaces of the valve may be overhanging its seat; the valve seats are thus kept clear. The improvements relating to the moveable partitions or diaphragms consist, when forming them of several plates of metal united by leather or other flexible material, in employing a large central plate and narrow plates round the edge, the centre plate being united to those around the edge of it, as also these edge plates to the case by prepared leather; and to ensure the correct relation to or operation of these plates, they are connected at suitable places by connecting links. *Patent abandoned.*

1029. R. BEST. *An improvement or improvements in illumination.* Dated May 7, 1858.

This invention consists in combining two or more burners projecting flat or sheet-like flames in a nearly horizontal plane in the interior of a shade or dome, the burners being situated excentrically to the axis of the shade or dome, and being so situated with respect to the shade or dome that the flames converge towards its middle or axis. *Patent completed.*

1030. T. and D. BROWN. *New or improved machinery for filing or smoothing the ends of fish-plates, rails, wrought-iron railway chairs, and other articles made by sawing bars transversely.* Dated May 7, 1858.

This invention relates to machinery consisting essentially of a rotating roll or cutter, or rotating rolls or cutters, having grooves of a form suitable to act upon the bar or plate to be filed or smoothed, the grooves being cut similar to the way in which files are cut, provided with cutters inserted therein. *Patent completed.*

1031. D. STOTHARD, J. JONES, D. JONAS, and B. W. JONAS. *An improved ship's block.* Dated May 7, 1858.

This invention consists of an outer sheave or block furnished with a channel, in which pulleys are so arranged as to admit of the rope impinging upon the peripheries so as to increase or diminish the space between the same, through the medium of a concentric slot bearing in which

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one of the lesser wheels revolve, the larger or fixed wheel moving from a common centre as heretofore. *Patent abandoned.*

1032. W. CLARK. *Improvements in apparatus for sharpening saws.* (A communication.) Dated May 7, 1858.

This invention relates to a machine for sharpening all kinds of saws by means of a small grindstone or surface, which enters between the teeth of the saw. *Patent completed.*

1033. J. T. ROBSON. *Improvements in sheet-flue and tubular boilers.* (A communication.) Dated May 8, 1858.

This invention consists in arranging the flues of boilers one above the other in a serpentine form, extending from front to back of the boiler. Between these flues, and at intervals, are oval tubes placed vertically, and so that the second row of tubes are seen between the spaces of the front row. Tubes are also placed horizontally at the bend of each flue. *Patent completed.*

1034. A. V. NEWTON. *Improvements in machinery for manufacturing paper.* (A communication.) Dated May 8, 1858.

This invention relates to a mode of varying the width of the paper while the machine is in operation, and during the manufacture. It consists in making the lip or basin which conducts the pulp from the vat to the endless wire apron of two parts, and in connecting these parts with the "deckles" which, as well as the "deckle straps," are by a novel mechanism rendered susceptible of lateral adjustment. It also consists in a novel way of adjusting the usual guage employed for the even distribution of the pulp on the endless wire apron. These improvements are not completely described apart from the inventor's drawings. *Patent completed.*

1035. W. E. NEWTON. *Certain improvements in grinding circular saws.* (A communication.) Dated May 8, 1858.

This consists in grinding one side of a saw at a time while its opposite side is supported by a roll which has a rotary motion at the requisite speed to cause the revolution of the saw as desired. It also consists in the employment of a rotating friction clamp applied to the saw during the grinding, so that it derives rotary motion from the saw through the agency of friction, and by the momentum thus acquired is caused to render uniform, or nearly so, the velocity of the saw, notwithstanding any differences of the thickness of the saw plate, and consequent tendency to variation in the action of the feed roll. *Patent completed.*

1036. A. V. NEWTON. *An improved manufacture of hard and waterproof fabric, and the application of the same to the construction of boats, parts of carriages, and of furniture, portmanteaus and travelling cases, and vessels of capacity.* (A communication.) Dated May 8, 1858.

In carrying out this invention, woven wire cloth or pierced sheet metal is coated on both sides with india-rubber vulcanite compound in a plastic state. *Patent completed.*

1037. G. DAY. *An improved self-acting valve for regulating the flow of liquids.* Dated May 8, 1858.

This invention consists in the adaptation of the ordinary spindle valve to the regulation of the flow of liquids, by adding thereto the common floating ball or an inverted basin. *Patent abandoned.*

1038. R. B. GOLDSWORTHY. *Improvements in machinery for grinding emery and other materials.* Dated May 10, 1858.

This invention consists, 1, in the application of a loose weight or weights to the upper part of a pair of grinding mills, for the purpose of being able to regulate the weight thereof according to the sizes of the emery, or other material to be ground. 2, In a mode of shaping the teeth of the mills used in grinding emery and other materials. These improvements are not described in detail apart from the inventor's drawings. *Patent completed.*

1039. C. F. VASSEROT. *Improvements in the manufacture of umbrellas and parasols.* (A communication.) Dated May 10, 1858.

The inventor forms umbrellas and parasols with the handles out of the centre, that they may be carried directly over the head, (1) by placing the handle and the ribs eccentrically, and diminishing progressively the length of the ribs on nearing the side where the handle is placed: (2) by making the handle with an arm or elbow projecting from the centre directly under the stretchers when the umbrella is open, this arm being hinged with the upper and lower parts of the divided stick, and retained in its horizontal position by a rod connecting the upper and lower parts of the stick. *Patent abandoned.*

1040. C. F. VASSEROT. *Improved driving machinery applicable either for thrashing, winnowing, cleaning, and bruising grain, cutting straw, or other agricultural purposes.* (A communication.) Dated May 10, 1858.

This machine consists of a case having in its bottom, upon a pivot, the main axle which passes through the top, and receives shafts or poles to which the horse or other power is applied. Within the case, and fixed to the axle, is a spur wheel which drives a small cog wheel upon an axle at right angles to the former, and also within the box upon this latter axle is fixed another spur wheel, which gears into a conical pinion fixed to the main transmitting shaft. This shaft passes out of the case, and is connected by riggers, toothed wheels, or pulleys to the machinery to be used. *Patent abandoned.*

1041. W. H. ODDEN. *Improvements in pumps.* Dated May 10, 1858.

Here one piston or plunger is used in combination with a double set of valves, which are fitted to a box or frame so placed that it can be readily fixed or removed by hand. This valve box is divided into two compartments, the bottoms of which are fitted with suction valves, and the tops with delivery valves. The cylinder is placed on one side of the valve box, and the communication between the valves and the pump barrel are formed by two pipes extending from openings formed in the side of the valve box between the upper and lower valves, one of which pipes extends from one of the valve chambers to the bottom of the cylinder, and the second from the other valve chamber to the top of the cylinder. On the up stroke of the piston the fluid is drawn up through the lower valve of the chamber connected with the lower end of the pump cylinder, and on the down stroke the lower valve closes, and the upper valve opens and delivers its water, and at the same time the water is drawn through the other lower valve, which is in communication with the upper end of the pump cylinder, by the down stroke of the piston, and is delivered through the upper valve on the up stroke, and so on alternately. *Patent completed.*

1042. W. C. FORSTER. *An improvement in the manufacture of bricks and slabs for preventing damp in the walls of houses and other buildings.* Dated May 10, 1858.

This consists in the production of a vitrified substance in the interior of bricks or slabs. The outer surfaces remain unglazed, and the absorption of damp from the lower surface to the upper is prevented. *Patent completed.*

1043. I. L. BELL. *Improvements in the manufacture of iron.* Dated May 10, 1858.

This invention is described and illustrated at p. 601 of No. 1846 of the MECHANICS' MAGAZINE for Dec. 25, 1858. *Patent completed.*

1044. J. M. E. MASSON. *Improvements in diving apparatus.* Dated May 10, 1858.

Here the divers descend with a frame, to which reservoirs of compressed air are attached for supplying the divers. The frame is composed of two rectangular gratings, at a distance apart, so that the diver may walk between them. The reservoirs of air are attached to the upper grating, and in order that the divers may be supplied with air at the same pressure as the column of water under which they are working, the reservoirs communicate (by means of pipes with cocks) with two cylinders placed perpendicularly between the two gratings, and open at the bottom; the quantity of air admitted varies with the pressure of the water. The air from the cylinders is transmitted by air pumps (one in each cylinder), through a flexible pipe, to the helmet or dress of the diver, and passes away from his dress through another flexible pipe into an apparatus where it is purified by passing through a shower of a solution of soda, and from there back into the cylinders on which the air pumps work, to be again used. The invention includes other details. *Patent completed.*

1045. R. WILLAN and D. MILLS. *Improvements in machinery or apparatus for drawing in, twisting, or looming textile fabrics.* Dated May 10, 1858.

Instead of drawing the yarn thread or warp through the eyes of the healds by hand, the inventors employ an apparatus worked by power or by manual labour. They place the reed in front of the healds as usual, but below the reed they have a dividing apparatus acted upon by change wheels, so that the divisions of movement may correspond to the spaces of the reed, and the drawing of the yarn through the healds is performed by a falling drum, cam, or eccentric, acting upon mechanical fingers, which push the hooks through the eyes of the healds; and after the yarn is placed upon the hooks they are drawn back again, drawing the yarn with them, which yarn is afterwards passed through the reed by a self-acting hook, the fingers and hooks being connected with the dividing apparatus and all the movements being self-acting. *Patent adandoned.*

1046. W. G. TAYLOR. *Improvements in covering the rollers employed in spinning cotton and other fibrous materials.* Dated May 10, 1858.

This relates to the covering of the rollers to be used in spinning machinery with a leather made from rabbit or hare skin, or similar skins of small dimensions and fine surface, in lieu of ordinary sheep and lamb leather. *Patent completed.*

1047. J. B. PIM and C. PAYNE. *Improvements in recovering useful matters from oil or floor cloth, tarpaulin, American leather cloth, and other like substances.* Dated May 10, 1858.

This consists in recovering the oil or paint from these materials. The patentees use old materials, by preference waste cuttings, which they treat with a strong caustic alkaline solution. With this they sometimes mix ammonia and sulphuric or muriatic acid. *Patent completed.*

1048. P. A. APPARUTI. *A machine applicable for picking and choosing out corn.* Dated May 11, 1858.

The inventor employs a slightly inclined table upon which the corn is laid, and which is moved by jerks. At each jerk the grains of corn are thrown up the incline a short distance (until they fall over the top), while the impurities—which are all supposed to be spherical—will roll down the plane into a receiver. *Patent abandoned.*

1049. J. LUIS. *A mechanical washing apparatus for iron ore and other matters.* (A communication.) Dated May 11, 1858.

This consists in causing the matter to be washed to advance regularly in an opposite direction to the water. *Patent completed.*

1050. G. H. CRESSWELL. *Improvements in pads and apparatus for inking stamps.* Dated May 11, 1858.

In the improved pad printers' ink or thick colouring material is used, and a piece of drugget is thickly saturated with it and placed under the cloth surface of the pad, which is moistened occasionally with sweet oil, rubbed or brushed into it, which softens the ink, and causes it to work up or soak into the upper cloth, and keep it in a proper state for inking the stamps which are pressed upon it. *Patent completed.*

1051. J. H. JOHNSON. *Improvements in madder dycing.* (A communication.) Dated May 11, 1858.

According to this invention the fabrics, which have been printed in suitable mordants, and prepared as usual, are submitted to the action of a hot decoction of garancine, madder, water, air, liquid ammonia, or other equivalent alkali, in proportion of about 10 lbs. of garancine madder to 40 galls. of water, and 1 pint of ammonia or other equivalent alkali. After passing through this decoction, and being acted upon by it for from 3 to 5 minutes, the colouring matter of the madder will be found to be completely fixed on those parts printed in mordants. The addition of about 1 pint of alcohol to the above ingredients will confine the colouring matter of the madder to those portions of the fabric printed in mordants and prevent it from being absorbed by the portions which are to remain white. *Patent abandoned.*

1052. E. FAIRBURN. *Improvements in machinery or apparatus employed in carding wool or other fibrous substances.* Dated May 11, 1858.

This relates to the "single doffer condenser," and consists in having the surface of the doffer cylinder formed of rings (of wood, or other material) for rings of cards of corresponding widths to rest upon, with a flange or shield of thin metal on each side of the rings, projecting to and even with the surface of the cards, leaving a small space betwixt the two flanges. Also, in having similar flanges betwixt rings of cards on the stripping roller projecting above or beyond the surface of the cards, and so arranged that when the stripper and doffer are brought together, the flanges on the stripper will enter into the spaces formed betwixt the flanges or shields on the doffer, thus effectually separating the fibrous substances on the surface of the doffer into strips, the breadths of the card rings, which are then conducted by grooved rollers to the rubbers, where they are formed into slubbings or threads. *Patent completed.*

1053. J. SOUTTER. *Improvements in washing machines.* Dated May 11, 1858.

Inside a trough the patentee fixes a drum consisting of two discs for ends, and several laths let into the discs to form the sides. The drum is rotated by a crank handle. Inside the trough, and near the sides of the drum, he fixes upon springs, rods, bands and blocks, to act as rubbers, and provides means for regulating the distance thereof from the sides of the drum. Inside the drum he fixes projections for stopping or retarding the articles inside the drum to be washed. The laths, or some of them, are free to be drawn apart for placing articles inside the drum and removing them therefrom; also for nipping between them the ends of any large articles to be washed, such as sheets, table-cloths, &c., which are wound round the outside of the drum, and have both sides washed by turning the drum first in one and then in the other direction. *Patent completed.*

1054. W. PARF. *Improvements in metallic and other bedsteads, and other articles of furniture.* Dated May 11, 1858.

Here the sockets for receiving the side and end pieces of the horizontal frame of the bedstead (or other article) are cast in one piece with the legs and the pillars. *Patent completed.*

1055. A. PARKES. *Improvements in the manufacture of tubes and cylinders.* Dated May 11, 1858.

In place of employing hollow cast cylinders of copper, German silver, or other alloys of copper, the patentee uses cast discs, or discs cut from comparatively thick sheets of copper, German silver, or other alloy, and then, in order to produce short and comparatively thick tubes or cylinders, he subjects such disc to a raising process by means of forcers actuated by steam, causing the discs to be raised by dies through which the metal is forced, or, "drawn through." Or the discs may be forced by the steam forcers into hollow dies. When using German silver in making tubes or cylinders, he prefers to cast a short hollow cylinder, and then to extend it into the length and dimensions desired; he also in some cases combines German silver with copper, brass, or other tubes in order to coat the same with German silver. *Patent completed.*

1056. A. PARKES. *Improvements in rollers or cylinders used for printing and embossing.* Dated May 11, 1858.

In constructing rollers or cylinders when shells of metal are used on bodies, the patentee employs a body made of zinc, brass, or of an alloy of copper, or of an alloy of iron and nickel, in combination with an engraved shell or outer surface; and he applies German silver, and also an alloy of iron or nickel in place of the metals heretofore used in the manufacture of such rollers and shells; and in making printing or embossing rollers or shells of copper, or alloys of copper, or of German silver, he first raises a disc of either of such metals by stamping, or by drawing the same through dies, and then extends the same by hammering or rolling, or drawing through dies. *Patent completed.*

1057. W. OLIVER. *Improvements in combining ovens for the manufacture of coke with the furnaces of steam boilers.* Dated May 11, 1858.

This consists in so combining ovens that the operation of making coke shall supply heat for the boilers. When the boiler is cylindrical, he places the coke oven underneath and in front of the boiler up to about one-third of the length. This oven is fed from the front. The furnace for the boiler is placed about the middle of the length of the boiler, and is fed from the side, a bridge with a damper between the two fires being so arranged as to shut off the one from the other when the coke is being withdrawn. The smoke from the coke oven is thus caused to pass over the boiler fire. The bed of the coke oven is built solid in brick, the boiler fire having the usual fire bars. *Patent abandoned.*

1058. R. HALLIWELL. *Certain improvements in mules for spinning and doubling cotton and other fibrous materials.* Dated May 11, 1858.

This is applicable to self-acting mules, and consists, 1, in a combination of machinery for effecting the changes performed by the cam shaft in Robert's Patent Self-Actors. The machinery consists of a lever, or combination of levers, and of a weight connected to the carriage and acting on the levers; this weight, with the levers, act on the machinery for putting in and out of gear the apparatus for drawing up and putting up the carriage, and on the machinery for putting the backing off friction cones out of contact. 2, In the application of duplex levers to which motion is given by wheels in combination with the squaring shaft or other part of the mules, for moving the driving strap on and off the fast and loose pulleys at the commencement and completion of the stretch. 3, In the application of a latch or curved plate and bar in connexion with the strap fork lever for allowing the backing off friction cones to be drawn into contact by a spring for backing off when the driving strap has been moved off or nearly off the first pulley. *Patent completed.*

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1059. G. LOWRY. *Certain improvements in machinery for heckling flax and other fibrous materials.* Dated May 11, 1858.

This consists, 1, in supporting the troughs of heckling machines (along which the strick holders are traversed) by links or levers to which vibrating motion is imparted by a suitable mechanism; this vibrating motion imparts simultaneously the requisite longitudinal and up and down motion to the trough and strick holders. 2, In a combination of parts for traversing the strick holders along the heckling machine. 3, In a mode of combining two heckling machines, or two series of heckles, with mechanism by which the sticks of flax after being heckled at one end, in passing through the first machine or series, are liberated, then reversed, then taken through the second machine or series by which the other ends of the sticks are heckled. *Patent completed.*

1060. J. M. GILBERT. *Improvements in the construction of cylinders and mandrils used in printing calico and other surfaces.* Dated May 11, 1858.

This consists, as regards the cylinders, in the form given to their interior, which, instead of being one cone from end to end, is formed by two cones having their small diameters towards the middle. The mandril is constructed of three principal parts, two of which are hollow cylinders or shells formed conical on their exterior to fit the interior of the cylinder. The third part is a spindle or shaft made to fit the printing or other machines at the ends, and to carry the two coned shells at its middle part. By means of a right and a left hand thread or screw upon this shaft, and corresponding nuts or threads in the two-coned shells, the latter may be drawn together within the cylinder until a sufficiently tight fixture of the cylinder upon the shells is effected. The same means, but reversing the direction of the action, suffice for releasing the cylinder when required to be removed from the mandril. *Patent completed.*

1061. J. DYSON, E. W. SHIRT, AND H. SHIRT. *Improvements in the mode of rolling strips of steel for crinoline and other purposes.* Dated May 11, 1858.

This applies to a mode of rolling steel of small guage for crinoline, &c., in strips of greater length than the present system admits of. By the ordinary mode steel is rolled in sheets of about 10 ft. in length; the patentees propose after it has been reduced singly to No. 17 guage, to reduce it to the requisite guage in the required lengths by folding each length or strip, and passing it in two or more thicknesses between the rolls. This process will reduce the strip to so small a guage as to obviate the necessity of cold rolling. *Patent completed.*

1062. J. HENDERSON. *An improved apparatus for measuring fluids.* Dated May 12, 1858.

This relates to apparatus to be applied to taps, or pipes, for measuring off separate portions of fluids, and may be used by druggists, &c. According to one modification it consists of a glass vessel fitted to the outflow pipe, and communicating by its bottom with the pipe at a point between two stop cocks fitted to the pipe. The glass vessel is graduated to show the quantities of liquid when at various levels. In using the apparatus, the inner stop-cock between the reservoir and the glass-measuring vessel is just opened, the outer being closed, and the liquid is allowed to flow into the measuring vessel until it attains the level corresponding to the quantity wanted to be drawn off, or measured. The inner stop is then closed, and the outer one opened, when the liquid in the measuring vessel flows off into another vessel. In a modification of the apparatus for measuring gas, the measuring vessel is by preference inverted, and the gas is made to displace water when flowing into it, the liquid refilling the measuring vessel on the egress of the gas. *Patent abandoned.*

1063. L. DURAND. *An improved tubular steam generator.* Dated May 12, 1858.

This consists of a steam generator composed of one upper and two lower longitudinal tubes of comparatively large diameters, and communicating with each other by a number of very small tubes arranged side by side transversely, and in a zig-zag form. *Patent completed.*

1064. M. DIOSY. *Improvements in machinery for preparing or manufacturing granulated potatoes for preservation.* (A communication.) Dated May 12, 1858.

This relates to machinery for preparing granulated potatoes for preservation, and is not described apart from the patentee's drawings. *Patent completed.*

1065. J. A. DETROYAT and F. TEUBERT. *Improvements in apparatus for cleansing hair combs and other similar articles.* Dated May 12, 1858.

The inventors mount, on a handle, a spring band of steel, curving upwards, and terminating at each end in a roller or cushion; towards one of these the handle will slightly incline, and between the lugs of that one the shank ends of a series of steel blades or teeth will enter and be secured by a spindle passing from end to end through the cushion, the other end of each of these blades terminating with a hook, which, on the blade being depressed, will enter between the lugs of the opposite cushion and fasten on to the spindle passing through it. In use, the cleaner should be held in the left hand and the comb drawn perpendicularly along the blades in the direction of the holder. To clean the apparatus, press each cushion slightly inwards and, passing the hand beneath the blades, lift and clean them one after the other. *Patent abandoned.*

1066. J. A. CLARKE. *Improvements in compositions for coating vessels' bottoms.* Dated May 12, 1858.

The patentee employs white lead (free from admixture with carbonate of barytes, oxide of zinc, &c.), ground in naphtha to a paint-like consistence, adding thereto rosin varnish, by which he obtains a composition capable of being used either cold or hot for paying or painting over vessels' bottoms, as a preservative coating. *Patent completed.*

1067. W. MARK. *Improvements in roofing and other tiles.* Dated May 12, 1858.

This consist, 1, in forming tiles for roofing, &c., with a feather or projecting rib along one of the edges, the opposite edge being formed with a channel or groove situated at the reverse side of the tile, and made to fit upon the feather or rib of the next adjoining tile. At the under side, between the two edges of each tile, and parallel thereto, is a recess (extending partly across the tile) for lying over a portion of the joint of the adjoining tiles of the next row. It has reference, 2, to tiles used in the formation of gutters, spouting, &c., and consists in forming the body thereof hollow, or in other words, as a double shell with a space between the two thicknesses. *Patent abandoned.*

1068. J. WEST. *A mode of covering and securing water-taps and branches.* Dated May 12, 1858.

In the ordinary way in which water-taps are placed, and also the extremities of stand or branch water pipes, they are subject to be destroyed by accident and other causes, and are also easily removed. To guard against these evils, the patentee proposes to apply the following means:—In front, and over the tap or mouth of the pipe, he fixes a plate of cast iron, and the face of this plate he secures to the wall or post on which the tap is fixed. Sometimes he encases the tap. The outlet of the tap discharges into a spout or mouth in the face-plate. Anywhere on the said face-plate he forms a slot for admitting the key or lever which opens and shuts the water-way. Also in some cases he fixes in the rear of the face-plate a spring so arranged as to press against the lever or key when it has opened the tap, urging it back again whenever the force which opened it is removed and thus prevent the water from being wasted. He proposes also to form another aperture in the face-plate through which access may be had so as to screw or unscrew the plug or valve of the tap, and render it unnecessary to remove the plate. The inlet or junction of the tap is attached to a tube of iron, &c., enclosing the supply pipe which may be let into the wall post or plate, and covered over with cement or other material. *Patent completed.*

1069. A. H. ROGERS. *Improvements in lubricators.* Dated May 12, 1858.

The lubricating vessel is attached to a revolving wheel, the boss of which fits on a plug fixed to the cap of the shaft to be lubricated; the lubricating material enters through a hole in the boss, and is delivered into a recess in the plug, from which it passes through a side passage in the boss to a hole in communication with the passage, running from one end of the plug to the other; this passage admits air, and affords facility for cleaning. The requisite rotary motion is given to the boss or to the plug by any means so as to deliver a supply of material at intervals to the shaft. The improvements in lubricators for connecting rods, slides, &c., having a vibrating motion, consist in the use of a plunger with recesses; this plunger is raised and lowered by a ratchet wheel, and in descending delivers a portion of the lubricating material to a chamber (furnished with a set screw to regulate its capacity) and in descending the lubricating material in the chamber descends on the article to be lubricated. *Patent abandoned.*

1070. J. SHARPLES. *Improvements in extracting moisture from and drying porous and fibrous substances.* Dated May 12, 1858.

This consists in extracting moisture from and drying fabrics or other porous and fibrous substances, by forming a partial vacuum on one side, and admitting air, either heated or otherwise, at the other side; the current of air passing through the materials removes the moisture therefrom. *Patent completed.*

1071. R. KNIGHT. *Improvements in apparatus for refrigerating, also for bottling ærated liquids, and in the preparation of storing salts for the production of artificial mineral waters.* Dated May 12, 1858.

The apparatus for refrigerating is formed of a metal vessel having an external cover, and in the space between the vessel and the cover is a bag of flannel or felt fixed around the lower edge of the inner vessel, and against the surface of the external cover is fixed a lining of felt or flannel. Between the inner surface of the bag and the outer surface of the inner vessel is placed ice. The apparatus for bottling ærated water consists of a moveable stand or block (to receive a bottle) fixed to the upper end of a rod, which is guided in its passage through a table or bench. This rod and stand or block is acted on by the foot. Above the block is fixed a socket, through which the corks are forced into the bottles. The corks are forced through the socket and into the bottles by a ram, or forcer at the end of a bar which moves vertically in guides, and receives its motion by a lever handle. To convert ærated water into artificial mineral waters the constituent salts in the exact proportions required for a given measure of water are mixed together and stored in small glass tubes or vessels, which are closed at their outer ends by corks so as to keep them dry. The patentee produces any of the artificial mineral waters by placing the salts into an open glass or vessel and drawing on to them ærated water, the salts being prepared so as to dissolve clear, and they are mixed and kept closed from the air till about to be used. *Patent completed.*

1072. J. G. JACKSON. *A method of carrying roads over (or through) land covered with water.* Dated May 12, 1858.

The inventor constructs and places upon the surface of the water which covers the land to be crossed a water-tight tube. The railway is laid down in the interior of the tube, which may be enclosed in another similar tube for security. Pieces of glass, &c., may be let into openings to admit light. When completed the tubes are to be sunk in the water on to the solid ground, which must be prepared to form a solid bed to receive them. *Patent abandoned.*

1073. J. BIGGS. *Improved apparatus for compressing vegetable and other substances.* Dated May 12, 1858.

The object here is to facilitate the pressing of tobacco. The inventor uses a hydraulic press fitted with a tram way, to receive the mould and facilitate its being brought to and from the press. To the side standards of the press he attaches a pair of rails or ways and turns up their ends to prevent the mould, which is mounted upon wheels, from running off the ways. Midway between these ways stands up the hydraulic ram, and immediately above the ram a pressing block is suspended from the cross head of the press. This block fits the mould, and is intended, as the charged mould is raised up by the ram, to enter the mould, and compress the material contained therein. *Patent abandoned.*

1074. A. L. LIETOUT. *Improved portable medical and hygienic gymnastic apparatus.* Dated May 12, 1858.

This apparatus consists of a foundation bed on which four uprights are placed. These four uprights serve as a support for all the ordinary parts used for gymnastic purposes, comprising a ladder placed at the side, an arm chair for straightening the body, a pulley or tackle for raising weights, a rope ladder with knots, rounds, blocks, &c., a horizontal bar, a swing bar, a horse, &c. The whole apparatus is arranged so as to be capable of disconnecting, folding up, and placing in a case. To mount it it is merely necessary to join the pieces and place it on a level surface.—*Patent abandoned.*

1075. J. S. and W. H. BAILEY. *Improvements in machinery for preparing and combining wool, cotton, and other fibrous materials.* Dated May 12, 1858.

This relates to a combination of circular or endless guides, grooves, or channels, with rotary comb frames for controlling the motion of the taking combs or instruments on their own axis or points of motion. The guides, grooves, or channels are mounted on an axis excentric to the comb frame but with which they rotate and perform an equal number of revolutions; crank pins project from the lever arms fixed on the axis of the combs or taking instruments, which pins are received in the grooves or channels; stops are placed in the grooves or channels; the crank pins coming in contact with the stops carry the grooves or guides round with them, but these, by reason of their excentricity, control the lever arms fixed to the comb axis, and cause them to assume the different positions required. It also relates to combing wool, &c., by operating on the material by taking instruments individually or in combination with other instruments, whereby the material is taken from the feeding apparatus and transferred to the receiving-comb, so that the end of the material which is last in leaving the feeding apparatus shall become the first end when delivered on to the receiving-comb. It further relates to the application of a pressing surface, to exert a pressure on card surfaces in carding or combing machinery, which has a tendency to bend the wires to their original form after they have been straightened by contact with the receiving-comb or surface, or the material that is thereon. The patentees also apply emery for sharpening the card teeth, which is effected by rubbing contact. *Patent completed.*

1076. J. HAMILTON.—*Improvements in the preparation and use of starch for manufacturing, bleaching, and finishing purposes.* Dated May 12, 1858.

Instead of finishing and drying up the starch, as is commonly done, the process of manufacture is carried on no further than the actual deposition or solidification of the starch, when it is at once taken for use without any further preparation. Starch used in this way is most effective in its action, whilst it is peculiarly economical. *Patent completed.*

1077. W. SIMONS.—*Improvements in the construction of iron ships or vessels.* Dated May 13, 1858.

This relates to arranging the deck beams of ships diagonally or with the reverse inclines, so as to gain superior strength. Each line of beams is disposed so that the individual beams lie at an angle with the keel line of the ship, and in every deck the direction of the angle is reversed. It also relates to the diagonal disposition of the staunchions, each staunchion or hold-fast beam or bar being inclined or set diagonally in one or more lines, the lines being reverse to each other, and the bars being attached at the intersections and at their upper ends where they join the beams. It also comprehends inverting the knees of the ship, that is to say, the knees are disposed above instead of below the deck, and iron plates are laid above or over the lines of knees throughout the ship fore and aft. *Patent abandoned.*

LIST OF SPECIFICATIONS, &c.,

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No.	Pr.	No.	Pr.	No	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
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1156	0 3	1164	0 7	1171	0 3	1182	0 10	1189	0 3	1198	0 5
1157	0 6	1166	2 11	1172	0 8	1183	0 3	1190	1 6	1199	0 6
1159	0 10	1167	0 3	1173	0 8	1184	0 6	1191	0 6	1199	0 3
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1206	0 3	1219	0 3	1232	1 10	1245	0 11	1259	0 3	1272	0 3
1207	0 3	1220	0 4	1233	0 3	1246	0 8	1260	0 3	1273	0 3
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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, JANUARY 21, 1859.

CAPTAIN FISHBOURNE ON NAVAL ARCHITECTURE.

A LETTER printed for private circulation, entitled "Observations on the present state of Naval Architecture, addressed to the Right Honourable Sir JOHN PAKINGTON, Bart., M.P., First Lord of the Admiralty, by Captain E. GARDINER FISHBOURNE, R.N.," has lately been producing some sensation among certain ingenious naval men and others who persuade themselves that they understand naval architecture. We do not propose to act less wisely than Captain FISHBOURNE by publishing the letter, or even by making known to the world the opinion which he entertains of the efficiency of the English Navy and the ability of the Constructive Department of the Admiralty. But as the letter is addressed to a public officer in his official capacity, we think ourselves at perfect liberty to criticise the principles laid down by Captain FISHBOURNE in establishing his charge against the Naval Architects at Whitehall.

The Lords of the Admiralty are, of course, perfectly competent to judge of the value of his facts, some of which appear to us to be very recklessly stated. The *Orlando*, for example, is said to be 360 feet long, and as, according to him, *unsteadiness* varies directly as the length, she cuts a sorry figure in the comparison he makes. But when we remember that her length is 300 and not 360 feet, matters assume a different complexion. Again, in making unfavorable comparisons between the *Diadem* and *Galatea* and some French ships, he reasons on the assumption that the former vessels are armed with 8-inch shell guns; whereas we are quite sure the *Diadem* has 20 and the *Galatea* 24 10-inch shell guns.

Captain FISHBOURNE is of opinion that for war purposes the modern ships of the Royal Navy "are, in respect of that indispensable quality, *steadiness of platform*, very deficient as compared either with those of foreign nations or with our own of the old and unwisely rejected construction."* Regardless of stability, *i. e.*, the power of resisting an inclining force, the writer directs his attention to the amount of the angle through which the ship rolls in a given time in a rough sea as the measure of her steadiness. That steadiness is a most important quality in a ship of war we readily admit, but Captain FISHBOURNE has greatly underrated the difficulties which surround the question. Let us observe what has to be taken into account in considering the rolling motion of a ship:—When a wave rolls across a vessel, climbing up above the water level on one side, and falling considerably below it on the other, the balance between the supporting forces on the two sides of the ship is destroyed, and her line of support—passing vertically through the centre of gravity of the *displacement*—will pass on one side of the centre of gravity of the *ship*. There will then be an immediate effort, dependent on the amount of stability in the ship, to correct this, and the ship will roll towards the depressed part of the wave. The angle through which she will roll in the attempt to restore the statical equilibrium, and in the subsequent oscillations necessary to destroy the *vis viva* which has been generated, and also the time of these oscillations, will depend on the weights—and possibly, too, on the elasticity—of every portion of matter in the ship, together with its position, both in a vertical and in a horizontal sense; on the relative positions of the meta-centre and the centres of gravity and of buoyancy; on the resistance offered by the outer surfaces of the ship to rotary motion in the water, and the amount of friction upon them; and, if the ship is under sail, on the resistance of the air upon it, a resistance which varies in amount with every angle of inclination. Captain FISHBOURNE, however, feels assured that there is "nothing connected with Naval Architecture but might be resolved into general laws." But, although there certainly can be no doubt that all the forces which act upon a ship, and produce or retard motion, are under the influence of immutable laws, very grave doubts may be entertained as to whether we shall ever comprehend those laws, and be able to calculate their effects. NEWTON, and his scientific successors, in their Hydrodynamic studies, have attempted to force from nature these secrets, and have failed. The darkness in which they have ever been involved is still impenetrable. With this statement of the case Captain FISHBOURNE will not agree. He thinks he has solved the most difficult problem of all. Let us examine his analysis of the question. He says:—

"A ship or other floating body when at rest is subject to, and is retained in that state by the balance of forces, resolvable into two, equal and opposite; that of gravity, which is equal to the total amount of water which the ship displaces, in other words, is equal to her weight, together with that of her contained weights; and the sustaining pressure of water on the outer surface of the parts immersed."

What does all this mean? The force of gravity is equal to an amount of water, or in other words, to the weight of the ship and contents, and these are balanced by the sustaining pressure of water! This is an odd way of stating the principle that the weight of a floating body is equal to the weight of fluid displaced by it. But to proceed with the argument,

"The directions in which these pressures act are *perpendicular* to the varied surfaces, or to the indefinite number of *points** that go to make up the curves, forming the envelope of the body immersed; consequently, as these surfaces are changed in form, either by an actual change in the conformation of the ship or floating body, or from an inclination of the body around a horizontal axis, that immerses a different form; so the directions of these pressures are changed, and with them is moved the position of that mean centre at which lines drawn from these numerous points of pressure would meet. A floating body is thus as effectually sustained by the joint action of these pressures as though the water were rigid, but equally with any other body otherwise sustained when a third force is introduced, such as a horizontal push above or below the centre, or the withdrawal of or addition to the support on one side or the other, motion round a longitudinal axis will be communicated. Now, owing to the fact that these pressures are confined to the outward surface or periphery of the body when motion round a longitudinal axis is generated, the position of that axis will depend *much* upon the form, and will vary considerably according to the configuration of the surfaces in contact with the water, so that though there may be, and undoubtedly is, easy play amongst the particles from which these pressures proceed, yet if the ship or other body be considered at any given angle of inclination, the result of that motion, it will be found that it has rolled round an axis, with results analogous to those which take place when a body has been rolled on a rigid surface, and the vertical position of the axis would vary in each similarly, though not equally, with the inequality between the half-breadth and the depth."

We hesitated for some time time before we could determine to trouble our readers and ourselves with the above quotation; but we thought we should not be doing justice to Captain FISHBOURNE if we did not give his argument complete. He goes on to say:—

"If we take a homogeneous cylinder, the specific gravity of which is such that, when immersed, it will sink to its axis, we shall find—owing to the fact that the radii or the lines of pressure meet in the axis, and are coincident with the centre of gravity—that though it be rolled on a rigid surface or turned round a horizontal axis to any angle in water, the latter centre will not rise or fall. But if we take an eccentric body of an oval form, whose depth is only half its width, and the specific gravity half that of water, when floating, half will be immersed—and this be turned round a horizontal axis, whether floating or supported on a rigid surface, it will revolve round an axis situated somewhere between the centre of gravity and the surfaces of pressure."

With reference to the first of these examples, Captain FISHBOURNE seems to think that the specific gravity of the cylinder has something to do with the result mentioned, whereas—the section being circular—the centre of gravity will remain at the same height whatever be the height of the water-line! In the second example he makes a grave error, vitiating the whole of his reasoning. An ellipse of half the specific gravity of water, will have its centre of gravity in the water-line however much it may be inclined, for all straight lines through the centre of gravity cut off the same area: it will therefore be under exactly the same conditions as the cylinder. But applying these supposed discoveries to the ship. He says:—

"If we suppose this form [*i.e.*, the oval form] given to the ship's bottom, and the longer axis to coincide with her water-line, and she be rolled on a rigid surface, her centre of gravity would rise with each angle of inclination till the longer axis was perpendicular; the maximum height of which rise would be the difference between the half-lengths of the longer and shorter axis: in other words, a height equal to the difference between the half-breadth and the immersed depth, and the same effect, differing only in degree or amount, would occur if a ship of that form were inclined in the same way.

"This establishes that *the form of ship most suitable for easy and limited rolling motions is that of semicircles for her cross-sections*, as in that form the vertical motion of the centre of gravity consequent upon rolling motions, which must occur whenever there is a sea, will be a minimum, while *the amount of rise and fall of this centre will increase as the immersed depth is less than the half-breadth.*"

Both these conclusions are based on what we have shown to be false assumptions, and they are themselves both false and absurd, as any naval architect would have seen in a moment. The amount of the vertical motion of the centre of gravity is governed entirely by the position of this centre, and by the form of the vessel between wind and water, and is affected in no other way by the form of the sections below this, or by the relation between the breadth and depth. Vertical motion of the centre of gravity may be altogether avoided with *rectangular* sections, and with a breadth as great as you please. The midship bodies of the ships built by the members of the late school of Naval Architecture, and of nearly all those designed at the Admiralty since the accession to office of the present Surveyor, have been made either vertical or circular in the region of the load-water line, for the express purpose of avoiding the defect which Captain FISHBOURNE imputes to them, and for which most of the ships built by the former Surveyor were remarkable.

Captain FISHBOURNE says, however, "It is owing to the principle just explained that

* The reference here is to ships built before the time of Sir William Symonds.

* The Italics are our own.

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vessels of small draught of water, as compared with their breadth, are so uneasy." Further, the *Napoleon* is said to be deeper than the *Agamemnon*, and her cross sections less eccentric, and from both of these causes her motions are pronounced *less rapid and less extensive;* and towards the close of the letter the author says :—

"I have shown that to obtain the steadiest platform, the immersed body must approximate to the volume and form of a semi-cylinder; how far this is from being realised in the ships built during the last ten years may be gathered from the following dimensions."

Then follows a list of foreign and old English ships, with which our modern ships are made to contrast unfavourably with regard to steadiness, because the ratio of breadth to depth is greater in the latter.

Not content with this exposition of the causes of deep rolling, Captain FISHBOURNE makes a formula by which its amount and velocity may be determined. One would naturally expect to find in a formula based on such principles some index to the form, and also to find the proportion between breadth and depth so embraced that the discovered amount may be seen to diminish as the sections approach the semicircular form. But, strange to say, no notice whatever is taken of these things. The *numerator* of the fraction which is said to be proportional to both the amplitude and time of an oscillation, is the *length* of the ship, multiplied by the cube of the *extreme breadth;* and the *denominator* is the sum of the weights of the engines, coals, stores, and armament; so that the form of the section and the depth may be anything whatever. But that the formula is incorrect is evident enough from the consideration that there is no more reason for supposing the *lateral* oscillations of the ship to increase in amplitude according to the cube of the breadth, than for supposing the amplitude of the *longitudinal* oscillations to increase with the cube of the length—a supposition which is ridiculously wide of the truth. And again, it is not difficult to see that an increase of breadth will not always increase the rolling; on the contrary, we can imagine the breadth to be increased until, at the attainment of very great dimensions, the ship or raft became steady, and did not roll at all. Let us now observe how he applies this remarkable formula. He says :—

"On the other hand we may compare the *Orlando*, a new class 50, with an enemy's *sailing* vessel; the former is 360" [300] "feet long, the latter we shall suppose to be 200 feet by 48, and give her precisely the same armament as the *Orlando*.

Weights of each.	*Orlando.*	Enemy.
Armament, Stores	1,400	1,400 tons
Engines and Coals	1,500	
	2,900	1,400

If the vessels have the weights assumed above at starting from port, then we shall have as their ratios :—

$$Orlando\ \frac{360\times52^3}{2,900}=17,450.\quad Enemy's\ \frac{200\times46^3}{1,400}=13,900,$$

that is, the motion of the former will be greater than that of the latter as 175 to 139, and if the former has used half her coals, these motions will be as 202 to 139."

He says again, with reference to this formula, that neither the *Diadem* nor *Galatea*, the armaments of which consist of 10-inch shell guns and heavy 68-pounders, would dare to approach a French *sailing* frigate armed with 30 guns like our long 32-pounders, and with 30 30-pounder short guns or carronades, in consequence of the superior steadiness of the French battery, as will appear, he says,

"From the following table, which shows the relative amount of motion of the ships specified, and which is, indeed, a measure, in an inverse ratio, of the precision of fire possible in each,

French 120 gun ship	...	...	...	125
„ 102 „ „	...	...	...	130
„ 86 „ „	...	...	...	118
Diadem	...	...	...	176(!)"

We cannot seriously discuss the gallant officer's disquisition further. We have said sufficient to show that his views of established science are false, and his speculations altogether baseless. In one respect, however, we can agree with Captain FISHBOURNE,—that is, in regarding the systematic collection and arrangement of facts connected with naval architecture as a matter of prime importance, demanding the attention not only of the Government and of private shipbuilders, but of every man who has to contribute towards our constantly increasing Navy Estimates; and we are glad to find that there is a movement among the scientific naval architects in and about town in that direction. We shall offer them our most cordial support. Captain FISHBOURNE advocates—and, we believe, has long advocated—the establishment of a Statistical Office "for the collection, arrangement, and discussion of facts connected with naval architecture." We are inclined to think, however, that this matter would be better out of the hands of the Government. If it were undertaken by them, the scientific materials and facts would flow into the huge official machinery to the pecuniary benefit of younger sons, and of illustrious noodles not a few, to be faithfully recorded in thick folios, and deposited in secure presses, to the mystification of all who were privileged to examine them, and to the mortification of those who were not. Things of this kind must not be left to the management of clerks, or even of "young officers," as Captain FISHBOURNE innocently proposes. If our remarks here are worth anything, they must show not only that the work needs to be done, but that none but carefully educated naval architects can be entrusted with it.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

ORDINARY meeting, Dec. 28, 1858. W. Fairbairn, F.R.S., &c., President, in the chair.

The President stated that it was his painful duty to announce a loss which the Society had sustained in the death of their friend and colleague, the late Rev. H. H. Jones, M.A., F.R.A.S., &c., on the 21st inst. For upwards of twenty years he took an active part in the business of the Society. He served the office of Honorary Secretary from two to three years, in conjunction with Dr. Angus Smith; and on every occasion Mr. Jones as an ardent lover of science faithfully discharged the duties of that office. A sympathetic resolution was then unanimously passed by the Society.

Mr. Binney brought before the Society some *Lithographs of Brooches and Ornaments.* Mr. F. M. Jennings, M.R.I.A., F.G.S., some time since travelled in Morocco. Whilst there he collected a series of brooches and ornaments in common use in that country. These are very similar in form to specimens of ancient Irish brooches and ornaments now in the Museum of the Royal Irish Academy, and are, in the opinion of the author, another evidence of the trade anciently existing between the Phœnicians, their colonies, and Ireland. The drawings exhibited show the African and Irish ornaments. Mr. C. J. Julote, a Manchester gentleman, who has resided in Morocco, says these brooches, &c., are not uncommon in Algeria and Morocco. They are made by *Moorish* and *Jewish* workmen. All the designs acknowledged as *Moorish* have reference to some geometrical figure. In others, some have waving lines with branches, others have reference to the Cross. These designs may be traced to Christian workmen (Spaniards, Portuguese, Italians, and Maltese) who have, from time immemorial, occasionally resided in these countries; indeed, many of them have adopted the manners and religion. The people of Susa consider themselves a distinct nation, have a distinct language, said to somewhat resemble the *Irish*. They used to keep up an intimate relation with the Canary Islands. The above people, of which very little can be learned, owing to the jealousy of the Moors, are an active, intelligent class, sometimes employed by European settlers as trusty servants, and very seldom abuse the confidence placed in their fidelity. They are the celebrated snake charmers, vaulters, skull and choppers, of whom we read; and they are the carriers to Wednoor Mogador. If we could induce the Emperor to allow us to trade to Agadeer, a large and valuable trade from that place to Senegal and Timbuctoo might be carried on. At present it is not safe to enter the country.

Mr. T. T. Wilkinson, F.R.A.S., laid before the meeting a selection of *Geometrical Investigations*, from the papers of the late Mr. Henry Buckley, of Wood House, Delph. Mr. Buckley (a pupil of the late Mr. John Butterworth, of Haggate, near Oldham) was distinguished for his knowledge of the Ancient Geometrical Analysis; he died in July, 1856, and might almost be considered as the last of the Oldham group of self-taught mathematicians. He corresponded to the *Diary*, the *York Courant*, and the *Educational Times*, both in his own name and under assumed signatures. Since his death, Mrs. Buckley has consigned the MSS. to Mr. Wilkinson, who, on the suggestion of the President, promised to make a selection for the Society at no distant period.

A paper by Mr. Morris was read "*On the Practicability of Counteracting a Portion of the Resistance at the Head of a Ship, by employing a Revolving Conical-Bow to work a Stern Propeller.*" Communicated by David Chadwick, F.S.S., Assoc. Inst. C.E. The following extract is sufficient to illustrate the author's notions :—"No one, at this day, will imagine that any power can be created; but a great deal is lost, and perhaps some may be saved. The ordinary head of a vessel may be regarded as a wedge employed to split open a channel for her. In her voyage, the water is at every moment making an effort to press the two sides of the wedge together, and yet no attempt has been made to economise this constantly-sustained pressure. Now, a cone is a wedge in every direction—a circular wedge—and by surrounding it with spirals, it will become a revolving wedge, the flanges themselves constituting an active part of it. I submit that by driving through the water an immovable wedge, a large portion of the motive power is wasted; but by employing a revolving bow, that wasted portion may be economised. I believe that the result may be thus stated :—Resistance of plain conical-bow 100 + 10 for resistance of flanges + 5 for friction = 115. Available power, one-half of 100 = 50 − 15 = 35 clear again. This is upon the supposition that the revolving-cone is only checked to the extent of half the speed due to the resisting water." Several experiments were tried. A laden model was balanced in the stream by a weight, and then a string attached to the shaft of the propeller, which revolved six times the speed of the bow. The string was fastened ahead, and the model wound itself forward. A second model was placed in the stream without a balance-weight, and it pulled itself ahead by a string fastened to the cone-shaft; and so on. In the discussion which followed the paper, the President said it was impossible to take power from the water without decreasing the speed of the ship to the extent of the power gained. Dr. Joule thought that the effect of the revolving-bow might in some cases be to make a bad bow better; but denied the possibility of its producing any but a retarding effect if applied to a ship possessing good lines.

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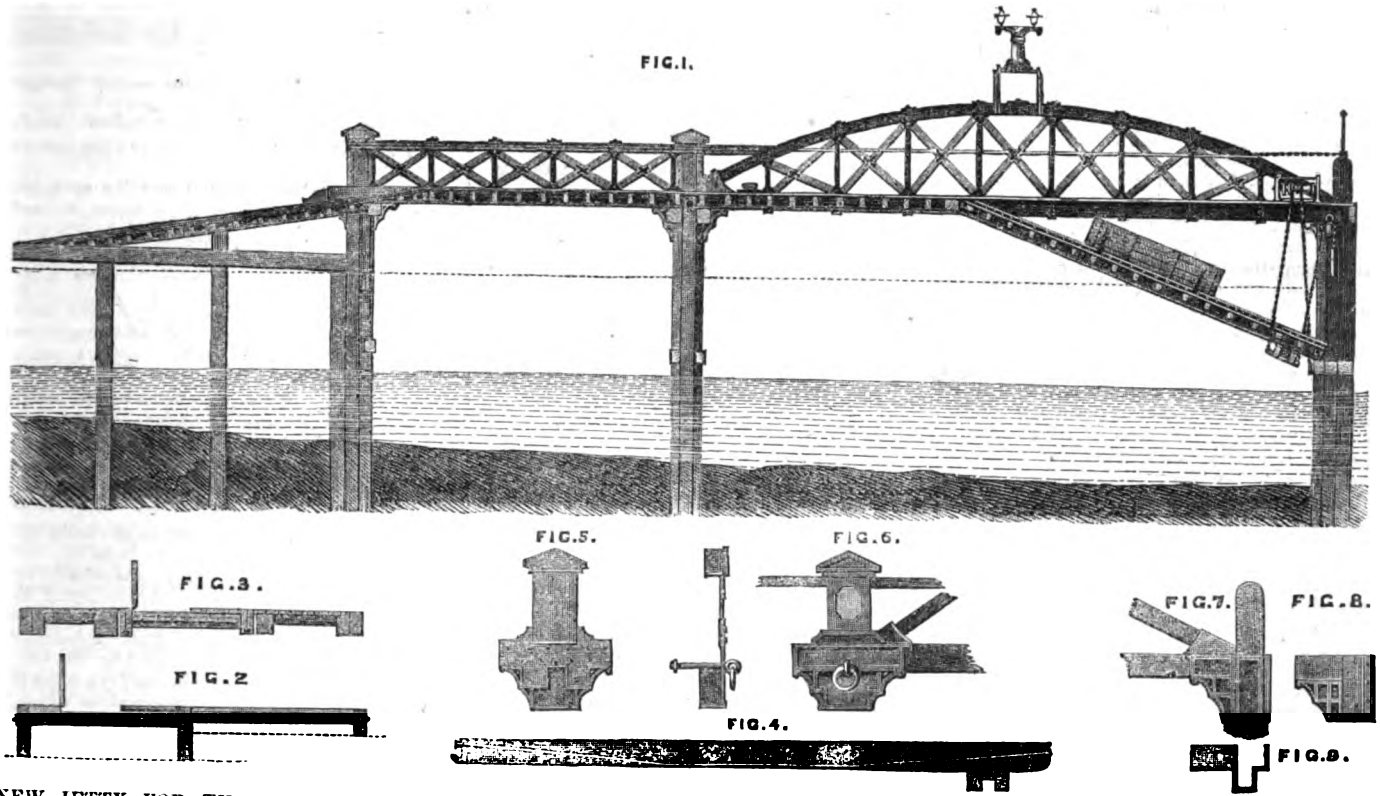

NEW JETTY FOR THE BRITISH, IRISH, AND FOREIGN STEAM-PACKET COMPANY.

AMONG the most recent improvements designed to facilitate the shipment and unshipment of goods on the banks of the Thames, without obstructing the river traffic, is a very well-contrived jetty, designed by Mr. R. Davison, C.E., of London-street, City, for Messrs. J. Hartley and Co., of Leadenhall-street, who represent the above-named company. The jetty, which was suggested by Mr. Price, the active manager of the company, is constructed in front of the large warehouses on the Dublin-wharf, immediately below the entrance to the St. Katherine's Docks, and has met with the entire approbation of the Conservancy Board, who exert themselves strenuously to discharge their duties efficiently, and to encourage improvements brought forward by private enterprise. The construction and erection of the jetty have been carried out with very remarkable skill and rapidity by Messrs. Gladstone and Co., contractors and engineers, of John-street, Minories. The contract was not taken until the end of September, and the first pile was not pitched until the 11th of October; yet, on the 9th of November the jetty was brought up the river on barges, and on the following day was landed on the piles, and secured in its place. It was in use by December. This was certainly very rapid work, and does great credit to Messrs. Gladstone and Co. The progress of the jetty up the crowded pool, floated on barges, and towed by steam-tugs, was a remarkable circumstance, and could not have been effected without great skill on the part of Mr. T. N. Gladstone, who superintended the operation, or without the considerate care of the harbour-master, who kept the river as clear of traffic at the time as possible. The new jetty is illustrated in the annexed engravings, fig. 1 being a side-elevation of it. It extends into the river, at right angles to the warehouses, upwards of 110 feet, and its platform is 20 feet wide. It rests upon a group of piles at its outer extremity, and 55 feet towards the quay are other piles, and again at 27 feet are more. The whole is strongly tied together. The old landing forms two openings, the one 55 feet in the clear, the other 27 feet, the greater space being strongly supported by trussed arches of timber, and tension-beams of 16½ inches square. At the river end of the jetty is a moveable gangway 35 feet long, which, though weighing more than four tons, one man can raise or lower to the angle required, according to the height of the water or of the vessel using it. The whole is bound together by cross timbers, braces, &c., so that it is calculated to bear much more than any load likely to come upon it. It is also provided with moving-posts, tie-rods for cattle, and such requisites as will tend to economise in moving the traffic over it. Fig. 2 is a section of the inner end of the jetty, showing the manner in which hinged flaps (one of which is shown open) are fitted to guide the cattle off and on. Fig. 3 is a section of the outer end, through the moveable gangway, which is fitted with similar flaps. Fig. 4 is a view of one of the trussed side-timbers of the moveable gangway. Fig. 5 is an inside view, fig. 6 an outside view, and the fig. between a section of the cast-iron caps of the centre piles. Figs. 7, 8, and 9, are respectively outside, inside, and plan views of the cast-iron caps for the outer piles. By aid of these details the whole construction of the jetty will be readily understood. By the removal of the old dummies formerly employed, a new and clear passage at all times is now open for boats and barges to pass freely under the jetty at all times of tide for the full length of the projection; and as it rests six feet clear above Trinity high-water mark (indicated by dotted lines in fig. 1), there is now little or no impediment to the inshore navigation. By the removal of the dummies, also, which kept back much of the sewage water, perfect freedom of motion is now given for this to pass freely away. To the proprietors it affords some 1,100 feet additional quay space always available, and upon it they can secure a whole cargo of beasts, thus vastly facilitating the discharging from vessels in the safest manner.

THE ASSOCIATION OF FOREMEN ENGINEERS.

A GLOOM has fallen, at the very dawning of the new year, upon this rising association. Mr. George Sheaves, the founder and first chairman of it, died on the 8th instant, the very day appointed a month previously for the meeting of the society. The lamented gentleman had presided at the December meeting; and, although suffering from indisposition at that time, subsequently recovered, as all thought, his usual good health. A day or two previously, however, to the fatal one, Mr. Sheaves suffered a relapse, from which, unfortunately, no medical skill, nor the anxious solicitude of loving relatives and friends, could rally him, and the end came, as we have stated, on the 8th. At the meeting on the evening of that day most of the members heard, for the first time, of the loss which, individually and collectively, they had sustained. The shock thus communicated may be imagined. The secretary performed the routine duties of his office in the midst of profound silence, and Mr. Joseph Newton, who had declined taking the vacant chair under the painful circumstances, after proposing that a letter of condolence should be written to the widow of Mr. Sheaves, who is unfortunately left with a young and helpless family, moved an adjournment to February. Both of these propositions were carried *nem. con.* Mr. Sheaves had occupied the post of manager for Messrs. Grissell, of the Regent's Canal Iron Works, for many years, and was universally esteemed. His funeral took place at Abney Park Cemetery on the 14th inst., and was attended by many friends of the deceased, and a host of workmen from Messrs. Grissell's.

We have to record with regret the decease, on Monday last, of George Mills, Esq., late Engineer of the Royal Mail Steam Company. Mr. Mills was connected with the Company from its establishment and acted as their Chief Engineer until within the last twelvemonths, when ill health compelled him to retire upon a handsome pension generously awarded by the Company for his past services.

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THE THEORY OF NAVAL ARCHITECTURE.

No. II.

IN constructing a ship, the drawing is made to give the form either at the outside of the planking, or at the outside of the frame-timbers. If it be made to the outside of the timbers, before any exact calculations can be made respecting the ship's displacement, or any other of her qualities, it will be necessary to obtain the form at the outside of the planking—that is, in technical phraseology, to *put on the planking*, in order that we may operate upon the form corresponding to the actual surface of the ship when she is afloat. The method for putting on the planking will be given hereafter; for the present, in the investigations which we are about to make, we shall presume that our drawings give the form at the outer surface of the ship.

But before proceeding with these investigations it is necessary to explain that the drawings of a ship made to the outside of the frames — called the BUILDING DRAUGHTS—have for their planes of projection, 1. a vertical longitudinal plane passing through the middle of the ship, dividing it into two symmetrical portions; this corresponds with the SHEER PLAN: 2. A plane perpendicular to this, passing through the upper edge of the rabbet of the keel, corresponding with the HALF-BREADTH PLAN: 3. A plane through the broadest part of the ship perpendicular to each of the other planes, corresponding with the BODY PLAN. The drawings giving the form at the outside of the planking, denominated the CONSTRUCTION DRAUGHTS, have the same sheer plan as the "building draught," but the Load water section, or a plane parallel to it, becomes the half-breadth plan, and a plane perpendicular to each of these through the broadest part of the ship, becomes the body plan of the "construction draught."

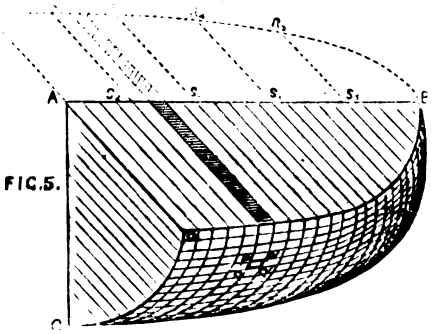

FIG. 5.

an ellipsoid, for instance, of which AB, AD, and AC are the semi-axes, and equal to a, c, and b respectively; and take these as the co-ordinate axes. Then the surface of the ellipsoid is such that all sections of it made by planes perpendicular to the axes are ellipses. Let a number of such planes, which are also parallel to the co-ordinate planes, CDA, DBA, be drawn, at distances δx and δy respectively apart, dividing the solid into a very large number of bars, each having for a base the very small area of $\delta x.\delta y$, in the plane CBA, corresponding to the sheer plan. Let $PP'Q'Q$, be one of these bars, and the distance from P to the plane CBA be equal to z., its distance from $CDA = x$, and from $DBA = y$, then $z.\delta x$, δy is the content of this bar very nearly, and the sum of all these bars will give the contents of the solid when the area $\delta x.\delta y$ is exceedingly small. This sum is represented in the language of the integral calculus by the symbol

$$\iint z.\, dx.dy$$

Now z depends for its value upon its position, or upon the corresponding values of x and y, and by giving x and y any values in the equation to the surface the corresponding value of z is obtained. The equation to the surface of the solid we have taken as an example is

$$z = c\sqrt{1 - \frac{x^2}{a^2} - \frac{y^2}{b^2}}$$

and the content of the solid is represented by

$$\iint c\sqrt{1 - \frac{x^2}{a^2} - \frac{y^2}{b^2}}\,.\,dx.\,dy.$$

When the first integration is performed one of the quantities x or y remains constant (x suppose) and the other (y say) will be variable, consequently the integral taken is that of $z.dy$. The result, when the limits have been taken, is represented by

$$\int \frac{\pi}{4}\cdot\frac{bc}{a^2}\,(a^2 - x^2)\,dx.$$

The quantity $\frac{\pi}{4}\frac{bc}{a^2}(a^2 - x^2)$, is nothing more than the area of the section of the solid made by the plane in which P lies, and which is parallel to ACD at a distance x from it, and by giving x any values between zero and AB we may obtain the areas of the sections of the solid, at any distances from CDA.

Let these be obtained at the distances, zero, AS_2, AS_3, &c., and through these points let dotted lines AR_1, S_2R_2, S_3R_3, &c., be drawn perpendicular to AB on the other side of it in the plane ABD, and the numerical values of the sections set off upon these; and in the same manner as lines are taken to represent forces in mechanics, let AR_1, S_2R_2, &c., just set off, represent the areas of the sections of the solid through the same point: then, if Y be the general value of the ordinate at the distance x from A, $Y.\delta x$ is the elementary area of the superficies, bounded by AB, AR_1, and the curve, the ordinates to which represent the area of the sections of the solid. This small area is shaded in the figure.

Since $\frac{\pi}{4}\frac{bc}{a^2}\left(a^2 - x^2\right)$ is the area of the section of the surface at a distance x from CDA, $\frac{\pi}{4}\frac{bc}{a^2}\left(a^2 - x^2\right)\delta x$ is the content of a slice of the solid made by planes parallel to CDA at a distance of δx apart, as shaded in figure 5, and $\int \frac{\pi}{4}\frac{bc}{a^2}\left(a^2 - x^2\right)dx$ is the representative of the sum of all these.

But since $Y = \frac{\pi}{4}\frac{bc}{a^2}\left(a^2 - x^2\right)$, $\therefore \int Y dx$ must be equal to $\int \frac{\pi}{4}\frac{bc}{a^2}\left(a^2 - x^2\right)dx$ taken between the same limits. If the integration be performed, the content of the solid is obtained in one case and in the other, the curvilinear area* the ordinates to the curve of which are taken to represent the areas of the sections parallel to CDA. The result of the integration is $\frac{1}{6}\pi abc$. The area of the figure AR_1B is therefore numerically the same as the contents of the solid $ABCD$; and the area of any part $R_2R_4S_4S_3$ numerically the same as the contents of the solid intercepted by planes parallel to CDA through the same points S_3, S_4. It is clear therefore that in order to obtain the content of a regular solid by the integral calculus, it is necessary in the first place to obtain the general value of the complete area of the sections parallel to one of the co-ordinate planes, as CDA, and in the second place to do what amounts to finding a curvilinear area, the ordinates to the bounding curve of which represent the areas of the corresponding sections.

If the moment of the solid about one of the co-ordinate planes CDA be required, we see that the moment of the whole would be equal to the sum of the moments of all the bars $z.\delta x.\delta y$, or to the sum of all the quantities $z.x.\delta x.\delta y$, which is represented by the symbol $\iint z.x\, dxdy$.

As before, x will be constant, and the first process gives the same quantity as that obtained in the first operation, multiplied by x;

$$\text{or } \int \frac{\pi}{4}\frac{bc}{a^2}\,(a^2 - x^2).\, x\, dx.$$

The quantity $\frac{\pi}{4}\frac{bc}{a^2}(a^2 - x^2).\, x$ may, as before, be represented by the ordinates to a curve, and the area of the superficies included between the co-ordinate axes and the curve will represent the whole moment of the solid about the plane CDA.

We have above attempted to prove that each step in the process of integration is identical with that of finding a curvilinear area; and that if we represent areas, moments, &c., by ordinates we are really doing the same as the integrator when, step by step, he proceeds until he completes the process of his integration, and obtains rules for measuring cubic contents, the accuracy of which is never doubted. And, as a consequence, the questions of finding the cubic contents of a solid, its moment about any plane, &c., are all reduced to that of finding a curvilinear area.

The reason why such prominence has been given to the above proof is this: many persons seem to doubt the accuracy of a result which has been obtained by representing an area by a line; and the following instance in the mensuration of a square balk of timber, fig. 6, is taken as a case of

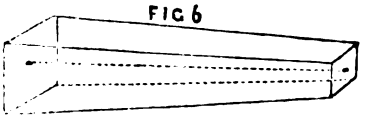
FIG 6

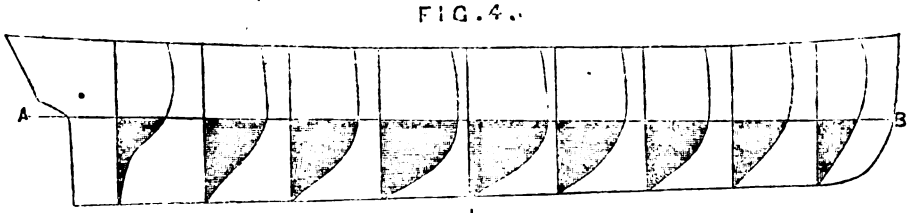

FIG. 4.

Let, then, fig. 4 represent the construction sheer draught of a ship, AB being the line of the load water section, and let the equidistant transverse sections, perpendicular to the sheer plan and load water section, be turned round their lines of intersection with the sheer plan. Now, what we have to do in finding the "displacement" of the ship is, to find the contents of the solid the transverse sections of which are represented by the shaded parts of the figure.

If ships were similar to each other, on knowing the displacement of one, that of any other could readily be found; it would be to the given displacement as the cube of one of its principal dimensions is to the cube of the like dimension of the first ship. Or if the submerged parts of ships were of any regular form, such as a hemisphere, a semi-spheroid, &c., the cubic contents could be obtained from the principal dimensions by the rules of mensuration. The content of a hemisphere of which the diameter is a, is $\frac{2}{3}\pi a^3$,* or, $\frac{1}{6}\pi\, l.\, b.\, d.$ if l, b, and d, represent the length, breadth, and depth respectively of a ship of that form;

that of an oblate spheroid is $\frac{2}{3}\pi a^2 b$ or $\frac{1}{6}\pi.\, l.\, b.\, d.$
that of a prolate spheroid is $\frac{2}{3}\pi ab^2$ or $\frac{1}{6}\pi.\, l.\, b.\, d.$
and that of an ellipsoid $\frac{2}{3}\pi abc$ or $\frac{1}{6}\pi.\, l.\, b.\, d.$

But these rules are obtained by the aid of the Integral Calculus, and as the manner of obtaining such rules will, we think, throw much light on the more general question which we have to do with, we will now endeavour to describe the process, and render ourselves intelligible to those who are without a knowledge of the calculus.

Let $ABCD$, fig. 5, represent any regular solid,

* π *(pi)* is the ratio of the circumference of a circle to its diameter. Its numerical value is 3·1416 nearly.

* *Definition.*—A curvilinear area is the area of a plan figure bounded by a curve and one or more straight lines

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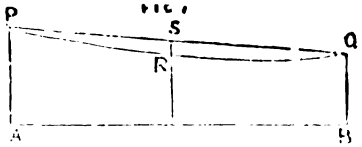
failure of such a method of proceeding. The length of it is l feet, the area of one end a^2, and the area of the other b^2; the content given in works on mensuration is $(a^2 + ab + b^2)\frac{l}{3}$

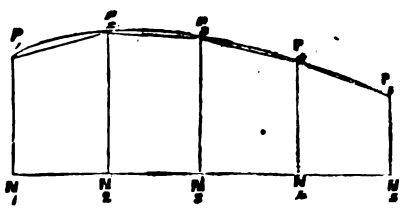
FIG. 6.



Let AB, fig. 7, be equal to l measured by a scale, AP numerically equal to a^2, BQ to b^2; then, say they, as the piece is straight, PQ must be joined by a straight line, and the contents, according to that method, will be $\frac{AP + BQ}{2} . AB = \frac{(a^2 + b^2) \times l}{2}$ Now this is wrong, and for this reason:—the extremities of the ordinates which represent the areas of the cross sections of the piece do not lie in a straight line, PSQ, as has been supposed, but in a curve, PRQ. Let the cross section be obtained at the middle point; the side of square $= \frac{a+b}{2}$ and the area of it $= \left(\frac{a+b}{2}\right)^2 = \frac{a^2 + 2ab + b^2}{4}$ and not $\frac{a^2 + b^2}{2}$ as was supposed.

Now, we shall presently shew that the area of the figure, the three equidistant ordinates of which are a^2, $\frac{a^2 + 2ab + b^2}{4}$, and b^2, and the distance between the ordinates $\frac{l}{2}$, is $(a^2 + ab + b^2)\frac{l}{3}$, exactly the same as that given in text-books on mensuration. We now proceed to the question of finding a cuvilinear area.

FIG. 8.



Let $N_1P_1P_5N_5$, fig. 8 be the figure; and $N_1P_1N_5P_5$ be perpendicular to N_1N_5; divide N_1N_5 into a number of equal parts, and at the points of division draw P_2N_2, P_3N_3 &c, perpendicular to N_1N_5; let m represent the common distance between the ordinates; and $a_1, a_2, a_3, a_4, \ldots$ &c. $\ldots a_n$ the lengths of the respective ordinates, a_n being the length of the last. Now of the nature of the curve joining all the points $P_1P_2P_3$ &c. we know nothing whatever, except that it is what is termed a *fair curve*. As a rough approximation to the area of the figure, if the extremities of the consecutive ordinates be joined by straight lines, we shall have for the area of the figure, the sum of all the trapeziums—neglecting as small the parts outside the straight lines P_1P_2, P_2P_3, &c.

$$\text{Area, } P_1P_2N_2N_1 = \frac{a_1 + a_2}{2} \times m$$

$$\text{,, } P_2P_3N_3N_2 = \frac{a_2 + a_3}{2} \times m$$

$$\text{&c.} \qquad = \text{&c.}$$

$$\text{,, } P_{n-1}P_nN_nN_{n-1} = \frac{a_{n-1} + a_n}{2} \times m$$

sum of all the trapeziums =

$$\left\{\frac{a_1}{2} + (a_2 + a_3 + \text{&c.}) + \frac{a_n}{2}\right\} \times m$$

Whence this rule:—To half the sum of the first and last ordinates add the sum of all the other ordinates; then multiply the sum of these by the common interval, m. This gives a rough approximation to the curvilinear area $P_1P_5N_5N_1$. This is called by writers on naval architecture Rule 1; but it is now rarely made use of, and we should have abstained from giving it but from the fact that no other was used until about the end of the last century.

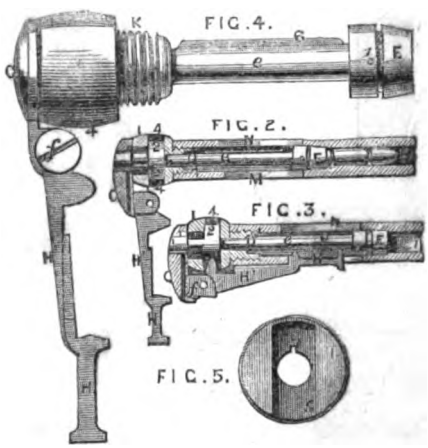
THE NEW BREECH-LOADING CAVALRY RIFLE.

THE Secretary of State having ordered the immediate supply of Terry's Patent Breech-Loading Rifle to several cavalry regiments, a description of the weapon will doubtless be interesting to our readers. Mr. William Terry, the inventor, is a Birmingham gunmaker, and his invention was patented on the 7th April, 1856. The arm is of simple construction, being loaded through an aperture in the side of the breech, in a manner similar to that which was described by Robins, in his "Treatise on Gunnery," more than a century ago, who (as Lieut. Busk remarks) somewhat prophetically said, "perhaps something of this kind would be of all others the most perfect method for the construction of these sorts of barrels." Lieut. Busk does not speak highly of the Terry Rifle, but states, that a carbine on this construction sent to him for trial, "did not load with the same facility as one of Prince's Rifles, nor was its accuracy of fire at all comparable to that of the latter weapon."

The new arm is illustrated in the annexed engravings. Fig. 1 is a side elevation of a complete Terry Fire-arm. Fig. 2 is a longitudinal horizontal section, of part of the barrel of the fire-arm, showing the mode of arranging and actuating the mechanism employed for inserting the cartridge into the barrel, and securely holding it during the discharge. Fig. 3 is a similar section to the last, showing the mechanism in different positions. *A*, is the stock of the fire-arm; *B*, the barrel; *C*, an ordinary percussion lock; *D*, the breech. The construction of this part of the fire-arm and the mechanism connected therewith forms the principal part of Mr. Terry's improvements. *E* is a sliding piston, the rod *e* whereof is securely fixed into a piece of metal *G*, to which is also hinged at *f* a lever *H*, *H'*, employed for the purpose hereafter mentioned. *I* is a piece of metal passing over the piston rod *e*, and connected to the breech end of the barrel by a screw *K*, formed in the end of the barrel and around the piece *I*. The piston *E*, Fig. 4, is formed slightly taper and solid, and is securely connected to the piston rod *e* by a pin at 1; and the diameter or calibre of the bore of the barrel at the breech end thereof is somewhat larger than the other part of the barrel, and is made conical to receive the taper part of the piston, which should fit, as far as practicable, air-tight therein. The piston rod *e* has two lugs or projections, 2, 3, formed thereon, which take into slots or openings, 4, 4, formed opposite to each other in the piece *I*, as at Fig. 2; an opening, 5, is formed in the piece *I*, as at Fig. 5, to enable the parts, 2, 3, to be inserted into that piece. One side of each of the slots, 4, 4, as also of the lugs, 2, 3, is formed inclined or sloping in opposite directions, so that when the lugs, 2, 3, are moved in said slots the piston *E* shall be forcibly pressed into its seat and held there. In order to effect the partial turning round of the lugs, 2, 3, as lastly stated, the feather 6 in the rod *e* is free of the groove 7 in the piece *I*, in which the feather slides for drawing back the piston, to allow the cartridge to be introduced into the breech through the opening *M* formed in the side, the said opening being nearly entirely closed by the outer end of the lever *H*, which fits therein, as at Figs. 1 and 3. There is a tempered steel spring attached to the piece *G*, and employed for securely keeping the lever *H*, *H'*, in the opening *M* during the discharge of the contents of the fire-arm. The upper and under sides of the part *H'* of the lever *H* are sufficiently bevilled inwards to enable them to be readily gripped by the finger and thumb for withdrawing the lever and pulling back the piston when it is desired to introduce a fresh cartridge at each discharge of the fire arm. *N* is a slot or opening formed in the breech for the escape of dirt, &c.; and *O* is a recess, containing cotton saturated with oil or other lubricating substance, so that at each discharge of the fire-arm the piston rod is both lubricated and cleansed in a simple and efficient manner. As regards the construction of the piston *E*, in order to provide means for compensating for the wear of the piston, Mr. Terry proposes, if necessary, to construct the piston in two parts, in such manner as to compensate for any wear, without having to substitute an entirely new piston.

FIG. 1.

FIG. 4.



The military correspondent of the *Times*, speaking of the Terry Rifle says:—"The peculiar advantage of this weapon is to make one man equal to ten; the carbine may be loaded with facility at the time of a horse being at full gallop, because neither biting the cartridge nor a ramrod is required, and there is no risk of blowing off the hand while loading. The Small Arm Committee have submitted the carbine to the soverest tests, making a most favourable report on its peculiar advantages, and hence its adoption in the army. Only some few months ago Terry's Rifle was subjected to a test by Captain Richard Hewlett, of the Excellency gunnery ship, and 1,800 rounds were fired without the carbine requiring to be cleaned, or missing fire; the same carbine was tested on Southsea-common by order of the Lieutenant-Governor Major-General the Hon. Sir James York Scarlett, and 25 rounds were fired at 300 yards' range from the butt; and the General himself made a centre hit. An officer on the ground, one of the instructors of musketry, then took the instrument and struck the target afloat twice out of three times, at a distance of 1,050 yards; yet the barrel is but 30 inches in length."

A SLAVE'S INVENTION.—We read in a letter from New York:—"There is a curious case shortly to come before the Federal Courts. A negro slave invented a machine, and applied for a patent. It was denied him, as a matter of course. His master now insists on its being granted to him, inasmuch as he owns the inventor he owns the invention. But he is not the inventor, the patent office hesitates, and he talks of a mandamus. What curious legal complications are raised by chattels having faculties."

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SCOTT'S PATENT APPARATUS FOR DRESSING, SEPARATING, AND CLEANING SEEDS.

FIG. 5.

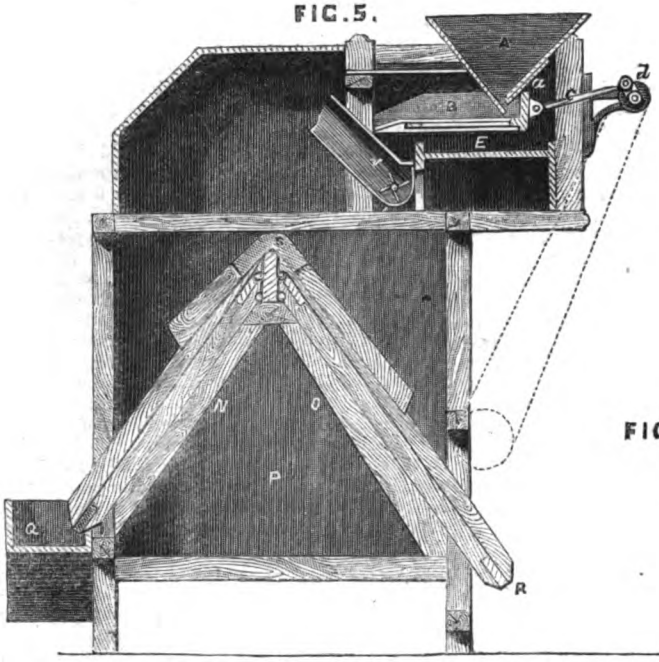


FIG. 6.

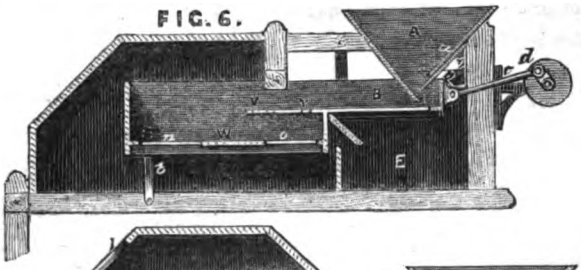


FIG. 1.

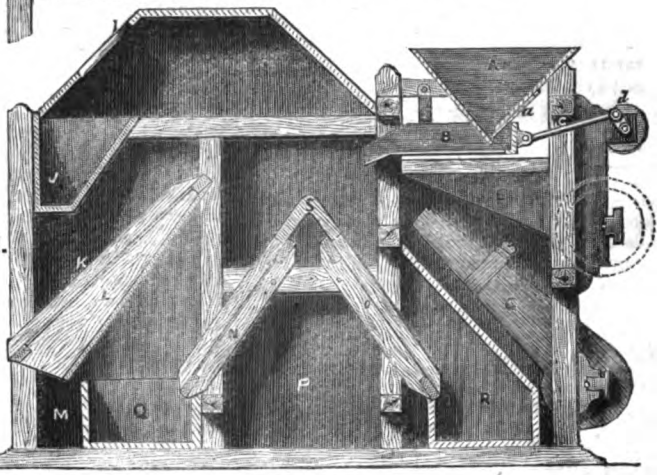


FIG. 7.

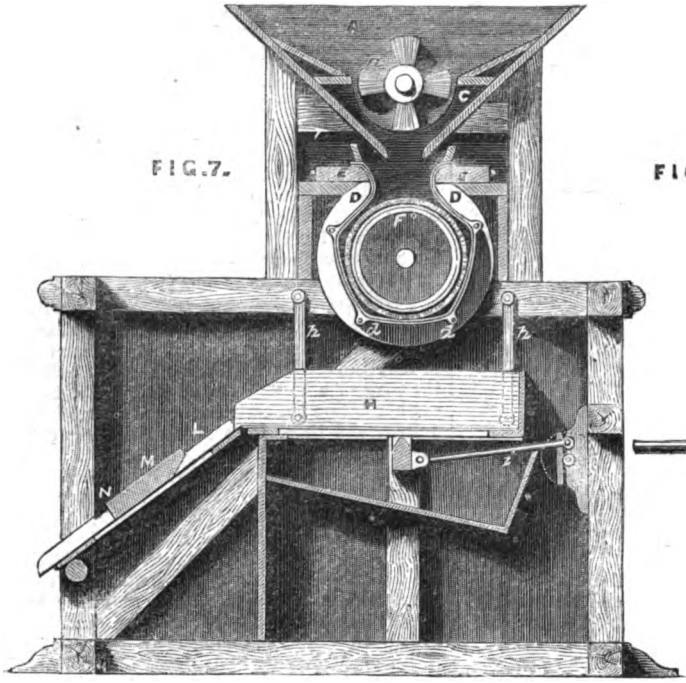
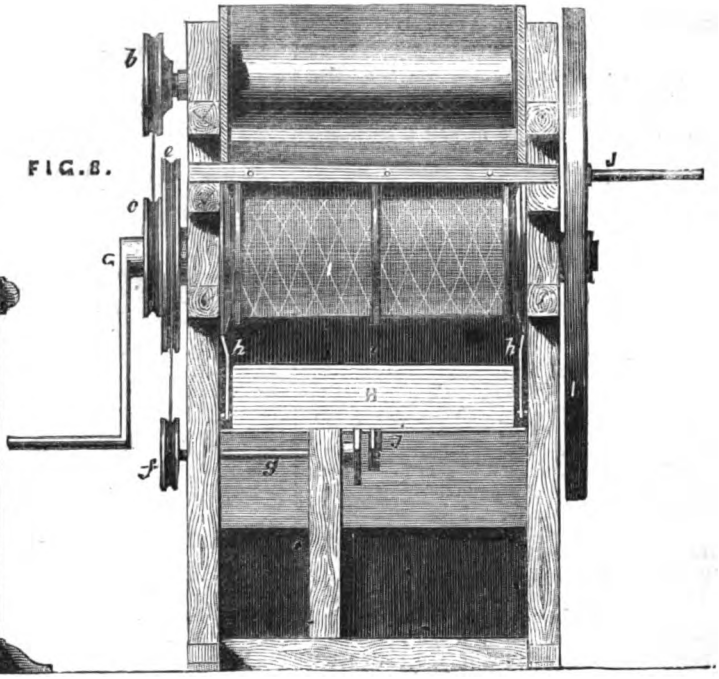


FIG. 8.



SCOTT'S PATENT APPARATUS FOR DRESSING, SEPARATING, AND CLEANING SEEDS.

OUR attention having been attracted by the specification of a patent granted to Mr. Thos. Scott, of Drummond-street, Euston-square, in which a very valuable set of machines for dressing, separating, and cleaning seeds is described, we now lay the same before our readers. These machines appear to have been devised with an accurate knowledge of, and a careful regard to the evils which they are intended to remove—evils of very great importance to the agriculturalist. As the specification of Mr. Scott's patent is very voluminous, we must condense it as much as possible, and print it in small type, in order to economise space. The following is substantially what is stated in that document.

Carrot seeds, the seeds of some sorts of weeds, and other seeds have beards, tails, down, husks, or hulls. Grass seed is often mixed with the seeds of weeds having horns or tails, and also with round or other shaped seeds. The patentee causes the grass seed and its impurities to descend from a hopper on to a reciprocating sieve with longitudinal spaces, from which it falls on sloping sieves with longitudinal spaces. The grass seed slides down and off the end of the sieve, while the tailed or horned seeds fall with a spiral motion, or in such a position as to pass through the longitudinal spaces of the sieve. The first reciprocating sieve also separates a portion of these seeds, and of the small round seeds which may have been mixed with the grass seed. He sometimes projects the seeds by centrifugal or other force, and allows them to fall upon the aforesaid sieve or grating; or, in some cases, the seeds being projected to different distances, according to their weight or form, are received in different receptacles. For cleaning or dressing carrot seed and similar seeds, so as to remove the tails, beards, husks, or hulls from them, he employs cylinders, or cones covered with wire cord metallic brushes, perforated metal, or other suitable rough surface, which is enclosed in a wire gauze casing. Or the wire cords or brushes may be arranged on a disc revolving in proximity to a fixed sieve. The seed is introduced between the two surfaces, and the tails, beards, or husks are rubbed off, and pass through the gauze. The carrot seed may pass out at the end or sides, or it may pass through with the detached tails or beards, and be afterwards separated by sifting, winnowing, or otherwise. The wire gauze casing may fit the wire cord surface, or may touch it at certain points, or may have cavities at intervals, and be adjusted by screws or other means. He sometimes applies a gentle heat for drying the seed by means of gas burners, or otherwise. The last portions of the tails or down may be removed by sieves with rubbers, which rub them through while the seed passes off at the end. This rubbing apparatus may also be used in combination with a winnowing machine, or with the machines before-mentioned.

Fig. 1 of the accompanying engravings is a longitudinal section of one of Mr. Scott's machines for dressing grass seed. *A* is a hopper with a slide *a* for adjusting the aperture at the bottom. *B* is a vibrating sieve suspended by links, and driven backwards and forwards by a connecting rod *c*, and a crank *d*, which is driven by a band passing round a pulley on the crank shaft, and another pulley on the main shaft, which may be turned by hand by means of a winch, or by power. *E* is a box which receives the dust

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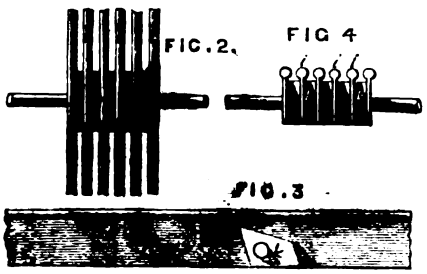

and dirt, and any small seeds which are shaken through the sieve *B*. The main shaft carries another pulley, round which passes a band which drives a pulley on the spindle of a blowing fan, or winnower *F*. The air from the fan *F* is conducted up a spout or trunk *G*, with an adjustable opening, and is directed upon the seed falling from the sieve *B*. *I* is an aperture for the escape of the air and chaff, or light particles. *J* is a box or pocket. *K* is a sieve which may be fixed, or made capable of adjustment to various angles. *L* is a tray or box under the sieve *K*, which directs the matters passing through this sieve into the space *M*. *N* and *O*, are two inclined sieves with a space *P* under them to receive anything which passes through them, and with two boxes, *Q R*, to receive all that passes off the top of the sieves. *S* is a sort of cap or saddle to prevent any seeds from falling between the top of the sieves *N O*. These sieves may be fixed, or may be capable of adjustment to various angles. The sieves *N O K* and *B* are constructed with longitudinal bars, as shown in Figs. 2, 3, and 4; *i i i* are longitudinal bars, having a bead along the top edge, and made thinner beneath, so that anything passing through the top may escape freely at the bottom. The mode of making these bars may be varied. They are kept at the proper distance apart by small pieces of metal, *k k*, and are held together by a rod passing through them, or otherwise. They may be made adjustable. The pieces *k k* are angular at top, and kept a little below the bead, so as not to obstruct the passage of the seeds, like the cross wires of an ordinary sieve. Moreover the bars *i i* are so strong and stiff that few transverse supports are required. The bars are so close that good grass seed cannot pass through. The action of this machine is as follows:—The seed to be cleaned is thrown into the hopper *A*, and allowed to fall on the sieve *B*, which is kept in rapid vibration by the winch. The dust, small particles of dirt, round seeds smaller than grass seed, and some of the immature and useless grass seed pass through the sieve *B* into the box *E*. The tailed or horned seeds of weeds, although smaller or thinner than grass seed, lie upon the sieve, very few of them passing through. They are carried forward with the grass seed by the vibration of the sieve, and fall over the end into the blast of air from the fan. The lighter downy portions are thus blown out at the opening *I*; while the heavier fall into the box *J*, and the still heavier fall on to the sieve *K*. The good grass seed and the heavier horned or tailed seeds of weeds fall upon the sieves *N O*. The seeds are so shaken and separated by falling from the vibrating sieve through the blast of air, that for the most part each seed falls separately through the air. The grass seeds slide down the sieves into the boxes *Q R*. The horned or tailed seeds, on the contrary, fall like little darts or arrows, frequently acquiring a revolving or spiral motion, and pass between the longitudinal bars into the space *P*. A similar effect takes place with the lighter seeds which fall on the sieve *K*, and a portion of rather lighter grass seed runs off the lower end of this sieve. If any grass seed should be found in the box *J*, it will be of inferior quality. The heaviest clean grass seed is received in the box *R*, and the next heaviest in the box *Q*, and a rather lighter seed runs off the sieve *K*. Instead of the three sieves *K N O*, more may be employed, to separate the grass seed into a greater number of qualities.

The above machine admits of several modifications:—Thus a plain vibrating table, or tray, may be used in lieu of the vibrating sieve B, or a revolving fan may be employed for scattering the seed, and throwing it on the sieves *N* and *O*. The winnowing fan may also be dispensed with. Fig. 5 is a longitudinal section of a machine in which the seed is thrown into the air by centrifugal force. *A* is the hopper, with its slide *a*. *B* is the vibrating sieve, driven by a connecting rod *c*, and crank *d*, which is driven by a band passing round a pulley on the crank shaft, and another pulley on the main shaft, which may be turned by hand or otherwise. *E* is a box, which receives the dust and dirt, and any small seeds which are shaken through the seive *B*. The crank shaft carries another pulley, round which passes a band which drives a pulley on the spindle of a centrifugal beater or fan, placed in a case or spout, *v*. *N* and *O* are the two inclined sieves, with longitudinal bars as before, and *P* is the space between them; and *Q* and *R* are the boxes for the reception of the clean seed. *S* is the saddle piece on the sieves *N O*. The seed descends from the hopper *A*, on to the vibrating sieve *B*, and drops from the end of this sieve into the case *U*, and is then thrown out of the spout by the rapid revolution of the centrifugal beater. It falls on the sieves *N O*, and the grass seed slides off the sieve at *Q* and *R*, while the horned or tailed ends of weeds pass through the sieves into the space *P*. The arms or blades of the beater may be of different lengths, or placed at different angles, so as to throw the seeds to different distances. A revolving disc may also be used to project the seed on to the sieves.

Fig. 6 is a section of another arrangement of apparatus which may be substituted for the centrifugal beater, and the upper part of the apparatus shown in Fig. 5. *A* is the hopper, with its slide *a*. *B* is a vibrating sieve, driven by a connecting rod *c*, and crank *d*. *V* is a table, or tray, and *W* is another table, or tray, with two openings *n o*, covered by coarse sieves or wire netting. These trays are mounted in the same frame as the sieve *B*, and vibrate with it. The seed is thus shaken over the end of the tray *V*, and falls on the tray *W*, and thence through the openings *n o*, on to the sieves *N O*, shown in Fig. 5. If too much of the seed should pass through the opening *n*, a hole *v* may be made in the tray *V*, so as to equalise the quantity falling on each sieve. Instead of the crank motion, the vibrating sieves and trays may receive a jogging motion, by being moved in one direction by a cam or tappet, and allowed to return and strike against a stop by their own weight or by springs. Fig. 7 is a transverse vertical section of a machine for cleaning carrot seed, constructed according to Mr. Scott's invention. Fig. 8 is a side view partly in section. *A* is a feed hopper, in which is a revolving drum *B*, carrying four brushes *a a*, which run in contact, or in close proximity, to a semi-cylindrical sieve or grating *C*, with meshes or openings large enough to allow of the passage of the seeds. The seed falls into a case *D*, which consists of wire gauze supported by a coarse wire netting, which is itself supported by bars or frames, jointed together at *d d*. These frames are supported at the top by two blocks *H E*, adjusted by screws, and at the bottom by a lever or wedge (not shown), by adjusting which, and the blocks *E E*, the distance of the wire gauze case from the drum *F* is regulated. *F* is a drum covered with wire card similar to that employed for carding cotton, &c. By the revolution of the drum *F*, the seeds are forcibly rubbed at the parts where the wire gauze approaches closest to the drum, and they are rolled about in the recesses opposite the joints *d*, and are again carried on and rubbed about until the horns or tails are detached and reduced to powder or dust, and pass with the seeds through the wire gauze, falling on the vibrating sieve *H*. This sieve is suspended by links *h h*, and is driven backwards and forwards by a connecting rod *i*, and crank *j*, on the spindle *g*, which carries a pully *f*, driven by a band from a palley *e*, on the shaft of the drum *F*. Another pulley *c* on the same shaft, drives a pulley *b* on the spindle of the brush drum *B*. The shaft *G* may carry a fly wheel *I*, and may be driven by hand winches *J K*, or otherwise. The horns and tails being reduced to dust, pass through the vibrating sieve *H* into the space beneath, while the clean carrot seed is shaken out at the end of the sieve and falls on an inclined sieve, which is jointed to the sieve *H* at the upper end, and rests upon a roller or bar at the lower end. *M* is a rubber, formed of a flat piece of wood, covered with leather or plush, and bevilled or curved at its upper end. This rubber lies on the sieve *L*, being confined by a lodge at each side of the sieve, and a bar or stop *N* on the frame of the machine. As the sieve *L* moves backwards and forwards, the seeds pass under the rubber *M*, which rubs off and through the sieve any slight portions of the horns which may remain on the seeds, these finally passing off in a clean state from the lower end of the sieve. This machine, like the others, admits of several modifications, some of which are described in the patentee's specification. The machines described above particularly refer to the dressing of grass and carrot seed, but they may be used for clover and many other seeds, the width of the spaces in the sieves and wire gauze being varied according to the size or nature of the seeds operated upon.

It is not our intention, either here or in future cases, to urge agriculturalists to the use of newly-invented apparatuses. Our business is mainly to *describe* them, and thus afford the reader the means of judging for himself. We may, however, state that there seems to be no room for doubting either the utility of the machines described above, or the urgent necessity for them which exists. In reference to the grass-seed separator, the patentee, in his prospectus, speaking of Italian rye-grass, says:

> Very few samples of the seed of these valuable plants are free from admixture with that of the most noxious and—in its eradication from the land—expensive weeds known to the farmer, viz., 'couch' or 'twitch' grass, and the great difficulty and expense attendant on even its *partial* removal is well known to all in the agricultural seed trade. It is to the presence of the seeds of this *pest* that the observation now becoming so general amongst farmers is attributable—that, when they have sown rye-grass with clover, they find, on ploughing for the succeeding wheat crop, that the land is replete with a luxuriant braird of healthy 'twitch,' although in the preceding fallow it had been thoroughly cleaned. The detection of the seeds of couch-grass amongst those of rye-grass, in such quantity as to produce the effect above referred to, is, by a mere superficial inspection, by no means easy; and hence it is now no uncommon thing to hear intelligent farmers allege that to sow rye-grass and to sow couch is synonymous. It is needless to say that nothing could be more erroneous than this conclusion, by which two of the most valuable grasses in cultivation are confounded with one of the most objectionable and expensive weeds.

It will be the fault of farmers themselves if, after the production of Mr. Scott's machines, they continue to propagate "twitch," for while it may not be expedient in all cases to have a machine for their own separate use (although we see that the patentee has contrived one of somewhat smaller capacity, which is within the reach of almost every occupier of land), they have only to bargain with the local seedsman, and insist on the condition that their rye-grass shall be entirely free from "twitch," "couch," "hair," or "spear" grass seed. The seedsman cannot now urge in excuse the impossibility of extracting these noxious seeds.

We proposed adding a remark or two on the importance of the purification of carrot seed, and of the fitness of the above machines for effecting it; but our space is gone, and we must, therefore, refer inquirers to the patentee for further information.

THE UNITED STATES' NAVY.

THE Secretary of the United States' Navy says that since his last annual report it became necessary to charter a number of vessels. As these vessels would be useful, he recommends their purchase. The sum required for six would be 244,000 dols., of which 94,800 dols. must be paid for the use of them for a period of six months, and a porportionate sum for a longer time if no purchase be made. The five steam sloops-of-war authorised by the Act of 1857 will soon be completed. The seven screw sloops-of-war, under the Act of 1858, are in a state of great forwardness. All experience evidences a necessity for an increase of the navy. Twenty effective vessels of smaller class can be built and kept at sea for what it would cost to build and keep at sea four or five vessels of a larger class. Let Congress increase the number of heavy-armed vessels of light draught until we can frequently display our flag at every point where American interests may need protection. The addition of at least ten more vessels of that description is not only a necessary measure, but will be found to be as efficient as any that can be desired, requiring so small an expenditure of the public money. In the construction of the steam-ships authorised by Acts of Congress, it has been the aim of the Department to combine speed and power with strength in the highest practical degree for vessels of their class. Accordingly models have been selected with particular reference to their adaptation to the greatest attainable speed, and contractors for the engines and machinery under the Act of last session have been required to guarantee the result of their plans, by stipulating the number of revolutions to be performed in a given space of time. In placing an estimate upon the value of high speed, the importance of it has not been too highly appreciated. Of two war vessels—the equals of each other in every other respect—the one which has the greatest speed has a decisive advantage over the other, and in a contest is most sure to win. The time has gone by when steam can be regarded in any other light than as the principal motive power on the water for warlike purposes. It is impossible any longer to regard the unsteady and uncertain power of the wind as anything more than an auxiliary power, subordinate to that of steam. In the construction of a war vessel everything connected with it has ultimate reference to a single point, the use of the gun; by which alone, as the means or instrument of power, important results are to be accomplished. To place it in the presence of the enemy, or beyond his reach in the shortest possible time, and to use it with the greatest possible effect, is the great object to be sought for in the construction of a navy or the maintenance of its auxiliary establishments. It is to attain this object that the skill of the departments of ordnance, of construction, and of engineering is taxed to the utmost. They will not rest satisfied until they have given to the service the fastest war ship which skill and science can produce.

RIFLE SHOT.—There are cases in which the expanding principle of lead, or other elastic matter, is not required in rifle shot. For instance, it is not required for breech-loading rifles, neither is it required when shot have projections on them to fit accurately into the grooves of a rifle when loading at the muzzle, nor with the rifle shot of the late gallant and intelligent officer, General John Jacob. It is not required in shot adapted to the two-groove elliptic bore rifle, and for this latter the shot may be made of a mixture of lead and tin, which is desirable for shooting lions, tigers, and other strong wild animals, or wherever great penetration is required.—J. NORTON.

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MR. SCOTT RUSSELL'S PATENT THREE CYLINDER ENGINES.

FIG. 1.

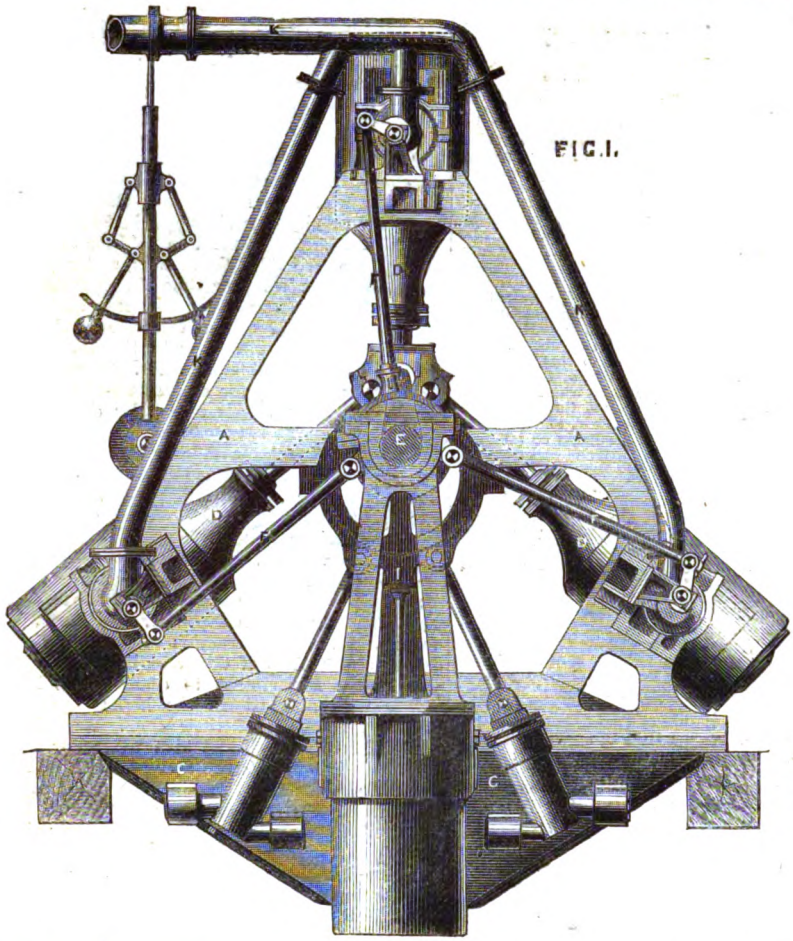
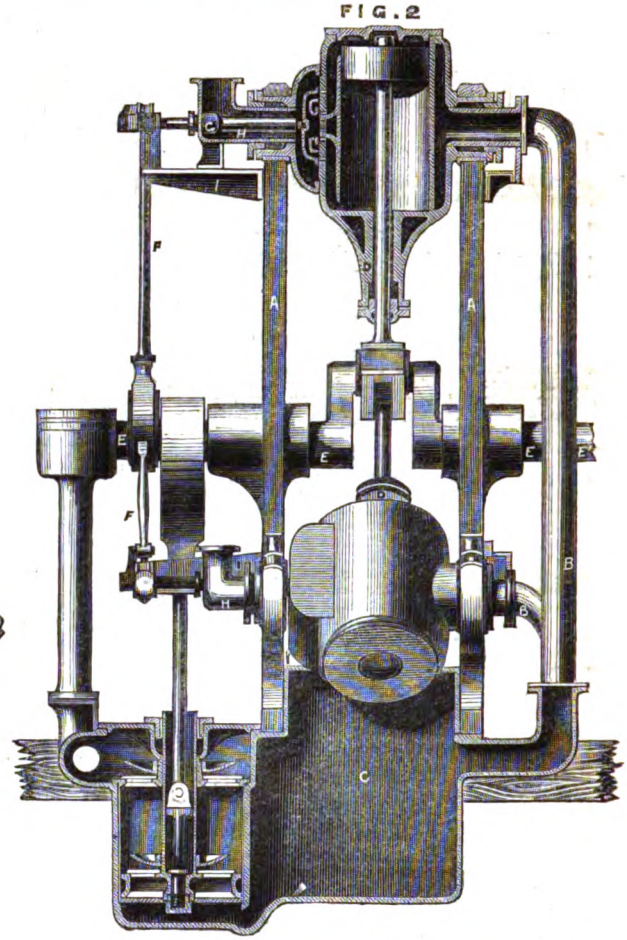


FIG. 2



MR. SCOTT RUSSELL'S PATENT THREE-CYLINDER ENGINES.

THE three-cylinder oscillating engines lately fitted by Mr. J. Scott Russell in the exquisite light draught yacht built by him for El Hami Pasha, deservedly excited much attention. The extreme smoothness of their working, evidenced by the almost entire absence of tremor in the vessel when under steam, was most remarkable, and Mr. Russell has found that a much better result, in so far as indicated horse-power is concerned, is obtained from the three-cylinder engine than from any two-cylinder engine he has ever had in use. The form of engine, although patented some years since by Mr. Russell, has not, we believe, been extensively applied until lately. Now, however, it is to be introduced into a light draught steamer building on the Danube; in another built for navigating the shallow rivers of India (a vessel now lying in the Thames at Millwall), and in other vessels, as well as in the Turkish yacht before-mentioned. Several new engines of the same construction are also in course of manufacture at Mr. Scott Russell's works. As an example of this form of construction, we have, however, selected for illustration, not a marine engine, but a fixed engine, which has been erected to drive a portion of the machinery at those works. Fig. 1 of the annexed engravings is a front elevation of it; fig. 2 is a side view partly in section. The engine is in this case supported by a cast-iron frame, *A*; but for marine purposes the frame is sometimes forged in a single piece, and sometimes formed of plate and angle-iron, suitably arranged and riveted, forming a very light but strong combination. The three oscillating cylinders are supported in the positions shown, the piston-rod of all three coming to the same crank-pin. All the cylinders are jacketed, being cast with an external cylinder or casing for the purpose; the escaping steam keeps the inner cylinder hot. All the cylinders condense through pipes, *B*, into one condenser, *C*, placed below the engine. The cylinders are each cast with long necks, *D*, which act as guides, and improve the steadiness of the engine. The valves are worked by a single eccentric, on the main shaft, *E*, by means of rods, *F*. The valve-spindles pass through long stuffing-boxes, *G*, in the hollow trunnions, *H*, which are also the steam induction-pipes, leading from the steam-pipe, *K*, proceeding from the boiler. The outer extremities of the valve-spindles are supported by brackets, *I*, projecting from the frame, *A*. The arrangement and action of the air-pump, feed-pump, &c., will be understood upon inspection of the engravings. The power is taken from the engine by means of a large bevil wheel (not shown) on the extremity, *E'*, of the main-shaft, *E*. We may remark that the third cylinder is sometimes placed below and the two side-cylinders above the shaft. Mr. Russell has been materially aided in bringing this form of engine to its present perfection by Mr. Dickson, the able and experienced manager of the engineering department of the works at Millwall.

OBSERVATORY IN ALGERIA.—An Astronomical Observatory has recently been established near Algiers by the French Government. Besides making astronomical observations, for which the climate is particularly favourable, it is intended to register the meteorology of the district. The observatory will be under the superintendence of Professor Simon, of the Government Lyceum at Algiers; and M. Bulard, who has been furnished with a powerful telescope, will have the charge of the astronomical observations.

TINDALL'S PATENT STREET-SWEEPING MACHINE.

IN the present age, when men are more than ever bending their powers to the development of something better and more ingenious than their predecessors in almost every mechanical department, it is remarkable that no efficient machine has been introduced to supersede the old and degrading system of hand street-cleansing. Attempts have, it is true, been made to accomplish so desirable a result; but, from the expensive, heavy, and inefficient performances of the machinery used, they have proved abortive, and instead of conferring any positive advantage, have rather been retrograde, and consequently abandoned. The simple fact that such attempts have been made, and the machines experimented with officially, is sufficient evidence, however, that our municipal bodies and street contractors are not insensible to the disadvantages of hand street-cleansing, or opposed to its abolition. There is, perhaps, hardly any occupation which could be named which is more unsuitable for manual labour, or which renders the use of machinery more desirable than that of street cleansing. To cleanse *all* the streets in a town is indispensable. To neglect any is a serious omission, fraught with results far more pernicious to the moral and sanitary well-being of its occupants than is, perhaps, often contemplated. But such neglect of necessity forms part of the present partial and inefficient mode of operation. It is not our present intention to enter minutely into the details of the inconveniences and annoyances of the present plan. Of these, most people who are under the daily necessity of traversing our streets have sufficiently disagreeable proof and reminiscences. Our object is rather to direct attention to the accompanying engraving of a newly-invented machine, just patented by

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TINDALL'S PATENT STREET-SWEEPING MACHINE.

FIG. 1.

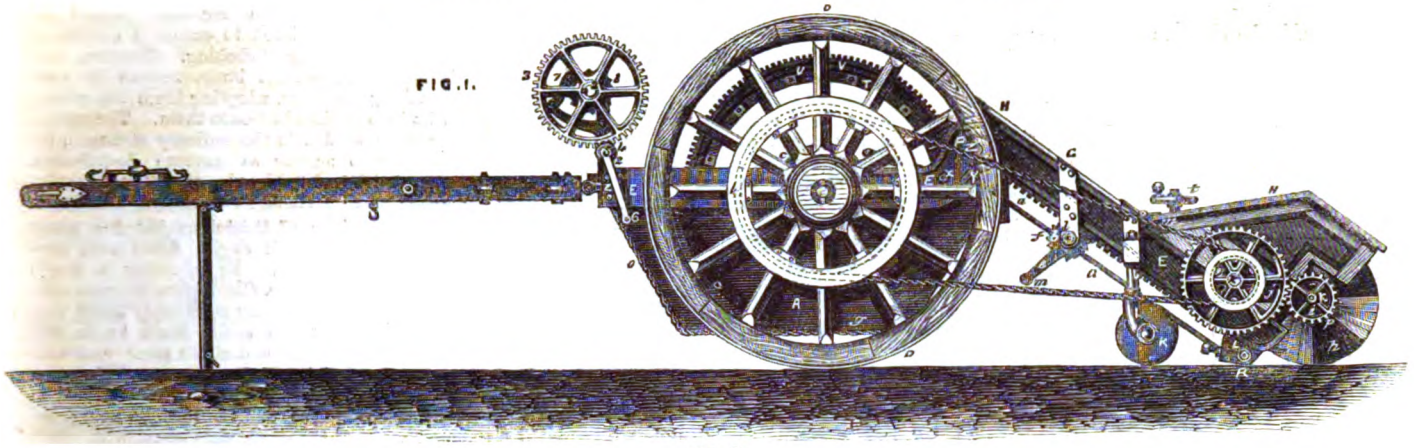
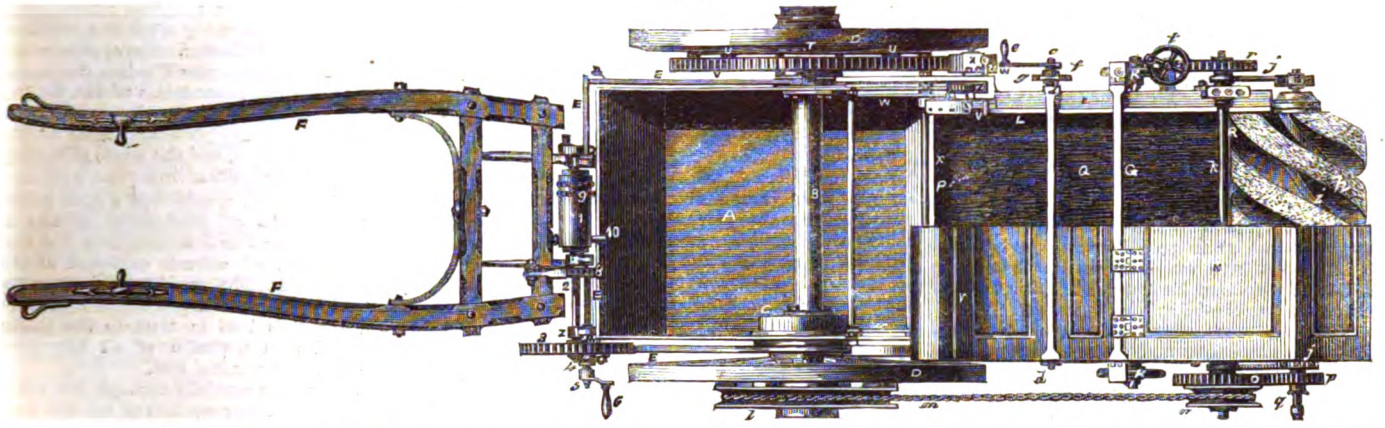


FIG. 2.



Mr. Lorenzo Tindall, of the Sherwood Iron Works, Mansfield. The arrangements of the machinery are exceedingly simple, and, we think, eminently adapted for the purpose. We understand it has been thoroughly tested, both on wet and dry material, and has proved highly successful. Its manifest utility, combined with the low cost at which Mr. Tindall proposes to manufacture it (not much more than that of an ordinary waggon) will no doubt soon cause it to be introduced into every town where economy and cleanliness are considered desirable. At any rate, we have a high opinion of its merits, and hope to see it largely adopted.

Fig 1. of the annexed engravings is a side elevation of the improved machine, and fig. 2 a plan of the same. The body of the machine which forms a receptacle *A*, in which the mud or dirt is deposited is of a trough-like form, and, by preference, of wrought iron. Across it extends a tubular shaft *B*, the flanges of which are bolted on one side to the trough, and on the other to a box or recess *C*, made to receive the nave of the contiguous bearing wheel. The axles of the bearing wheels *D* pass through the tubular shaft *B*, and through the rectangular framing *E*, which encompasses the upper part of the receiver *A*. The front portion of this framing is of wrought iron, and to the transverse piece the horse shafts *F* are attached. The back portion of the framing *E* is curved upwards at the rear-end of the receiver *A*, and thence descends, forming an incline. The inclined portion of the framing *E* is strengthened by transverse tie pieces *G*, and the open metal frame is covered in by the wooden casing *H*; the lower part of this casing extends upwards to allow room for the brush beneath, and it is hinged at the centre to afford access to the interior. Two adjustable pendent brackets *I* are bolted to the opposite sides of the framing *E*; these brackets may be lenghtened or shortened by adjusting the number of washers at the part *J*. Each of the brackets *I* carries at its lower extremity a stud, on which are carried the wheels *K*, which serve to support the framing *E* at the proper height from the ground, the distance being regulated by altering the length of the brackets. Within the inclined portion of the framing *E* is fitted a secondary frame *L*, of sheet iron, strengthened by transverse rods and diagonal stays *M*. The framing *E* has along each of its inner sides a projecting piece of angle iron *N*, upon the upper edge of which the rollers *O* move; these rollers are carried in brackets that are attached to the sides of the moveable frame *L*. The stationary framing *E*, and the moveable frame *L*, are fitted together so as to prevent as much as may be possible the access of dust and dirt to the rollers *O*. A roller *P*, which extends across the framing *L*, is fitted at its upper part; this roller derives its motion from the "off side" driving or bearing wheel *D*, as will be presently described. An endless belt or sheet of thick matting *Q* passes round the roller *P*; this endless belt serves to carry up the mud or dust into the receiver *A*; it is, by preference, made of cocoa-nut fibre, closely woven for the purpose. The endless belt *Q* is strained round a roller *R* arranged at the lower part of the frame *L*; this roller *R* is smaller in diameter than the upper roller, and its bearings are carried in a slot made in each of the side pieces of the frame *L*. By means of the screws *S* the roller *R* may be moved outwards to the extremities of the slots in the side pieces of the frame *L*; this adjustable action affords the means of regulating the tension of the endless belt *Q* as required. An upward traversing motion is communicated to the carrying belt *Q* from the "off side" wheel *D*. This wheel has a metal ring *T* attached to the spokes; to the face of this ring are bolted the brackets *U*, which form a part of or are secured to the toothed wheel *V*; this wheel *V* gears with an intermediate wheel *W*, the spindle of which is carried in a bracket *X* that is bolted to the framing E, and in a downwardly projecting part of the framing. The shaft of the intermediate wheel *W* also carries a pinion *Y*, which gives motion to the pinion *Z* on the spindle of the roller *P*. When the machine is drawn along the ground the gearing causes the carrying belt *Q* to traverse round the rollers *P* and *R*, and any matters deposited on the upper surface of the belt are carried over the upper roller, and deposited in the trough or receiver *A*; the frame *L* is provided with an arrangement for raising it clear of the ground, to admit of the roller *R* passing over any obstruction. At each side of the frame *L*, on its under side, is a rack *a*, in gear with which are two pinions *b* that are fast to a shaft *c*, carried in the pendant brackets *d*. The shaft *c* is put in motion by the winch handle *e*, behind which is fitted the rachet wheel *f*, into the teeth of which the pawl *g*, which is carried on a stud projecting from the framing *E*, falls. Upon turning the handle *e* the frame *L*, with the carrying belt *Q* and its rollers, traverse upwards over the rear end of the receiver *A*, so as to lift the lower end of the frame clear of any obstruction. The mud or dust is swept on to the carrying belt *Q*, by means of the rotatory brush *h*, which consists of a wooden drum *i*, filled with pieces of split cane or wood *h*, arranged helically, as shown. The journals of the drum *i* are carried in bearings, which are fitted in the free extremities of the arms *j*, the other ends of these arms being fast to the horizontal shaft *k*; this shaft *k* works in pedestal bearings that are bolted to the upper face of the framing *E*. Motion is imparted to the rotatory brush *h* from the "near side" wheel *D*, the nave of which is sunk in the recess *C*; the wheel is thus arranged to admit of the brush *h* sweeping up to the curb of the street. To the spokes of the "near" wheel *D* is bolted the spiked pulley *l*, round the grooved periphery of which is passed the endless chain *m*, through the links of which the spikes of the pulley *l* pass as the wheel *D* rotates. The chain *m* is also passed round a spiked pulley *n*, which is cast in one with the wheel *o*, and runs loosely upon the end of the shaft *k*. The wheel *o* gears with the pinion *p* on the spindle of the drum *i*, and thus causes the brush to rotate when the machine is put in motion. The spindle of the drum *i* is made with a feather *q* to admit of the pinion *p* being thrown out of gear when the brush is not required to be in use. The pinion *p* is held fast on the spindle by a key. When the pinion is taken out of gear with the wheel *o*, the key is taken out, the pinion slipped along the spindle and the key put in on the inner face of the pinion. The machine is also provided with an arrangement for adjusting the height of the brush *h* from the ground. On the extremity of the shaft *k*, which projects out from the "off side" of the machine, is keyed a segmental wheel *r*, that is in gear with the vertical worm *s*, which is carried in a bracket projecting from the stationary framing *E*. The spindle of the worm *s* extends upwards above the cover and terminates in a hand-wheel *t*; by turning this hand-wheel *t*, it raises or depresses the segmental wheel *r*, and this being fast to the shaft *k*, which carries the arms *j*, the brush *h* is thereby raised from the ground or lowered, as the material of which it is made wears away. To prevent the worm *s* from turning when not required, a pin is passed through a hole made in the spindle, the extremity of which is fixed in one of a series of notches made in the boss, through which the spindle passes, so that it is kept exactly in the position required. At the upper part of the inclined portion of the framing *E*, is a bolt *u* which is passed through the frames *E* and *L*, and serves to steady the latter whilst the machine is at work. Beneath the roller *P* a brush or scraper is arranged to clean the surface of the belt *Q*, as it passes under the roller *P*. As here arranged, the brush *v*, which extends across the belt *Q*, is attached to the extremities of the two levers *w*, which are centred upon the transverse shaft *x* that is carried in the framing *E*. The other ends of the levers *w* extend towards the front of the machine, and are connected by a transverse rod. In this manner the brush *v* oscillates upon the supporting shaft *x*, so that it may be caused to press with more or less force upon the belt *Q*. A scraper *y* is also shown as adapted for cleaning the surface of the belt *Q*; this scraper may be a sheet of iron or a rod. In the drawing a sheet of iron is shown which is bolted to the receiver *A*. The trough or receiver *A* is hung upon the axle of the wheels *D*, and to admit of its being readily inverted, in order to discharge the contents of the receiver, a windlass is fitted over its front end. The standards *z* are bolted to the front end of the framing *E*; the windlass barrel 1 is carried upon the shaft 2, which has keyed to one extremity the wheel 3; this wheel is driven by the pinion 4 which is carried upon the end of the shaft 5, projecting from the contiguous standard *z*. Motion is given to the wheel 3 by means of the winch handle 6, and the barrel is prevented from turning in the wrong direction by the pawl 7, which falls into the teeth of the rachet

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wheel 1 on the shaft 2. A chain 9 is made fast to the barrel 1, and is carried beneath the trough *A*, and fastened to its rear end; upon winding up the chain 9 the front end of the trough *A* is raised and the contents are discharged at the rear end. When emptied the trough is lowered to the horizontal position and secured by the bolt 10, which passes through the framing *E*. With these several improvements the operation of sweeping the streets by mechanical agency may be effected in an expeditious and highly effective manner.

THE SMITHFIELD CLUB SHOW.

Concluded from page 41.)

S. SMITH (late Fisher), of Thrapstone, exhibited his steerage corn drill, never exhibited at the Christmas shows before. This is a handy little implement for small occupations, and suitable for drilling on hill sides. The wheels can be set to any width, and the coulters are renewable at any time. Mr. Smith also exhibited a new double oil-cake mill, fitted with a moveable grating for regulating the size of the broken pieces. It breaks the cake up very regularly, and is sold at the same price as the single mills.

T. Standing, of Preston, exhibited his churns, in which the sun and planet motion is very ingeniously applied, so as to constitute a most efficient apparatus for churning, or, indeed, thoroughly mixing materials for various purposes. It is contemplated to work out the principle in large machines suitable for brewers, dyers, and others.

E. Page and Co., of Bedford, exhibited their "eclipse" plough, a very efficient implement; as also their brick and pipe machine, capable of making the largest size drain pipes with great accuracy and speed.

J. Braby and Sons, of Newington-causeway, exhibited their patent wheels and axles. These wheels have cast-iron naves, the inner surfaces of which are hardened. The front reservoir or cap for containing the oil is made spherical so as to resist concussion. This cap is attached to the nave by bolts, and has a leather washer between it and the nave to prevent the escape of oil. The spokes of the wheels are bevelled where cut down to fit the naves, so as to avoid the weakening effect of sharp angles. Matters of detail of this character are important and deserve notice, exhibiting practical skill and care in the manufacture.

Kingston and Trowbridge, of 116 Aldersgate-street, exhibited a variety of scales and weighing machines. Their scales and weights on single stand, weighing up to 7 lbs., and sold for a sovereign, deserve special mention. This design has been registered by the makers.

Picksley, Sims, and Co., of Leigh, Lancashire, exhibited a large assortment of chaff-cutters, made of ten different sizes. The No. 3 machines are specially notable from their being constructed so that the rollers may be instantly thrown out of gear, the wheel work being protected, their being fitted with hand levers for regulating the length of cut and the improved form of the knives. This firm also exhibited some very efficient grain crushers and turnip cutters.

W. Snowden, of Longford, near Gloucester, exhibited an improved chaff and litter cutter, capable of cutting ten different lengths from 3-8 inches to 6 inches, by an adjusting lever and without change wheels. In this machine all pressure is taken off the straw before the feed movement comes into operation, which renders the work easy, and prevents choking. Mr. Snowden also exhibited Woofe's patent paring plough, of which he is the maker and proprietor. This implement is worked by one horse, and cuts turf one inch thick, and in uniform lengths of about 18 inches, completely turning them over.

J. Eaton, of Thrapstone, exhibited a novel sheep crib, designed to enable the sheep to feed at ease while keeping the food covered. He also exhibited his corn-dressing machine, in which the fine riddles answer as screens, the tail, small seeds and screenings, being effectually winnowed from the grain. These machines are sold as low as seven guineas.

Messrs. Woods, of Stowmarket, exhibited their improved separate gear, or intermediate motion, for horse power, also one of their excellent portable corn mills, with iron framing and wooden gearing.

Hensman and Son, of Leighton Buzzard, exhibited one of Seaman's ploughs, having cast bosses, which can be easily replaced.

G. Turner, of 196 Great Dover-street, Borough, exhibited various machines for domestic use and at very low prices, including sausage machines, domestic flour mills, and an admirable cream whipping machine or egg whisk, fitted with arrangement for screwing to table. The latter machine we saw used, and although very simple in construction, and so calculated to work almost any time without getting out of order, produces marvellous effects upon eggs, three or four of which can be whipped by it into a compact mass, capable of being cut like butter, in about a minute and a quarter. The price of this machine is only 21s. It does in less than a minute and a half what would take a dexterous hand from 30 to 40 minutes to accomplish.

B. Fowler and Co., of Whitefriars, exhibited a very compact double-acting pump (Holman's), mounted on cast-iron base-plate and column, with spur wheel, pinion and drum, and capable of being wrought by a fixed or portable engine. These pumps are suitable for irrigation, pumping liquid manure, or for manufacturing purposes. They are made capable of raising from 1,100 to 17,000 gallons per hour, and are very completely fitted.

S. and E. Ransome and Co., of Essex-street, Strand, exhibited (Long's) new washes or dressings for sheep, &c., which are prepared without mercury or arsenic, and stated to be "non-poisonous." Some splendid samples of wool were exhibited from sheep dressed with one of these preparations. Messrs. Ransome also exhibited a new wrought-iron dressing fork, invented and made by Henry Inskip, of Potton.

R. and J. Reeves, of Westbury, exhibited one of Chandler's liquid drills, with striers, and new arrangement for working the valves from below them. These drills are also fitted with Chambers' drop apparatus, and have a harrow at back.

J. Warner and Sons, of Jewin-street, exhibited their improved double-action fire pump, which is intended to be used as a fire engine, and liquid manure distributor. The arrangement is very compact—pump, air vessel, and valves all being supported on a wheel-barrow frame, so as to be easily removable. We may also notice Messrs. Warner's new mode of making the pump valves of iron, faced with india rubber, as also the buckets which have leather packings bolted between iron plates.

G. Kent, of 199 High Holborn, exhibited Griffiths' beating, mixing, and churning apparatus, similar in construction to those we have already noticed for whipping cream or whisking eggs and designed for the same purpose. These machines are sometimes provided with an external casing for containing hot or cold water for regulating the temperature of the material operated upon.

James Haywood, jun., of Derby, exhibited his two-horse portable engine with vertical cylinder, all the tubes of the boiler being screwed in. The feed pump is made with a regulating valve for overflow of water, and the funnel is made detachable for easy transport. Mr. Haywood is now constructing thrashing machines suitable for these small engines.

Ransome and Sims, of Ipswich, exhibited a very large assortment of machines and implements, of course including their new horizontal root-cutters, which gained the prize at Chester. This firm, as the constructors of Fowler's steam ploughing apparatus, exhibited drawings of this machinery, which was at work during the show near the Redhill station and at Cann Hall Farm, near Stratford. Fowler's steam plough, taken in connection with his system of working it, has now obtained £825 in prizes, including the £500 prize given at Chester, after three years' competition, by the Royal Agricultural Society.

Smith and Ashby, of Stamford, exhibited one of their two-horse portable engines, with newly-arranged doors for enabling the tubes to be cleaned without taking off the front plate. Also their chaff-cutters, with improved pegged and fluted rollers, calculated to ensure a continuous feed without liability of choking. This firm have also introduced several improvements in their hay-making machines, adapting them for cutting thistles by a slight addition to them. The springs being made of double the ordinary strength, the machines also answer as manure distributors. Messrs. Smith and Ashby also exhibited a newly-arranged small portable corn-grinding machine.

Wm. Cambridge, of Bristol, exhibited a model of an ordinary portable engine, fitted with Boydell's endless railway. By adopting a simple steering apparatus, Mr. Cambridge believes ordinary portable engines may be cheaply fitted with Boydell's wheels, which enable them to be self-moving, at small cost, and at the same time suitable for working in the usual way. The model exhibited was very well arranged, and turned in its own length, the endless railway being dispensed with on the single fore-wheel with which the engine was fitted.

W. Smith, of Mark-lane, exhibited a model of his well-known steam-ploughing apparatus, which received a gold medal at Chester. The apparatus was at work on Flemish-farm, near Windsor, during the show. The great recommendation of Mr. Smith's plan of steam-ploughing is the cheapness of the apparatus—the ordinary portable engine costing from 235*l.* to 250*l.* only, and the whole ploughing apparatus, including 1,400 of iron rope, 192*l.*

Spencer Read and Co. exhibited a good collection of photographs of machinery, as also of cattle—which latter this firm have been the first to take—that is, of all animals exhibited at the agricultural shows. The rapidity and accuracy with which likenesses of favourites can be thus taken will doubtless lead in time to the public being supplied with portraits of all the prize animals at a merely nominal cost.

We have now gone carefully through the whole of the stands where any matters of novelty were exhibited, and have said enough to give those who could not attend the show a fair notion of what was to be seen. Our remarks have necessarily been very much compressed from want of space, but we believe nothing of importance has been overlooked.

COVERINGS FOR FLOORS, &c.—The production of a good, durable, and cheap covering for floors, embracing the advantages of softness and elasticity, has long been sought for. Carpets, whether of Brussels or Kidderminster, are expensive, and soon show signs of wear, besides which they are not adapted for halls, offices, or public buildings. To meet this want a composition called Kamptulicon has been extensively introduced in churches and other places, but after trial has been discarded as useless, on account of its extreme brittleness—or, perhaps, "*shortness*" would be a better term—as after it has been down for some time it breaks or crumbles on being taken up, very much like oat-cake. This may be a defect that possibly in time might be overcome by experimenting with the composition of which it is made, though most likely the result would be a hard compound. We have made these remarks to introduce a very beautiful invention especially designed for the purposes in question. The patentee is Mr. Dunn, of Messrs. Charles Goodyear and Co. (the inventor of the Vulcanization of Indian Rubber), for combining a mixture of cork, cotton, wool, and other fibrous materials of any colours and fineness with India Rubber, and spreading them upon a canvas, cotton, or woollen back, which is then subjected to a process by which the carpet in embryo can be embossed, either plain or in colours, the result being a material of great permanence and beauty. It has all the softness of the carpet with an elasticity and noiselessness of tread that constitutes the beauty of a real velvet pile Brussels, and there is very little doubt will supersede anything now in use—even the old oil-cloth of our childhood.

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NOTICES.

Numbers 1845 and 1846 of the MECHANICS' MAGAZINE (original series), containing the paper read at the Society of Arts, Dec. 15, 1858, "ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY IN RESPECT OF DIMENSIONS, FORM, MEANS OF PROPULSION, AND POWERS OF ATTACK AND DEFENCE," by one of the EDITORS of this Magazine, together with the discussion upon the same, are still on sale.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 6d. per line for any number of insertions less than 13; for 13 insertions, 5d. per line; and for 52 insertions, 4d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 6 o'clock on Thursday evening each week. None can be received after 9 o'clock on Friday morning for the ensuing number.

TO CORRESPONDENTS.

R. Armstrong.—The proposal suggested by you has been contemplated, and will be carried out speedily.

J. A. Davies.—Thanks for letters. The weekly list of contents will not be necessary after the half-yearly index has appeared, and the volume is bound.

W. Bennet—The prices current of metals will be regularly published each week for the future. Their non-appearance last week resulted from a misunderstanding.

K. K.—It is quite possible, and even probable, that we shall find it necessary to still further enlarge our Magazine before very long; but no further advance in the price will be made.

We have to thank several correspondents for letters on the "Conservation of Force." We desire it to be known that our excellent correspondent, "A Mechanic," undertook the series of letters in course of publication at our request, and we can give place to no criticisms upon them until the series is concluded.

*** The conclusion of the report on "Shipping Statistics" is unavoidably deferred until next week.

Law Cases.

SPENCE'S PATENT TIN AND LEADEN PLATES.

COURT OF CHANCERY, Lincoln's-Inn, Jan. 12.—Before the LORD CHANCELLOR.

RE SPENCE.

THIS was a petition of James Spence, of Liverpool, praying that the great seal might be attached to a patent for an improvement in the manufacture of tin plates and terne or leaden plates, notwithstanding a *caveat* which had been entered by Messrs. Clay, of the Mersey Ironworks, Liverpool, and Messrs. Vickers Benzon, of Sheffield, on the ground that the article of "puddled" steel, upon the application of which the patent was sought for, was not a new invention.

Mr. Malins and Mr. Webster (of the common law bar) appeared for the petition; Mr. Hindmarch and Mr. Drewry were for the opposition.

The LORD CHANCELLOR said that this was one of the cases in which the question in dispute between the parties ought to be tried at law. By refusing to seal the patent this Court would prevent such right from being exercised, and therefore the proper course would be to order the patent to be sealed.—Ordered accordingly.

The above report has been furnished by the ordinary reporter. The following letter, however, puts the matter in a somewhat different light:—

To the Editors of the MECHANICS' MAGAZINE.

"Gentlemen,—The shorthand writer for the papers not being an "expert" has fallen into error in his report of this case. The statement sent forth by the *Times*, and other journals, makes it appear that the invention of Puddled Steel (patented by Mr. Ewald Riepe) was not a novelty. This was never mooted, and is unquestioned. Mr. Spence's application was for a patent for making tinned plates from puddled steel, which was opposed by Mr. Clay (Mersey Steel and Iron Co., Liverpool), and by Mr. Benzon (Naylor, Vickers, & Co., Sheffield), on the ground that Mr. Spence cannot claim a patent for using *puddled* steel for tinned plates, as tinned plates have been previously made from steel manufactured in the ordinary way, and that therefore there was no novelty in steel tinned plates, and that if there were that Mr. Clay suggested the idea to Mr. Spence. The Lord Chancellor allowed the great seal to be attached to Mr. Spence's patent, stating as his reason for so doing, that if he refused it Mr. Spence would be deprived of all redress, whereas if he granted it, the opponents to the application would have their remedy by trying the issue at common law, adding, that this was just a proper case to go to such a tribunal, and which course will be adopted. As the MECHANICS' MAGAZINE is read by practical men, it is desirable that this matter should be correctly placed before them; and as you will doubtless report the case, may we request you to permit this explanation to appear in your next publication, and oblige Your obedient servants,

The MERSEY STEEL AND IRON Co.,
per W. Y. V., Jun.

NORTON'S REGISTERED SHAWL.

COURT OF QUEEN'S BENCH, Westminster, Jan. 14.—Sittings in Banco, before LORD CAMPBELL and Justices WIGHTMAN, CROMPTON, and HILL.

NORTON *v.* NICHOLLS.

MR. KNOWLES, Q.C. (with whom was Mr. Webster), moved, pursuant to leave reserved, for a rule calling upon the plaintiff to show cause why the verdict found in his favour should not be set aside and a nonsuit entered, or why the verdict should not be entered for the defendant. The action was brought to recover damages for the infringement of the plaintiff's design of a shawl registered under the 5th and 6th Victoria, cap. 100. The plaintiff's case resolved itself into five points, which constituted the alleged design. 1. It had a reversible or double texture; 2. it had a scallop which was said to be a new design; 3. whereas the body of the shawl was double, the border was single; 4. one of the four corners was rounded; and, 5., the fringe was of a particular manufacture. Only the 2nd and 4th came within the Act—viz., the scallop and rounded corner—and they were both old; but the plaintiff claimed the combination of the five points as constituting a new design within the Act, which was the question now to be determined. There was also a question as to the notice given to the defendant, who was the vendor, as required by the 7th section.

Lord CAMPBELL said the learned counsel might take a rule to show cause.—Rule *nisi* granted.

SHIPBUILDING ON THE WEAR.

SOME sensation has been created this year by the publication of the annual statistics in reference to the shipbuilding trade on the Wear. The following table shows the number of ships built at Sunderland since 1847, with their aggregate and average tonnage:—

Year.	Ships Built.	Aggregate Tonnage.	Average Tonnage.
1848	142	37,878	266¾
1849	155	44,333	286
1850	158	51,374	325¼
1851	146	51,823	355
1852	142	56,645	398¾
1853	152	68,479	454½
1854	151	66,929	443¼
1855	151	61,159	405
1856	154	63,047	409¼
1857	143	54,780	383
1858	110	42,003	381¾

It appears, from the following classification, that there has been no falling off in the quality of the build:—

	Class.									
Years.	5	6	7	8	9	10	11	12	13	14
1850	1	3	13	88	17	15	0	7	13	1
1851	1	3	8	81	17	14	2	7	13	0
1852	0	2	6	74	6	25	1	6	20	0
1853	2	0	4	77	10	25	0	5	27	0
1854	0	1	7	86	13	19	1	2	21	0
1855	0	0	8	67	32	22	3	1	16	0
1856	0	0	7	50	33	23	11	1	27	0
1857	1	0	4	51	43	18	10	2	14	0
1858	1	0	2	36	24	23	7	1	15	0

1 not classed.

The smallest vessel built last year was the *Derwent*, 49 tons, and the largest was the *Holmsdale*, 1,257 tons. Sunderland is her own best customer as regards the ports to which her ships are sold, and Shields and London rank next.

There is very little iron shipbuilding on the Wear, only one builder (Mr. Laing) being so engaged. In 1857 one iron vessel of 610 tons was built, while last year three ships of an aggregate tonnage of 2,160 tons were turned out.

INDIAN ITEMS.

A STEAM ferry is to be established on the Indus at Attock. Steam ferries, it is stated, will be more numerous in future on the Indian rivers. At present, however, considerable difficulty is experienced in repairing engines when they get out of order.——A railway bridge of stone and iron, projected over the Jumna, will be a great work when carried out. The following are a few details on the subject:—Length of bridge between faces of abutments, 3,224 feet; number of openings, 15; distance from centre to centre of piers, 219 feet 9 inches; spans of openings in the clear, 205 feet; and depth of the bottom of foundations below low water level, 50 feet. The railway will be 81 feet above the low water level. The iron work of the bridge is, it is understood, being executed at Newcastle.——The Kurrachee Cantonment Water Company is to be dissolved, 20,000 rupees having been expended without success.

THE FOUNDER OF THE LONDON MECHANICS' INSTITUTION.—The *Times* having alluded in a leading article to Lord Brougham as the founder of the above Institution, Mr. Hodgkin, who was assistant to the late J. C. Robertson, in 1823, has written to the newspapers, stating and proving that it was Mr. Robertson, the founder and first editor of the MECHANICS' MAGAZINE, who originated it. This statement was made some months since on a somewhat similar occasion, but the present Managers of the Institution have chosen to ignore the fact, and to continue to propagate the false belief in Lord Brougham's origination. They deserve the evils which have come upon them. At the same time we wish them well out of their difficulties, while despising their misrepresentations.

WOOD CARVING BY MACHINERY AND HAND LABOUR.—We are happy to find that the really beautiful machines which were formerly worked under the Jordan patent in the Belvidere-road, Lambeth, and to which the Houses of Parliament, and many other important buildings in Europe are indebted for their carved woodwork, have not shared the fate of the company that fruitlessly attempted their commercial development, but are now in active and profitable operation under the management of Messrs. Cox and Son, the well-known ecclesiastical furniture-manufacturers, who, after purchasing them, removed them to some new premises exactly opposite their former *locale*. The reason of the previous failure of this machinery would appear to have been that too much was required of it, and its present success is attributed to the confining of its operations to merely the rough definition of the form and pattern desired, and the calling in of hand labour to finish and perfect. By this a vast saving in the cost of the most ornate wood carving is effected, and consequently the demand for ornamentation of this description has increased to an extent which it is said will shortly compel the Messrs. Cox to double the number of the machines employed by the late company.

NOTES FROM THE EASTERN DISTRICTS.

[FROM OUR OWN CORRESPONDENT.]

The London, Dunmow, and Bury St. Edmunds Railway—Brick and Timber Bridges—Landing Stages at Ipswich—The New Telegraph Line to the Continent—Rating of Gas Company—Gas at Watton..

THE projected direct railway from the metropolis to Bury St. Edmunds *vid* Dunmow and Clare will not—at least so says a local paper—be proceeded with in the ensuing session of Parliament. The reason given is the late period of the season at which the affair was taken in hand. The plans and surveys are, the same authority consolingly adds, available for a future year.—A long timber bridge on the Great Northern Railway at Bardney has been for some little time past in such a condition that the Company has determined to substitute for it a brick and stone structure. This will involve an expenditure of £10,000, and the contract has been let to Mr. Jay, of London.—The Ipswich Dock Commissioners have determined to have two landing-stages at that port. One of them is nearly finished, and the engineer has been instructed to proceed with the second.——There has been a good deal of talk lately about a new telegraph from the metropolis to the continent *vid* Norwich, and it was stated a month since that the line would be ready for the transmission of messages by this time. The company (British and Irish Magnetic) seems to have met with unexpected difficulties in passing through some of the towns on the way, the original plan having been departed from at Norwich, while at Newmarket it is said the wires will have to be carried underground.—The Cambridge Gas Company occupied the local sessions two days at the close of last week with an appeal against the valuation of the property by the guardians, and the poor-rates consequently levied. The proceedings were tedious in the extreme, three learned counsel being retained on each side. At last the Recorder gave judgment, and decided that the assessment of the company's property should be £1,700. The company urged that it should be £750, and the guardians put it at £2,400. Mr. O'Malley, Q.C., on the part of the company, applied for a case for the opinion of a superior court. This was granted by the Recorder, who said he would respite the appeal against the rate sought to be imposed from session to session until judgment was given by the superior court. Evidence was given in the course of the proceedings by several gentlemen of experience in gas matters, but as the case involved merely matters of detail, it did not present features of general interest.—Steps are being taken to extend the benefits of gas lighting to the town of Watton, Norfolk. The necessary works will require an outlay of £1,200, and this sum is to be raised by a company formed under the Limited Liability Act.——Before an inventor of an agricultural implement can exhibit at the future meetings of the Norfolk Agricultural Society, he must pay an annual subscription of one guinea.

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THE SCOTCH PIG-IRON TRADE.

MESSRS. SHAW and THOMSON, of Glasgow, supply the following interesting statistical information with regard to the condition of the Scotch pig-iron trade since 1847:—

	1858.	1857.	1856.	1855.	1854.	1853.	1852.	1851.	1850.	1849.	1848.	1847.
Total Foreign Shipments	238,125	294,232	258,738	244,320	283,903	318,020	224,370	192,610	134,710	153,200	162,200	144,000
Total Coastwise, Shipments and per Rail to England	319,875	233,768	246,262	297,680	301,097	316,980	210,530	260,090	189,490	221,700	227,800	227,000
Total Shipments	558,000	528,000	505,000	542,000	585,000	635,000	434,900	452,700	324,200	374,900	390,000	371,000
Local Consumption	275,000	312,000	325,000	350,000	300,000	300,000	215,100	242,300	225,800	225,100	200,000	225,000
Total Deliveries	833,000	840,000	830,000	842,000	885,000	935,000	680,000	695,000	550,000	600,000	590,000	596,000
Computed Make	980,000	910,000	820,000	822,000	775,000	710,000	770,000	775,000	630,000	692,000	600,000	540,000
Stock, 30th December	337,000	190,000	120,000	130,000	150,000	225,000	440,000	350,000	270,000	190,000	98,000	88,000
Increase of Stock	147,000	70,000	.....	.....	.....	.....	90,000	80,000	80,000	92,000	10,000	.....
Decrease of Stock	.....	.....	10,000	20,000	80,000	225,000	.....	.....	.....	.....	.....	56,000
Average Number of Furnaces in Blast	129	128	117	117	116	111	110	114	105	113	103	100
Highest Price	60/	83/6	81/	83/6	92/3	81/	77/	44/9	51/	53/	51/	77/6
Lowest Price	52/	48/6	65/6	53/6	63/6	49/	35/6	37/6	41/3	41/6	40/	47/
Average Price	54/5	69/3	72/6	70/9	79/8	61/5	45/3	40/	44/3	45/6	44/4	65/
Variation	8/	35/	15/6	30/	28/9	32/	41/6	7/3	9/9	11/6	11/	30/6

NOTES FROM THE SOUTH WEST.

[FROM OUR OWN CORRESPONDENT.]

Somerset Central Railway: Wells and Glastonbury—Little Down and Ebber Rocks Mineral and Mining Company—Drinking Fountains for Southampton—The Water Supply of that town—Public Clocks—New Steamers for the Turkish Government—The Naval Service—London, Bristol, and South Wales Railway—Steamers for the Brazilian Coasting Trade—The Screw-Steamer Mauritius—The Royal Engineers—Organ for Barbadoes—Bristol Trade: Accommodation for Ocean Steamers.

THE chairman and directors of the Somerset Central Railway have made an experimental trip over the new portion of the line between Wells and Glastonbury. The contractor's engine left Glastonbury at 12·30, and arrived at Wells shortly before one. The works are very forward, and it is expected that the line will be ready for traffic in the course of February.——It is understood that a limited liability company has agreed for the purchase of the Little Down and Ebber Rocks estate on the Mendip Hills, with 235 acres of adjoining land, in order to develop its resources. The estate lies in Wookey and Wells, in Somersetshire, and is reported to contain vast deposits of manganese and iron, ochre, argentiferous lead ores, and other products. The prospectus is a very sanguine one, and states that the price to be paid for the property under consideration is £40,000. ——Mr. Melly (of Liverpool) has kindly offered to supply gratuitously to the town of Southampton a polished granite drinking fountain with appurtenances. Mr. Pegler has offered to pay the expenses attendant on the erection. Mr. Cooksey has also offered to supply, at his own expense, a drinking fountain, and suggests the bottom of Bernard-street as a fitting site.——The average quantity of water supplied to Southampton from the new reservoirs, exclusive of the old reservoirs, is reported to be 705,925 gallons by day, and 464,887 gallons by night. Some complaint has been made of the great consumption of coals at the works, but it is stated that this is to a great extent attributable to the waste of water, especially at night. In Southampton 6,653 houses are supplied with water, exclusive of a number of public and private establishments. The consumption is estimated at 185 gallons per house per diem; and it is stated that in London, in 1850, the supply was 164 gallons per house, and in 1856, 246 gallons. The subject of the erection of additional engines at Mansbridge has been referred to the Special Works Committee of the Local Board of Health, with power to consult Mr. Summers and obtain from him a report as to the power of the present engines, and their capability of supplying the quantity of water required for the town, and also whether the present staff of men employed are required for working the engines, and what quantity of coals it is necessary to consume.——The same committee of the same board has also had referred to it a suggestion as to the propriety of regulating the public clocks of Southampton, a clause in the act under which the local board is constituted authorising it to establish and take care of clocks. The town-clerk (Mr. Deacon) expresses his opinion that the clause does not apply to church clocks.——One must strain a point, and pass over a little blue water to notice the interesting fact that the keels for four new steamers for the Turkish Government have been laid in the ship-building yard of the Messrs. White, at Cowes. They are to be despatch boats, and the tonnage of the largest will be 300 tons.——*On dit*, that it is the intention of Sir John Pakington, the present First Lord of the Admiralty, in distributing to distinguished naval officers the few rewards of meritorious conduct which are at his official disposal, to divide them as equally and fairly as possible among the most deserving officers, and not to give good service pensions to the superintendent of docks or victualling yards, or officers holding other profitable appointments during the time of their holding such positions.——Mr. James Spence, chief foreman of the steam factory, Portsmouth Dockyard, has been presented by his brother officers with a handsome gold watch, as a proof of their appreciation of the zeal, energy, and intelligence displayed by him in the matter of their superannuation.——In the matter of the London, Bristol, and South Wales Railway, it has been decided to make a return to the shareholders of the assets, and to finally wind up the affairs of the undertaking.——Two steamers have been recently constructed in the north, for the Brazilian coasting trade. One of these has been named the *Gonçalves Martins*, and the other the *Valeria do Sinimbee*, and they are the property of the Bahia Steam Navigation Company. They are to be employed in the coasting trade between Bahia and the ports north and south, and have each accommodation for 120 first and 40 second-class passengers, exclusive of captain, officers, and crew. The following are the leading details of the *Valeria do Sinimbee*, which closely resembles the *Gonçalves Martins*—is, in fact, a sister ship:—length between perpendiculars, 200 feet; extreme breadth, 26 feet; depth of hold, 11 feet 9 inches; burden in tons (o.m.), 663; tonnage per register, 374·1. The engines are of 120-horse power, and are on the oscillating principle. The *Valeria*—one must shorten such a hard name—will carry 140 tons of cargo and fuel for five days on a draught of 7 feet 6 inches. On a trial trip from Hartlepool to Southampton, a speed of 12½ knots per hour by patent log was attained. Both vessels were designed by and built under the superintendence of Mr. Herbert L. Thompson, naval architect in connection with the firm of Messrs. A. Brett and Co., Leadenhall-street. The *Gonçalves Martius* has already arrived at Babia, and the *Valeria do Sinimbee* (which is named after the late president of the province of Bahia) is on her passage out.——The screw-steamer *Mauritius* which was recently employed as a government transport to India and China, has been thoroughly overhauled, since her return from eastern waters, by Messrs. Summers and Day, of the Northam factory. On a trial trip in Stokes Bay, the other day, she attained an average speed of 10·935 knots per hour, her draught of water being 14 feet 9 inches forward, and 16 feet 2 inches aft; pressure of steam, 14 lb.; average revolutions of engines, 48. The *Mauritius* is 2,125 tons register, and 300-horse power; she is fitted with a Griffith propeller, 15 feet 6 inches diameter, and 25 feet mean pitch.——Lieut. E. R. James, Royal Engineers, has been appointed from special service to ordnance survey, Southampton.——Messrs. Smith and Sons, of King-square, Bristol, have completed a fine and powerful organ for Barbadoes Cathedral, West Indies.—— The trade of the port of Bristol is increasing, as appears by the customs receipts for the past three years. In 1856 these receipts were £1,193,378; in 1857, £1,212,357; and in 1858, £1,295,559. The increase arises entirely from augmented commerce with foreign countries.——It is stated that an engineer in Bristol has a scheme for providing accommodation in the port for ocean steamers; and some interest appears to be felt in the subject. "The first improvement," writes a correspondent of a local paper, "should be the removal of the heap of mud known as 'the swash,' from the river's entrance. This accomplished, there would be depth of water from Sea-mills to King-road sufficient to enable steamers to arrive at and depart from the former place at all states of the tide; and by dredging, accommodation could be found for the largest vessels."

METAL AND COAL TRADES, &c.

[FROM OUR OWN CORRESPONDENT.]

Quarterly Meetings of the Iron Trade—South Wales Trade—North of England Iron Trade—St. Helen's Trade—Trade of Blackburn—Birmingham, Wolverhampton, and South Staffordshire Trades—South Staffordshire Colliers and the Coal Trade there.

THE Quarterly Meetings of the Iron Trade have passed, as it was previously anticipated they would do, without any change in existing prices, but with the prevalent opinion that the prospects of the trade are of a satisfactory, indeed, of an auspicious character, notwithstanding the unpleasant turn which matters have unexpectedly taken in connexion with foreign affairs. It is understood that within the last week or two many orders have been received from Australia and India, and from the United States, and that all the principal makers are well supplied with orders.

It is stated that there has been a larger quantity of finished iron sold at the late Quarterly Meetings than on similar occasions for two or three years past, and that the business transacted has been of a *bonâ fide* character.

There seems to be no doubt that the almost empty condition of the warehouses of the iron merchants at home and abroad will shortly lead to an increased demand. A large number of orders for rails and railway iron plates for various purposes must of necessity, it is said, be in the market in the course of a few months.

In the South Wales district the iron trade remains *in statu quo*. The dulness usual at this season of the year is prevalent. Prices have undergone no alteration. The coal trade is somewhat unsettled; but one or two fresh government contracts have caused a little more animation.

In the Northumberland and Durham districts, the coal and iron trades show signs of increased vitality

In the Derbyshire district increased buoyancy has begun to be manifested in several departments of business. For merchant bars there is a fair demand, sheets and plates are in more general request, whilst for railway iron-work there is a briskness in the demand which has not been experienced for some time past.

There is as yet but little improvement in any branch of manufacture at St. Helen's, and great numbers of skilled workmen continue out of work. The foundries have rather more doing, and at one place the turners have struck work to obtain the same rate of wages as was given before the last reduction.

The general improvement in the trade of Blackburn has caused the whole of the mills that were standing twelve months ago, with one exception, to be sold or taken. The first sod has been cut for a new mill; it is to contain preparations for 20,000 spindles. Others are talked about.

The manufacturing trades of Birmingham, Wolverhampton, and the surrounding districts do not afford much matter for comment; no perceptible change having taken place within the last few weeks. Generally full time is being worked.

The colliers of South Staffordshire have issued an address to their masters, asking for a rise of 6d. a day, but as coal has not yet got up sufficiently to warrant an advance, their application will not be granted.

CURRENT EVENTS

IN THE CENTRES OF THE IRON, COAL, MACHINE AND SHIPPING TRADES.

[COMPILED BY OUR OWN CORRESPONDENT.]

Commencement of a Railway Viaduct—The Tender for the Eden Valley Railway—Preston "Watching" a Railway Amalgamation Bill—The Indian Telegraph Cable—New Docks at Liverpool—Entries into Liverpool in the past two years—Wrecks in Liverpool Bay—Iron Ship Launch—Sunderland Shipwrecked Mariner's Society—Havelock Memorial—Preston Operatives and the Factory Act—Coating Iron Boilers with Zinc—Working Man's Institute Building in North Staffordshire—Opposition to Machinery—Serious Strike of Colliers—Association for Prevention of Steam Boiler Explosions—Isle of Man Telegraph—Discovery of Coal 1,000 feet above the Sea Level.

THE ceremony of laying the first stone of the Dellicar viaduct at Lowgill, on the Lune Valley Railway, has been performed. The engineer, J. E. Errington, Esq., (of Messrs. Locke and Errington), delivered the opening address, stating that the work about to be commenced was of great magnitude, consisting of a viaduct of 11 arches of 45 feet span, more than 100 feet in height, and containing about 400,000 cubic feet of masonry.——The tender of Messrs. Lawton Brothers, contractors, of Newcastle-upon-Tyne, has been accepted for the construction of the Eden Valley Railway, which commences at Clifton Station, near Carlisle, and terminates at Kirby Stephen, being a distance of 22 miles.——The Preston Town Council have appointed a committee "to watch the Lancashire and Yorkshire and East Lancashire Railways Amalgamation Bill, and to take steps for protecting the interests of the borough, and limiting the amount to be charged by the amalgamated companies for tolls and carriage."——The length of cable for the Indian telegraph from Suez to Aden, manufactured by Messrs. Newall and Co., was to have been despatched from Liverpool yesterday the 20th instant, in two vessels.——The association for the prevention of steam boiler explosions held their annual meeting in Manchester Town Hall on Monday. Mr. Wm. Fairbairn, C.E., F.R.S., president, occupied the chair. The report of Mr. R. Longridge, the late chief inspector, showed that the number of boilers under inspection at different periods was—In 1856, 1,401, the income being £1,285; 1857, 1,532, with an income of £1,599; 1858, 1,561, with an income of £1,638. The revenue of the year was £1,757 3s. 6d.; and the balance remaining

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in the Bank was £1,051, against £1,003 at the commencement of the year. "On the whole, the committee regard the financial portion of the Association with greater confidence than hitherto." The ordinary services rendered by the officers had been—Visits by chief inspector, 513; quarterly visits by sub-inspectors, 2,580; thorough internal and external examinations, 235; annual indications of engines, 603. Special services: Examinations by sub-inspector, 114; additional indications by sub inspectors, 138; special indications by the same, 6. The committee regret that although provision was made "for one thorough internal and external examination per annum of every boiler under their superintendence, yet only 235 such examinations have been made, out of a total of 1,561." Adding the 114 special examinations, the total was only 349. As regarded the important question of the incrustation of boilers, the committee "as a basis for further investigation, have deemed it expedient that the water supplying boilers in various parts of the district should be analysed;" and Dr. R. A. Smith was engaged in that object. The chairman, in moving the adoption of the report, said that he had recently investigated the causes of explosion from collapse of flues, and had found that the strength of a flue was in inverse proportion to its length. A flue of 15 feet in length would bear twice the pressure per square inch of one of 30 feet. He was also about to carry out some experiments with respect to surcharged and combined steam.——The Isle of Man Telegraph Company is proceeding very satisfactorily with its preliminary labours. Shares covering a sum larger than the capital required, are understood to have been already applied for.——The Park Lead Company, whilst sinking another shaft from the top of of a high mountain, at Minera, near Wrexham, in search of ore, have discovered a stratum of coal about 500 feet above the valley, and 1,000 feet above the level of the sea.——The New Liverpool Dock Board have resolved to apply to Parliament or powers to borrow £300,000 for the purpose of improving and extending the Liverpool Docks——The *Customs Bill of Entry* gives the following as the number of vessels registered at the port of Liverpool:—For the year ended December 31, 1857, 2,339 vessels and 936,073 tons; for the year ended December 31, 1858, 2,395 vessels and 953,955 tons: increase on the year 1858, 56 vessels and 17,882 tons.——From the return of wrecks in Liverpool Bay, it appears that during last year (1858) 25 vessels were wrecked. Of these 12 were totally lost, and the remainder, with four exceptions, either raised or removed. Other statistics show that during 1858, 16,726 vessels passed inwards, through the Victoria and other northern channels, to and from Liverpool. This makes a total intercourse of 34,402 vessels. During 1857, the total intercourse was 39,139.——There has just been launched from the building yard of Mr. J D. Marshall, South Shields, a new iron paddle-wheel steamer, to be fitted with a pair of engines of 60-horse power nominal. It is of the same size and power as the four steamers previously sent by the same builder to St. Petersburg and Liverpool.——The Twenty-fifth Annual Meeting of the Sunderland Shipwrecked Mariners' Society has been held. The report stated that during the past year the committee had relieved 35 widows, with 46 children, to whom they had distributed the sum of £111. The total number of cases relieved by the society since its formation in 1833, was stated to be 779 women, and 1,533 children, and the sum expended in relief had been £2,688 19s. —— The Sunderland Havelock Memorial Committee have resolved that the memorial shall be a colossal statue in bronze, figure not exceeding nine feet, mounted on a granite pedestal from ten to twelve feet high. The designs are to be received on the 7th of February next.——The Preston operatives have resolved to memorialise the Home Secretary for a more stringent enforcement of the Factory Act, which "has been and is being openly and grossly violated."——Two persons have been nearly poisoned in Berkshire from drinking wine that had been boiled in an iron boiler coated with zinc. The *Berkshire Chronicle* says:—"It is evident that galvanised iron boilers are quite unfit to be used for making of wine, or boiling fruit of any kind, as the acid in the fruit dissolves a portion of the zinc, forming a highly poisonous solution."——A beautiful building for the purposes of the Working Man's Institute, Hartshill, Stoke-upon-Trent, erected at the sole expense of Colin Minton Campbell, Esq., at a cost of some £600, after a design of Mr. Robert Edgar, architect, has been opened to the public.——"The United Society of Cordwainers of Stafford" have issued an address calling upon their fellows to resist to the utmost any attempt by the masters to introduce into that town machines for binding boot tops, and to refuse to work up any tops so bound. These machines are already in use at Kendal and other places.——A strife of a serious nature has taken place between the unionists amongst the colliers of Wigan and the police there; the colliers in question determining to prevent any of their number from returning to work, assembled "many thousands" strong, it is said, pelted the police with stones, and threatened to fire upon them if they further attempted to prevent them from carrying out their object. The arrival of the military from Manchester restored order.

LIST OF NEW BOOKS.

Art-Treasures Examiner, 2nd edit., oblong folio, cl., 12s.
Cappa's National Debt financially considered, c. 8vo. 7s. 6d.
Commercial Enterprise and Social Progress, 8vo, 2s. 6d. cl.
Drayson's The Earth we Inhabit, Past, Present, and Future, 3s. 6d.
Hitchman's Consumption, its Homœopathic Treatment, post 8vo, 3s.
Macgregor's, Our Brothers and Cousins, fc. 8vo, cl., 2s. 6d.
Macintosh's Popular Outlines of the Press, post 8vo, cl., 3s.
Markham's Commercial and Traders Legal Guide, 2nd ed., 12mo, 1s.
Thomas's Additions to the Homœopathic Materia Medica, 2s. 6d.
Thom's Almanac and Official Directory for 1859, 8v. 13. 6d.
Watkins's Prin. and Rudim. of Botany, fc. 8vo. 3s. 6d. cl.

PROVISIONAL PROTECTIONS.

Dated October 11, 1858.

2258. J. Saxby, of Brighton, Engineer. Improvements in apparatus for working signals on railways.

Dated November 30, 1858.

2724. J. Luis, of Welbeck-st. A watch, simplified with anchor escapements and rack, forming a double lever, catching in the pinion of its balance wheel. A communication from A. Lepage.

Dated December 16, 1858.

2884. J. H. Selwyn, of Grasmere, Westmoreland, Captain R.N. A novel apparatus for paying out or laying down submarine telegraph cables or wires, and for raising the same after they have been laid down.

Dated December 18, 1858.

2900. J. MacKenzie, of St. Martin's-le-Grand, Gas Engineer. Improvements in those gas burners known as ventilating sun burners.

2902. J. Taylor, of Birkenhead, Engineer. Improvements in the construction of pumps or engines for lifting and discharging water.

2904. E. Weber, of Mulhouse, Chemist. Improvements in dyeing or colouring textile fabrics and materials, and in the machinery or apparatus connected therewith.

2906. J. H. Johnson, of Lincoln's-inn-fields. Improvements in apparatus for reworking the waste steam of steam engines. A communication.

Dated December 20, 1858.

2908. S. Hunter, of Newcastle-on-Tyne, Gentleman. Improvements in the construction of anchors.

2910. J. Ronald, of Liverpool, Merchant. An improved machine for the direct spinning of hemp, flax, and other like fibrous materials.

Dated December 21, 1858.

2912. F. Winter, of Hoxton, Manufacturer. Improvements in the preparation and application of varnishes for waterproofing paper, linen, and textile fabrics, and coating the same with metallic foils.

2914. W. E. Dando, of Pennsylvania, Clerk. Improvements in apparatus for lowering boats from ships or vessels, and also for raising the same as required.

2918. N. Dawson, of Poplar, Stationer. Improvements in order books.

Dated December 22, 1858.

2922. G. Sharp, of Jarrow, Durham, Millwright, and W. Elder, of the same place, Engine Smith. Improvements in furnaces and steam boilers.

2926. E. T. Dunn, of Hammersmith, Gentleman. Improved fabrics suitable for the covering of floors, walls, and other like purposes.

2928. M. Shuldham, of Dursley, Gloucester, Commander R.N. Improvements in ships and vessels, and in working parts of their gear and rigging.

2930. A. Prince, of Trafalgar-sq. Improvements in ornamenting and illuminating surfaces of glass.

Dated December 23, 1858.

2932. D. Lichtenstadt, of Peckham, Chemist. Converting a certain vegetable substance into fibrous material for the manufacture of textile and other fabrics.

2934. T. Bird, of Manchester, Engineer. Improvements in spinning, and in the manufacture of cop bottoms or cop tubes.

2936. J. Whitelaw, of Dumfermline, Ironfounder. Improvements in sewerage and drainage apparatus.

2938. J. Maudslay, of Lambeth, Engineer. Improvements in the construction of ordnance and projectiles to be used therewith.

Dated December 24, 1858.

2942. J. W. Child, of Halifax, Engineer. Improvements in dyeing wool and other fibres.

2944. E. Fellows, of Canterbury, Clerk. An improved vent peg.

2946. J. Railton, of Blackburn, Machine Maker, and S. Lang, of the same place, Mechanic. Improvements in looms.

2948. A. Smith, of Humbleton Hall, York, Agriculturist. Improvements in gigs, dog carts, and other vehicles.

2950. J. H. Johnson, of Lincoln's-in-fields. Improvements in the permanent way of railways. A communication from C. E. Detmold, of New York.

2952. W. B. Johnson, of Manchester, Engineer. Improvements in the employment of gas for generating steam, and in engines connected therewith.

Dated December 27, 1858.

2955. T. Steven, Ironfounder, and T. Scott, Engineer, of Glasgow. Improvements in heating apparatus for culinary and warming purposes, and in part applicable to steam-boiler and other furnaces.

2956. J. Smethurst, of Guide Bridge, Lancashire, Engineer. Certain improvements in metallic pistons.

2958. W. A. Gilbee, of South-st., Finsbury. Improvements in treating fatty bodies, and in the apparatus employed therein. A communication.

2959. J. Macpherson, of Aberdeen, Comb Maker. Improvements in solidifying the raspings and other waste of horns and hoofs, and in applying the process to the cementing of prepared horns, hoofs, and tortoiseshell.

2961. C. M. A. Marion, of Paris, Manufacturer. An improved box or case for containing and preserving sensitive photographic paper.

2963. H. Lowe, of Birmingham, Manufacturer, W. Trueman, of Birmingham, Axle Maker, and J. L. Pitts, of Birmingham, Accountant Clerk. A new or improved axle for carriages.

2964. R. Hornsby, jun., of Grantham. Improvements in ploughing and tilling land by steam power, and in apparatus employed therein.

Dated December 28, 1858.

2965. B. Browne, of King William-st., London Bridge. Certain improvements in the manufacture of boots and shoes, or other coverings for the feet, and in the mode or method of uniting the same, or parts thereof. A communication.

2966. J. Sinclair, of Dublin, Turner. Improvements in pistons.

2967. T. Warren, of Glasgow, Bottle Manufacturers. Improvements in the manufacture of glass bottles.

2969. J. Leck, of Glasgow, Bleacher. Improvements in drying textile fabrics and materials.

2970. C. Fay, of Manchester, Carriage Builder. Improvements in railway carriages and brakes.

2971. J. H. Johnson, of Lincoln's-inn-fields. Improvements in the manufacture of boots and shoes or other coverings for the feet. A communication.

Dated December 29, 1858.

2972. W. Haworth, of Todmorden, Cotton Spinner, and W. Barker, of the same place, Overlooker. Improvements in the top clearers of machines for spinning.

2973. T. Welton, of New Compton-st., Soho, Artificial Limb Maker. Improvements in giving or obtaining publicity, and of advertising either by day or by night.

2974. E. W. Carter, of Rochdale, Cutler, and J. D. Abrams, of the same place, Machinist. Certain improvements in sewing machines.

2975. W. Taylor, of Nursling, Gentleman, and W. D. Grimshaw, of Southampton, Engineer. Regulating the admission of natural atmospheric air and eduction of rarefied air or gases from hotheuses or any other place or premises, and for supporting a required temperature.

2976. R. D. Kay, of Accrington, Manufacturer. An improved chemical means of applying or fixing on woven or felted fabrics certain colouring matters produced from tar.

2977. T. Pickford, of Mark-lane, Merchant. Improvements in the preparation and manufacture of manure.

2978. H. Hutchinson, of Paris. Improvements in the manufacture of india rubber goods.

2979. S. Morand, of Manchester. Improvements in apparatus for stretching fabrics.

2980. A. V. Newton, of Chancery-lane. Improvements in machinery for reaping and mowing. A communication.

2981. T. W. Gowing, of Camden Town, Veterinary Surgeon. An improved roughing for the shoes of horses and other like animals.

Dated December 30, 1858.

2982. H. N. Maynard, of Crumlin, Monmouth, Engineer. Improvements in anchors, and in the manufacture of anchors.

2983. F. Puls, of Roxburgh-terrace, Haverstock-hill, Chemist. The treatment of hydrocarbons.

2985. F. Johnson and J. H. G. Wells, of North-st., Westminster, Civil Engineers. Improvements in constructing breakwaters and other similar structures.

2986. J. F. C. Heyne, of Antwerp. Improvements in railway chairs and rails, and in the mode of fixing the same.

2987. T. Bell, of Plaistow. Improvements in purifying gas.

2988. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in stoppering or closing bottles, jars, and other like vessels. A communication from M. Charoblant, of Paris.

2989. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in washing and drying machinery and apparatuses. A communication from S. Charles, of Paris.

2990. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in revolving fire-arms. A communication from L. F. Devisme, of Paris.

2991. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in machines for embroidering. A communication from B. G. Dutel, of St. Quentin, France.

2992. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in machinery for splitting or dividing hides, skins, leather, and other like materials. A communication from F. Martin, of Paris.

2993. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. An improvement in pipes for smoking. A communication from P. F. Varenne, of Paris.

2994. W. Burgess, of Newgate-st., Agricultural Engineer. Improvements in apparatuses for converting reciprocating into rotary motion. A communication from G. Bancker, of New York.

2995. S. S. Bateson, of Bolton-st., May Fair, Barrister-at-law. Improvements in generating steam.

2996. J. Knowelden, of Southwark, Engineer, and R. D. Edwards, of Upper Belgrave-pl. Improvements in hydraulic engines and apparatus connected therewith.

2997. J. W. Duncan, of St. John's Wood, Gentleman. Improvements in or connected with appliances for transmitting or conducting signals or action by electricity or magnetism, and in the method of testing insulating materials, combinations, or structures, for conducting electricity, and in treating malconstructed or invalid electric telegraph cables, and in utilizing parts of certain cables, or the application otherwise of such structures, and in certain insulating compounds, and in the apparatus and machinery used in connection therewith.

Dated December 31, 1858.

2998. J. H. Johnson, of Lincoln's-inn-fields. Improvements in the permanent way of railways. A communication.

3000. H. Robin, of Nantes, France. Improvements in reaping machines.

3002. T. Z. L. Maurel, of Paris, Civil Engineer. An apparatus protracting indefinitely the working of any mechanism set in motion by springs, more generally applicable to clock-making.

3006. L. A. Normandy, of Judd-st. A new system of shaft tugs. A communication.

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PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

78. T. H. Toms, of Staining-lane, City. The employment of certain materials for the production of raised ornamental figures or devices upon textile fabrics. Dated Jan. 10, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

2032. W. Parsons. Steam boilers.
2034. W. Parsons. Safety valves.
2040. W. Prisley. Advertising.
2041. J. Rowley. Substitute for leather.
2043. C. N. Kottula. Grease for lubricating.
2045. T. Timms. Bits.
2058. D. Cheetham. Spinning.
2059. W. Toshach. Pile driving machines.
2065. H. Page. Crown glass.
2066. J. L. Hinks. Tap.
2069. L. Kaberry and T. Mitchell. Spinning.
2074. C. W. Siemens. Refrigerators.
2075. S. Hanbury. Metal tubes.
2082. J. Luis. Kilns. A communication.
2086. R. Lakin and J. Wain. Spinning.
2093. W. G. Taylor. Gloves.
2099. C. F. Vasserot. Finishing fabrics. A communication.
2107. J. G. N. Alleyne. Beams and girders.
2122. A. V. Newton. Sweeping floors. A communication.
2123. J. Dewrance. Pianoforte frames.
2151. G. L. Turney. Packing pins.
2154. M. A. F. Mennons. Iron and steel. A communication.
2157. W. Clark. Phosphates of lime. A communication.
2258. J. Saxby. Railway signals.
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2537. J. Buchanan. Propelling.
2819. R. L. Burrowes and J. Knowles, jun. Pianofortes.
2885. J. W. Edge Projectiles.
2896. J. Kerr. Fire arms.
2930. A. Prince. Ornamenting glass.
2936. J. Whitelaw. Drainage apparatus.
2942. J. W. Child. Dyeing.
2944. E. Fellows. Vent peg.
2948. A. Smith. Gigs, dog carts, &c.
2950. J. H. Johnson. Permanent way. A communication.
2955. T. Steven and T. Scott. Heating apparatus.
2969. J. Leck. Drying fabrics.
2997. J. W. Duncan. Electric telegraphs, &c.
2998. J. H. Johnson. Permanent way. A communication.
26. M. A. F. Mennons. Steam generators. A communication.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

84. T. C. Clarkson.
92. H. Emanuel.
93. W. Owen.
106. W. Owen.
110. T. H. Bakewell.
114. W. Prangley.
115. V. Scully and B. J. Heywood.
120. J. Fowler, jun.
122. H. R. Worthington.

LIST OF SEALED PATENTS.

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1580. W. Woodcock.
1584. J. Jones.
1605. C. de Fergue.
1612. T. Hart.
1613. J. Spence.
1615. W. Wildes.
1626. W. Tasker, jun.
1629. C. Lambert.
1654. C. Gammon. [jun.
1656. J. B. P. A. Thierry,
1762. J. H. Johnson.
1814. W. E. Newton.
2162. E. L. Benzon.
2190. T. Preston.
2214. J. Milnes.
2352. E. B. Horn.
2415. P. Wright.
2486. B. D. Webster and J. Horsfall.

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1628. W. Herapath.
1630. S. Maw.
1636. R. Clarke.
1640. W. N. Nicholson.
1644. J. W. Wilson.
1646. T. Piatti.
1652. B. Blake.
1653. H. Green.
1657. A. B. Tripler.
1668. W. Merry.
1679. J. Taylor & J. Nimmo.
1685. J. Hope.
1752. H. Greaves.
1759. J. Steel.
2025. G. Larsonnier and A. Blanche.
2554. C. J., T., H., and C. Thomas.
2625. W. Marshall.
2628. J. Easton, sen., and C. E. Amos.

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ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this magazine from official copies supplied by the Government, and are therefore the property of the proprietors of the Magazine. Other papers are hereby warned not to produce them without acknowledgment.

STEAM ENGINES, &c., 1017, 1096.

BOILERS AND THEIR FURNACES, 1026, 1033.

ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1116, 1130.

SHIPS AND BOATS, including their fittings, 1098, 1118, 1127.

CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 1093, 1104.

FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 1078, 1079, 1083, 1119.

FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1101, 1106, 1112, 1113, 1115, 1120, 1122, 1125, 1129, 1135, 1139, 1141, 1142, 1144.

BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c. *None.*

LIGHTING, HEATING, AND VENTILATING, 1088, 1097, 1109, 1126, 1133.

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1081, 1085, 1086, 1093, 1095.

METALS, including apparatus for their manufacture, 1094, 1100, 1102, 1111, 1114, 1134.

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WARFARE. *None.*

LETTER PRESS PRINTING &c., 1121, 1137.

MISCELLANEOUS, 1080, 1082, 1084, 1087, 1089, 1091, 1092, 1105, 1105, 1124, 1131, 1140, 1146.

1078. R. HISLOP, jun. *Improvements in machinery or apparatus for dressing or cleansing and separating grain and seeds.* Dated May 13, 1858.

This consists of a horizontal cylindrical screen, into one end of which the grain or seeds are fed for being dressed. Within this screen is an Archimedean screw revolving independently. The screen is made with fine perforations at the end where the grain or seeds are supplied, and the interstices increase in coarseness along to the other end. Beneath the screen are four receivers, into which the screened matters fall. Into the first the dust, mustard seed, and other matters fall, the second receives the worthless grain, the two last receivers receive the grey and good grain, whilst the stones and large foreign bodies pass out at the open end of the screen. As the grain leaves the screen it is received into two separate conductors, each fitted with an adjustable weighted valve that spreads and regulates the downward supply of the grain. The two last receivers are so disposed that all the good grain from both of the last compartments is deposited in one receiver, whilst all the grey or inferior matters from both compartments are delivered into the other receiver. As the grain falls from these two last compartments it is met by an air blast which acts in concert with two endless cloths or screw traversers beneath. These are so arranged that whilst the good grain from one compartment falls directly into its receiver, the good grain from the other compartment is traversed off into the same receiver, and similarly the grey from both compartments is delivered into one receiver by the same general action. *Patent completed.*

1079. A. M. DIX. *Certain improvements in the process of brewing or obtaining decoctions, and in apparatus connected therewith, which apparatus is also applicable to condensing, refrigerating, or other such like purposes.* Dated May 13, 1858.

This consists, 1, in the use of a condenser or refrigerator in connexion with the closed boiling pan or vessel, to prevent the escape of the effluvia during the boiling of the hops, &c.; 2, in the use of a condenser or refrigerator as applied to the boiling of any other liquid when necessary to boil in vacuo or under the ordinary boiling point of such liquids, whether aromatic or not; 3, of a coil of piping placed between two cylinders or drums, the inner one least in diameter, leaving only sufficient space for the coil of piping to be fixed between the cylinders, and so as not to come into contact with either cylinder, the method of condensing being to pass the steam, &c., over the coil of piping and between the two cylinders in thin streams, and to assist the passage of the steam, &c., by an agitator or propelling fan placed above and within the condenser, a stream of cold water passing simultaneously through the coil of piping, the tube or pipe which conveys the stream and aroma to the top of the condenser or refrigerator terminating in the closed vessel used for brewing or boiling. The reversing of the passages of the hot and cold streams renders the same apparatus available for boiling purposes. *Patent completed.*

1080. F. A. DELIRY. *An improved mechanical kneading trough.* Dated May 13, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

1081. A. WOLFF. *Improvements in musical instruments.* Dated May 13, 1858.

This relates to a musical instrument in which a key board and action serves for acting on proper strings (named "independent pedallier") its key board being formed of pedals on which the performer plays with his feet. It may be annexed to any piano. The object of the pedallier is, 1, furnishing to organists the means of exercising themselves in playing the pedals; 2, to facilitate the performing of music written for the harpsichord with tirasse pedal arrangement, or for pianos to which artists have sometimes annexed such tirasse pedal arrangement; 3, to give to the bass notes of the piano the vibrations and fulness of tone required for aiding vocal music of some magnitude. *Patent completed.*

1082. H. HYDE. *An improved mode of, and improved apparatus for manufacturing oils.* Dated May 13, 1858.

This invention has for its object the prevention of undue elevation of temperature at the moment of decomposition by acting on, in succession, layer after layer of the body subjected to heat at the lowest possible temperature, and by the avoidance of the elevation of temperature arising from the action of masses at the same moment; this is effected without applying heat externally to the vessel. *Patent completed.*

1083. J. GARDNER. *An improvement in chaff-cutting machines.* Dated May 13, 1858.

This invention is described and illustrated at p. 42 of our last Number. *Patent completed.*

1084. F. WARREN. *Improvements in the construction of stands for telescopes and other instruments.* Dated May 14, 1858.

The inventor forms of iron, &c., discs or plates, and manipulates their surfaces and centres as that they shall work freely, steadily, and smoothly upon or into each other; and of these plates or discs coupled together he forms the various movements required for the telescope or other instrument. *Patent abandoned.*

1085. J. COLGATE. *A "pipe case handle" for walking sticks, canes, riding whips, and umbrellas.* Dated May 14, 1858.

According to this invention a piece of ivory, bone, hard wood, &c., is turned in the form of a handle; the handle cut into two parts and hollowed out the proper size to admit the bowl of a tobacco pipe; when hollowed out the two parts are attached by a hinge, not observable under the handle, and fasten (enclosing the pipe bowl) at the back of the handle with a catch spring so as to form a handle. *Patent abandoned.*

1086. S. CARPENTER. *Improvements in escapements for watches and other timekeepers.* Dated May 14th, 1858.

This consists in the use of a horizontal escape wheel with three rows of teeth, of which two rows of vertical teeth are so arranged that the stuff which carries the pallets can have its bottom bearing between them so as to allow a tooth on each row to act alternately on the pallets. By giving a double action to the pallets, the watch, &c., is prevented from setting by a sudden jerk, as a tooth of one or other of the rings will always come at once into action on its corresponding pallet. *Patent completed.*

1087. D. DICK. *Improved cushions for trusses and other similar uses.* Dated May 14, 1858.

This consists in substituting a small bag of caoutchouc or other suitable material, filled with air in lieu of mocmain, or any of the materials now in use. *Patent abandoned.*

1088. W. E. NEWTON. *Improvements in the construction of lamps.* (A communication.) Dated May 14, 1858.

This relates principally to lamps fed by oil having a high equivalent of carbon, and consists in forming the lower part of the flame or current of fresh air so that the oxygen therein contained shall be brought immediately in contact with the carbon the moment the degree of temperature of the latter is sufficiently high to promote combustion. *Patent abandoned.*

1089. G. F. CHANTRELL. *An improved waterproof lithic paint.* Dated May 14, 1858.

This composition may be made by taking, say, 2 parts (by weight) of the liquid silicate of soda, or silicate of potash of commerce sp. gr. 1·200, 1 part of common chalk reduced to a fine powder, to which is added 1 part of china clay, also reduced to a fine powder, to which may be added a little cheese or milk, or other matter comprising caseine; the chalk or the china clay may be used solely. The ingredients are intimately mixed. This composition may be coloured any tint by adding colouring matter. The composition is then put into close vessels until required for use, when it is applied in the same way as common paint. *Patent abandoned.*

1090. J. MACINTOSH. *Improvements in insulating telegraphic wires.* Dated May 14, 1858.

Here the patentee laps round the wire a yarn made from gun cotton or other fibre similarly prepared, and then subjects the coated wire to the action of a fluid which acts as a solvent to the gun cotton, &c., so as to cause it to adhere firmly to the wire; sometimes he dissolves gun cotton, &c. in the solvent before applying it to the coated fibre lapped round the wire, and gutta percha, india rubber, &c. may be added to the solution. In this manner a coating of collodi n is given to the wire, which is impervious to moisture. Over this coating, or sometimes to wire not so prepared, he applies a coating of india rubber, and submits the wire so coated to the action of sulphuric acid, or of chloride of sulphur, and a solvent, by which the coating will be so changed as to be no longer liable to be injured by tropical heat. To apply the coating of india rubber he uses grooved rollers. *Patent completed.*

1091. L. PETRE. *Improvements in the application of glass to ornamental and useful purposes.* Dated May 14, 1858.

This consists in the use of glass ornamented or prepared on the one side, the ornament, &c., being visible through the glass. On the ornament or preparation the inventor lays a

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coat of paint, and when dry a coating of copal or other suitable varnish, which he sprinkles, by a sieve, with sand. He then lets the whole dry and afterwards applies a substance of cement over the entire surface, to which it adheres and becomes as one solid piece with the glass. *Patent abandoned.*

1092. J. H. JOHNSON. ***Improvements in the construction of artificial legs and feet.*** Dated May 17, 1858.

Here a lateral and diagonal flexion of the foot of the ankle joint is provided for as well as the ordinary forward flexion, by connecting the foot to the leg by two sets of cords and springs in combination with a universal or ball and socket joint. *Patent completed.*

1093. D. W. HAYDEN. ***Improvements in boilers for agricultural and other purposes.*** Dated May 17, 1858.

This invention is not described apart from the inventor's drawings. *Patent completed.*

1094. J. and W. ALLEN. ***Improvements in the treatment of iron and copper pyrites and in apparatus for same.*** Dated May 17, 1858.

This consists, 1, in applying atmospheric air by a downward draught to the mass of iron or copper pyrites under treatment for the manufacture of sulphuric acid; 2, in applying a downward draught of atmospheric air within a cupola, &c., for smelting the burned residuum of pyrites containing copper; 3, in the combination of a reverberatory furnace with a kiln, so as to form a furnace for the decomposition of iron or copper pyrites mixed with common salt when worked up into balls, bricks, or lumps, so arranged that the waste heat from the reverberatory furnace shall pass up through the mass of balls, &c. in the kiln; and that the mass of balls, &c. shall pass from the kiln to the reverberatory furnace to be finished. *Patent completed.*

1095. E. TOMUS. ***Improvements in the manufacture of ruche and other trimmings for ladies' apparel, applicable also to making cap fronts and other fluted fabrics.*** Dated May 17, 1858.

This invention is described at p. 47 of our last Number. *Patent abandoned.*

1096. J. WITTENBERG. ***Improvements in motive power engines actuated by air.*** Dated May 17, 1858.

The inventor employs two cylinders, each furnished with two pistons, and piston rods projecting from the two ends. The two pistons of each cylinder are connected by springs which allow freedom of motion, yet are capable of transmitting considerable power from one piston to the other. The two piston rods projecting from similar ends of the cylinders are connected one to either end of a beam, like the beam of an ordinary engine, while the other piston rods are connected with the cranks and shafts to which the power is to be communicated. Two double air-pumps are connected and worked by the beam, each placed as close as possible to its respective working cylinder. *Patent abandoned.*

1097. W. H. BAGNALL. ***Improvements in stove grates.*** Dated May 17, 1858.

The patentee claims, 1, the construction of stove grates described, whatever the shape or configuration given to the air chamber and ornamental parts thereof. 2, the use of distinct separate and moveable lustres, reflecting prisms or radiating surfaces whether of crystal or other glass or other material, mounted, secured, or held in suitable cells, recesses, or frames, for receiving and holding them in stove grates and their accessories. 3, the combination of an air chamber projecting before the line of the stove-front plate, and above and surrounding the fire-grate, with an ash pan as described, whether the moveable reflectors and the radiators and the hearth plate herein described, or either of them, be used in combination therewith. *Patent completed.*

1098. W. RAYMOND. ***Improvements in life rafts.*** Dated May 17, 1858.

This invention will be described in our next Number.

1099. C. W. HARRISON ***Improvements in obtaining light by electricity.*** Dated May 17, 1858.

This invention is described at page 48 of our last Number.

1100. S. HILER. ***An improved method of coating or amalgamating iron with silver, copper, brass, or other metals, or alloys of metals.*** Dated May 17, 1858.

This consists in forming a surface of brass or other ornamental metal on iron or steel as follows:—The inventor takes a sheet, bar, or block of wrought iron (or steel) and cleans the surface on one or more sides, and heats the same, and while heated casts on to the said surface or surfaces the brass, &c., and the union may be accelerated by the use of borax, or other flux, or the coating metal may be united to the iron while the latter is in a state of fusion, and the brass, &c., is to bear the desired proportionate thickness to that of the iron. The combined metals may be then rolled down to the desired shape or thickness, or cut out or made up into any articles for which the same may be adapted. *Patent abandoned.*

1101. H. CURZON, jun. ***Improvements in preparing printed yarns.*** Dated May 17, 1858.

This relates to the process of steaming printed yarns for fixing the colours, and has for its object the dispensing with the immediate covering of the yarn, namely, the upper layer of hulls or cut straw, and the cocoa-nut fibre materials. The patentee causes a coarse thick material, by preference of cotton or wool, to be attached to the under side of each tray, sufficient space being allowed between the material and the tray to ensure ventilation, and thus to facilitate the evaporation of that moisture which the material may have gained from condensation of steam when the tray is removed from the steam chamber. He dispenses with the moveable horizontal bars, and furnishes each tray with elevated ends, which, projecting sufficiently above the level of the yarn in the tray, support the tray above from pressure on it. The trays are in this manner piled one above another in a carriage, and when in the steam chamber, all steam which condenses immediately over the uncovered yarn being absorbed by the coarse material, the yarn is protected from injurious droppings. *Patent completed.*

1102. S. HIGGS, jun. ***An improvement in separating or precipitating copper from water having it in solution.*** Dated May 17, 1858.

The water is placed in tanks, together with scrap iron, and the water is heated by steam or otherwise, it being preferred to employ jets of free steam. *Patent completed.*

1103. R. IMEARY and T. RICHARDSON. ***Improvements in roasting small or disintegrated pyrites.*** Dated May 17, 1858.

The patentee claims in the heating of small pyrites, the use of several flats in the same furnace, or of several separate furnaces so worked together as to secure a regular supply of sulphurous acid, and by such treatment the residuum is rendered commercially useful. *Patent completed.*

1104. W. J. HIXON. ***Improvements in the construction of reaping and mowing machines, and in the form or shape of the knife or knives to be used in connection therewith.*** Dated May, 1858.

These consist, 1, in forming the bar which carries the knife or knives of such machines in a bent or slightly circular form, so as to suit the use of the course of the land over which they have to pass, and thus prevent the knives from being injured by coming into contact with the centre of the land. 2, in using circular knives having either a rotary or reciprocating motion, that is, having a continuous motion in a given direction, or a to and fro motion varied according to suit circumstances, and also to suit the size of the knife or knives used. 3, in constructing at the back of the machine a pan or metal frame which will lay the crops cut by the knives (after they have fallen upon a revolving apron, and are delivered into the said pan) in a suitable way for gathering them. 4, in using the knives having a circular or to and fro motion applied to the straight bar as at present used, the bar itself being constructed either to move with the knives fixed upon it, or the knives being made to move, the bar being in that case stationary. *Patent abandoned.*

1105. J. HIGGINS. ***Improvements in preventing explosions in mines, and in the machinery or apparatus employed therein.*** Dated May 18, 1858.

The inventor constructs a boiler and furnace to generate steam, and places it in any convenient position in the workings of the mine; to this boiler and furnace he attaches piping, which he conveys through the mine, and secures it near the roof. At certain distances he fixes taps, plugs, valves, &c., in the said pipes for letting off steam wherever there is foul air or gas accumulating, so that the steam will mix with the gas, and destroy its dangerous effects. He constructs the boiler and furnace in the shape of a tubed boiler, but he makes the furnace of two or more hollow shelves with vertical tubes, larger in diameter in the top shelf than the next under it, decreasing in each succeeding shelf, so that the fire being made in the top part of the furnace, it will fall through the vertical tubes to the lower part of the furnace in succession, according to the number of shelves or compartments in the furnace. *Patent abandoned.*

1106. J. MALLISON, jun. ***Improvements in the process of, and in the machinery or apparatus for dyeing yarns.*** Dated May 18, 1858.

This relates more particularly to the dyeing of yarns in the "cop," but is equally applicable when the yarn is in the "hank" or "bundle." It consists in dyeing yarns in vacuo, as follows:—The yarn is placed in a chamber or receptacle in connexion with an arrangement of pumps for extracting the air therefrom, and when the air has been sufficiently exhausted from the chamber containing the yarn, and a vacuum obtained, the dyeing liquid is to be admitted to the chamber until full, by which means the yarn will become thoroughly impregnated with the dyeing liquid. *Patent abandoned.*

1107. A. A. CROLL. ***Improvements in the treatment of sulphate of alumina, and in obtaining alum.*** Dated May 18, 1858.

These relate to preparing uncrystallised sulphate of alumina. In the preparation of sulphate of alumina the patentee employs as small a quantity of acid (oil of vitriol) as possible, and he then neutralises any remaining free acid as well as decomposes any salt of iron which it may contain by adding to the preparation soda or potash in an alkaline state, and he prefers to add such alkali in proportion equal to one-fifth of the resulting quantity obtained. Heretofore alum has been produced by a combination with the sulphate of alumina, of either sulphate of ammonia or of sulphate of potash, in certain proportions adapted to produce the best crystals. The patentee substitutes for the sulpbate of ammonia or potash sulphate of soda as a much less costly article, and only uses a small proportion of the sulphate of ammonia or potash. In place of the quantity of sulphate of ammonia or potash usually employed, he uses a proportion of sulphate of soda equal to about one-fifth part of such quantity, adding thereto four-fifths or thereabouts of sulphate of ammonia or potash to make up that quantity. *Patent completed.*

1108. E. C. BROCHAND. ***A travelling mill and improved millstone, part of the invention being applicable to other apparatus turned or worked by horses.*** Dated May 18, 1858.

This mill is mounted on, or combined with, a carriage, that it may travel about from place to place; it is principally intended to be actuated by a horse moving round it. The carriage supports a bolter, as well as the millstones, &c.; a bran box and tool case may also be mounted thereon. The millstones are formed with curved and straight master and guide furrows, leading into one another, whereby a large amount of work, and a better circulation of air, may be obtained. To prevent jerks, shocks, &c., motion is transmitted from the driving-shaft to the driving or main wheel by a pressing or friction-plate wheel or cone mounted on the shaft, and so adjusted as to press on the main wheel just sufficiently to drive it, while it will only slide on its surface without moving it in case of shocks, jerks, &c. This friction-plate is so mounted that it may rise and fall on the shaft while turning with it; it may lie flat on the main wheel, or fit into it by feather and groove, or other adjustment. A pawl is attached to the pole or perch taking into the teeth of a wheel fixed on the shaft, so as to drive it and the shaft when the horse goes forward, but not when it walks backward. The ground matters may be directed into and out of the bolter by guide-screws, &c., actuated by the driving shaft. *Patent completed.*

1109. S. HIGGS, jun. ***Improvements in miners' safety lamps.*** Dated May 18, 1858.

To each lamp an air vessel is applied, in which air is condensed by a suitable pump or apparatus; a stop cock or valve is also applied to regulate the passage of the air from the vessel to the wick of the lamp. By these means, when by reason of the bad atmosphere of a mine the flame of a lamp decreases, it may be improved by allowing the condensed air in the air vessel to flow therefrom to the wick, and the flame will be considerably improved, notwithstanding the lamp may continue to be exteriorly surrounded with the bad air of the mine. *Patent completed.*

1110. G. M. CASENTINI. ***The manufacture of a solution for mixing with or guaging plaster of Paris (or any plaster having sulphate of lime, or any similar substance for its base) so as to produce a hard and dense composition, the hardening or setting whereof may be retarded and regulated by the person using the same.*** Dated May 19, 1858.

The inventor takes borax of commerce, and, having ground it very fine, places a certain quantity of it in a vessel. He then pours in water in the proportion of one and a half gallons for each pound of borax. The contents of the vessel are then boiled and kept stirred, and maintained at the boiling point until by evaporation they are reduced to a saturated solution of borax. The solution is then allowed to cool, when it is bottled off, and in that state kept until it is required for use. *Patent completed.*

1111. J. BROWN. ***Improvements in the manufacture of iron, and in rolling iron and steel, and in machinery to be employed therein.*** Dated May 19, 1858.

These consist in the use of mechanical puddles or stirring and percussive instruments for effecting the agitation of iron while in a liquid or semi-liquid state in the puddling furnace, and for squeezing and fashioning the ball of iron in a heating furnace prior to the action of the hammer or rolls. Also, of machinery by which a ball or bloom is rolled and reduced to a puddled bar. These several parts of the invention are not described apart from the drawings. *Patent completed.*

1112. W. WALKER. ***Improvements in the manufacture of needles.*** Dated May 19, 1858.

The object here is to raise a portion of the metal in front of the eyes of needles on that side of the eye which is towards the point, by so forming or shaping the dies that a blow from a pair of them will form a groove somewhat like an elongated horse shoe, and raise the metal within it in front of the eyes of the needles. *Patent completed.*

1113. M. MACNAUGHT and W. R. CRITCHLEY. ***Improvements in the manufacture of copper or other metallic rollers or cylinders for printing fabrics, and in apparatus connected therewith.*** Dated May 19, 1858.

This consists in forming the ends of the cylinder thicker than the body thereof, and further strengthening the rollers by ferrules, rings, or ribs, either made out of the same solid metal or otherwise secured in the cylinder. And also in the use of a mandril having a coil of horizontal ribs or vertical rings thereupon to obtain a lighter mandril, which is equally applicable to all cylinders; and the cylinders may be used either with or without this form of mandril. *Patent completed.*

1114. J. MAUDSLAY. ***An improvement in the manufacture of iron, and in the furnaces employed therein.*** Dated May 19, 1858.

This consists in imparting motion to molten iron by inclining the bed of the furnace containing it, and causing the said bed to rotate by any suitable motive machinery, in order to improve the tenacity and fibrous quality of the iron, by mixing or agitating it, and thus facilitating the escape of its gaseous impurities. *Patent abandoned.*

1115. J. BOTTOMLEY and A. H. MARTIN. ***Improvements in means or apparatus employed in weaving.*** Dated May 19, 1858.

These relate, 1, to giving motion to rotary shuttle boxes or series of shuttle chambers capable of rotating upon an axis of motion, as also to other series of shuttle boxes capable of moving, in order that any one of the series may be brought into a line with the lay to effect change of weft; 2, to working the levers for sliding the stud wheels from jacquard apparatus employed to work the harness of the loom; 3, to another method of giving motion to rotary shuttle boxes; 4, to holding the series of boxes in position when a selection has been made, and for releasing the same for a fresh selection: 5, to governing the order of motion to a series of shuttle chambers from jacquard apparatus employed to work the harness of the loom; 6, to effect changes in the order of lifting and lowering leaves of heddles, so to change from plain to satin or twill or otherwise; 7, to operating the selvage threads of adjoining selvages of fabrics woven side by side in one piece to be separated afterwards by cutting up and thereby forming distinct breadths; 8, to operating the slay or reed. *Patent completed.*

1116. G. M. MILLER. ***Improvements in the joints of bridge rails for railways.*** Dated May 19, 1858.

These chairs are made with two jaws which project over the flanges of the rails and with a central ridge, which enters the hollow under the rails. This ridge prevents the ends of the rails from shifting laterally, and metal keys driven in between the flanges and the jaws of the chair prevent them from moving vertically. *Patent abandoned.*

1117. C. M. KERNOT. ***Improvements in distilling shale, boghead, and other mineral matters.*** Dated May 19, 1858.

The upper part of the retort or still is formed with an outlet leading to the condenser, an opening at top with a cover, and also a side opening with a cover. Between the head or top of the retort is a partition, consisting of two perforated plates, between which, when first distilling products from shale, boghead, coal, &c., are placed powdered coke and sand in layers, through which the evolved products pass and are filtered in their way to the head, and thence to the condenser. When redistilling products, such as naptha, oils, hydro-carbons, &c., then the still head is formed at the upper part of a pipe or neck, the lower part of which descends some distance into the retort, but so that

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such lower end comes above the charge of fluid in the retort. Around the upper end of this neck or pipe is formed a gutter, into which the condensed products in the head descend, and are thereby prevented flowing back to the retort, but are carried off with the gases or vapours to the condenser. In the pipe or neck is placed a partition consisting of two perforated plates, between which are placed matters suitable for acting on the passing products in a chemical or mechanical manner, so as to filter such products to arrest impurities and produce chemical changes. The matters which are generally used are black oxide of manganese, sulphate of iron, chlorate of potash, bichromate of potash, and others. *Patent abandoned.*

1118. W. E. NEWTON. *Improvements applicable to certain descriptions of marine engines, and in the mode of mounting paddle wheel shafts.* Dated May 19, 1858.

This consists in mounting the propeller shafts, and with them the paddle-wheels, so as to render them moveable in a vertical direction, to admit of regulating their "dip." The arrangement of the engine is also different from ordinary marine engines in consequence of the paddle-wheel shafts being made moveable. *Patent completed.*

1119. W. F. SNOWDEN. *An improved construction of chaff and litter cutting machine.* Dated May 19, 1858.

The object here is to permit of chaff and litter, or long stuff, being cut by the same machine. The inventor modifies his well-known chaff cutter in some of its details. *Patent abandoned.*

1120. W. CLARK. *Improvements in machinery for manufacturing knotted webs or nets.* (A communication.) Dated May 19, 1858.

This relates to a machine for knitting webs or nets with a single continuous thread, and without a break or severing of the thread, the meshes being made and secured by knots. A single thread only is used, which is added to when it is finished, and which by this means makes it similar to webs made by hand. The knots are made by two hooks, and a needle for each one, and also a shuttle, which furnishes thread to all the hooks. The invention is not fully described apart from the drawings. *Patent completed.*

1121. M. HENRY. *Improved apparatus for communicating or transmitting or producing facsimile copies of dispatches, intelligence or messages, or characters, drawings, or devices.* (A communication.) Dated May 19, 1858.

The object here is effected by the agency of currents. There is a manipulator or transmitter and a receptor, the manipulator consisting of a shaft having alternating motion, with a bar resting on it, which at every motion of the shaft is separated from it preferably by a stud on a wheel, and is fitted with a pipe or stylus in direct communication with the battery, and moving on a plate on which the despatch has been written in non-conducting ink. The receptor, set in motion similarly to the manipulator, is provided with an electro-magnet acting on a moveable piece or lamina, which is attracted each time a magnetic current passes. This lamina has, or ends in, a pen or pencil which traces the characters, &c., transmitted on common paper. As soon as the manipulator stylus begins to move on the plate, a magnetic current is established, and the electro-magnet allows the lamina to fall with its point on the paper and mark on it. *Patent abandoned.*

1122. J. HESFORD. *Improvements in the construction of stretching machines for cotton and other woven fabrics.* Dated May 20, 1858.

This relates to the stretching machines applied to bleachers' and other mangles, and to drying and other machines for widening the fabric. These machines consist of several ribbed slides, placed around an axle, and furnished with diagonal discs to move the slides to and fro in the direction of the axis. The invention consists in making each of the diagonal discs with an internal groove, and in applying anti-friction bowls to the slides; these bowls enter in the grooves; or the diagonal discs may be without grooves, and an anti-friction bowl applied to each side of the disc. It also consists in making the guides of the slides of separate pieces, to facilitate repairs. *Patent completed.*

1123. M. BRUN. *Improvements in dyeing.* Dated May 20, 1858.

This relates to the dyeing of animal and vegetable fibres, yarns, or stuffs, and consists in adding to the dyeing vats a liquid or compound which keeps the vats much longer fit for dyeing than hitherto, permitting, at the same time, alterations in the colours, and giving rise, also, to much faster dyes, thus allowing the use of pigments of a cheaper nature, or in less quantity than was hitherto required for obtaining the same shades. The liquid is obtained by dissolving grain tin in nitric and muriatic acid, to which are then added sulphuric acid and sulphate of zinc, or other salt acting in a similar manner. *Patent completed.*

1124. A. F. COSSUS. *Improvements in treating oils and fatty matters.* Dated May 20, 1858.

This relates to a former patent, dated 21st May, 1855, and consists in submitting fatty matters to the action of vegetable or mineral black, whereby they will be purified and bleached. The blacks which the inventor employs are schists, very perfectly carbonised. He sometimes employs a black composed of argillaceous or aluminiferous earth, to which may be added from 5 to 10 per cent. of vegetable or mineral tar, or some fatty matters. These ingredients may be carbonised in retorts, as in the case of schists, bones, &c. Or a black may be prepared by carbonising fossil calcareous phosphates, with the addition of tar or fatty matters. To produce the desired effect, the mass should be reduced to fragments of about the size of millet seed, and the dust or flour carefully removed therefrom. The fatty matter is placed in a boiler, and to it is added about 3 per cent. of the prepared blacks in the form of small grains. The temperature of the mass is to be raised by steam or otherwise, and to be kept agitated for about an hour, when the fatty matter may be drawn off and filtered, either once or twice, through a bed of white sawdust and a bed of prepared black. *Patent abandoned.*

1125. H. BRIERLY. *Improvements in mules for spinning.* Dated May 20, 1858.

This refers to two previous patents of the patentee, dated 2nd Nov., 1855, and 22nd March, 1856, and is not described apart from the drawings. *Patent completed.*

1126. J. COPCUT. *An improvement in preparing materials employed to obtain light when using oxygen and hydrogen gases.* Dated May 20, 1858.

The gypsum or other material used is raised to, and retained for a time at a red heat in a crucible, in which a small quantity of sulphur is introduced. *Patent completed.*

1127. J. BOYDELL. *Improvements in machinery for propelling vessels.* Dated May 20, 1858.

Here the crank shaft is caused to rotate by engines worked by steam, and two additional steam cylinders are used, each having its piston, piston-rod, and connecting rod, and these additional steam cylinders are constantly open to the steam boiler, so that the steam may pass freely to and from the cylinders and the boiler; other parts are included. *Patent abandoned.*

1128. R. A. BROOMAN. *A method of, and apparatus for purifying sulphuret of carbon.* (A communication.) Dated May 20, 1858.

This consists in bringing sulphuret of carbon in the state of vapour or gas in contact with water. The apparatus consists of a box fitted with perforated plates, which project alternately from opposite ends of the case, nearly across it. The perforations are filled with cotton, sponge, pumice-stone, &c., which is kept wet. The sulphuret is admitted at the bottom of the perforated plates, and in its ascent travels in a zig-zag course towards the top. The rectified sulphuret, being heavier than water, falls into a receiver at the bottom. The condensing water is carried off through a bent pipe when it attains a given level in the receiver, and the sulphuret is drawn off by a stap. *Patent abandoned.*

1129. T. SLITTLE. *Certain improvements in machinery or apparatus for preparing, slubbing, and roving cotton and other fibrous materials.* Dated May 21, 1858.

This consists in making the balance-leg of a "single presser flyer" of a solid rod, round in form, which shape will give additional strength to the flyer, and render it more steady in its revolutions. *Patent abandoned.*

1130. J. C. BRANT. *Improvements in the permanent way of railways.* Dated May 21, 1858.

This relates to a former patent, dated 12th June, 1855, and consists in the addition of a new railway sleeper; of improvements in rails, also, in using cork packing. The sleepers may be formed of potter's clay, refuse of glass works, or plastic clay in combination with plumbago, oxide of iron, manganese, smith's ash, steatite, silica, cements, slag dust, &c. These sleepers may be shaped while the materials are in a plastic condition, and when formed undergo the process of kiln-drying, or burning. They may be formed with or without the chair attached. One of the improved rails is composed of wood and iron, the wood forming the interior, and being slightly raised. The other rail is of metal only, and is a single-headed rail of a V pattern. *Patent completed.*

1131. F. C. BAKEWELL. *Improvements in machinery for making bolts.* (A communication.) Dated May 21, 1858.

The principle of action of this machinery consists in bringing converging dies to press repeatedly and simultaneously against the heated head of the bolt, each simultaneous pressure of the dies being preceded and followed by blows from a swinging hammer fixed to the machine, and actuated by it. *Patent completed.*

1132. M. HENRY. *Improvements in the manufacture or preparation of ink and paper to adapt them for copying purposes, in preserving food, skins, and hides, in rendering lint, vesicatory paper, and textile fabrics absorbent, and in treating mortar, cement, and other matters, in order to keep them in a damp state.* (A communication.) Dated May 22, 1858.

The patentee claims the application of glycerine for obtaining copies of writings, by preparing either the ink or the paper with glycerine. 2, the application of glycerine for preserving food, skins, and hides, for keeping cement, mastic, mortar, paste, and other matters in a damp condition, and for rendering vesicatory paper, lint, and textile fabrics absorbent. 3, preparing ink and paper for enabling copies or impressions to be taken. 4, the mode of rendering copying paper better adapted for the taking of copies by glazing, pressing, or satining it. 5, the preparation of hygrometric ink and paper by glycerine for enabling copies to be taken without mechanical pressure. *Patent completed.*

1133. J. ADAMSON. *Improvements in the manufacture of parts of gas meters.* Dated May 21, 1858.

These relate, 1, to the index, and consist in forming the framing of the index apparatus of hard white metal cast in metal moulds (steel by preference) previously heated. Also in forming part of the tooth gear of such metal. 2, in forming of hard white metal the pins from the guide rods of the valves, and in fixing the stud in a piece of tinned brass. 3, in forming the double crank axis in two parts, with a clutch connexion to the parts outside the valve chamber, so formed that the parts will couple together only in one way. *Patent completed.*

1134. G. F. MUNTZ. *An improvement in preparing yellow metal sheathing.* Dated May 21, 1858.

This consists in rolling such sheathing metal cold after it has been annealed, so that it may be hardened, and applied to a ship's bottom in a hardened state. *Patent completed.*

1135. J. APPERLY and W. CLISSOLD. *Improved machinery for condensing wool and other fibrous substances.* Dated May 21, 1858.

This relates to the rubbing surfaces for condensing the sliver, the object being to secure certainty of action. The rolls the inventors cover with strips of leather coiled helically round a central metal spindle, and arranged so that the thickness of the leather, or the cross section of the grain, will be shown on the periphery of the roll. They also apply to the feed end of the condensing machine a bar for guiding the wool into the bite of the taking rollers, thereby neutralising the tendency which these rollers have when supplied by a diagonal feed to draw the fibres endways into the machine. *Patent completed.*

1136. S. BEYER. *Improved instruments to be used in the sensitizing and developing of photographic plates.* Dated May 21, 1858.

The patentee provides a set of instruments for gripping the plates, whereby they may be transferred from the sensitizing bath to the plate frame of the camera, and again removed therefrom and presented to the developing fluid, without being touched by the operator's fingers. The grippers are not described apart from the drawings. *Patent completed.*

1137. J. SNOLL. *Improvements in the manufacture of paper used for letter-press, lithographic, and copper-plate printing, and for other purposes.* Dated May 21, 1858.

This consists in the introduction of chalk or whiting into the body or on the surface of such papers, which, in the case of printing papers, imparts weight and substance, and tends to render them more opaque. *Patent abandoned.*

1138. W. CLARK. *Improvements in the processes of treatment of peat, and of the hydro-carburets it contains, and in the apparatus for the same.* (A communication.) Dated May 21, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

1139. J. ELCE and J. CHAMPION. *Improvements in parts of machinery used in preparing and spinning cotton and other fibrous materials.* Dated May 22, 1858.

Top rollers are usually made with two bosses, and this invention consists, 1, in making one of the bosses with a projecting stud in which the other fits loosely, so that each boss may turn independently of each other. 2, in supplying a loose tube between the two bosses for the weight hook or saddle to bear upon. 3, in making each boss of top rollers with two projecting studs or pivots to which the weight hooks or saddles are suspended. 4, in making the saddle of the weight with projections to hold the single top rollers in their places, and in jointing the saddle to a bar passing behind the rollers. *Patent abandoned.*

1140. P. FERON. *An improved bandage or truss.* Dated May 22, 1858.

The advantage of this truss consists in the fixity of the cushion laterally, and its mobility backward and forward during efforts of nature. The details are not described apart from the drawings. *Patent completed.*

1141. J. RONALD. *Improvements in dressing hemp, flax, and other fibrous materials.* Dated May 22, 1858.

This specification must be consulted; the machinery described cannot well be explained verbally. *Patent completed.*

1142. E. T. HUGHES. *Improvements in machinery or apparatus for embroidering.* (A communication.) Dated May 22, 1858.

This relates to embroidering, so as to introduce the pattern at the same time the fabric is woven, and consists of two frames working invertedly by two springs passing over each other under a double pulley, of a diameter proportioned to the number of teeth in a wheel which is fixed to a cross piece adjusted to the batten. The wheel gives motion to the machine by the levers, each having an independent hook corresponding to the jacquard. The frames rest on moveable feet, to which strings are attached with elastic springs to preserve the required tension. To produce the design a number of needles divided into combs are fixed to each of the frames, the needles being supplied with the materials for embroidering. On one side of the batten is fixed an escapement pulley, the other side resting on the wheel, rotary motion being given to the wheel by the pulley, and two small rollers, containing the materials to be embroidered, are fixed behind the batten on a suitable frame. *Patent abandoned.*

1143. E. T. HUGHES. *Improvements in machinery or apparatus serving the purposes both of saponification and of decomposing neutral fatty substances into fatty or oily acid and glycerine.* (A communication). Dated May 22, 1858.

By this invention, neutral fatty substances, whether animal or vegetable, produce fatty acid and glycerine, by putting them in contact for some hours at a high temperature: 1, with ordinary water; 2, with water to which is added one or two per cent. of alcohol to facilitate the dissolution of the glycerine; 3, with water and five or six per cent. of the spirits of wine, dissolved very powerfully; 4, with a mixture of sulphur of carbon, the essence of terrebenthine, and the essence of lavender, in equal parts. *Patent abandoned.*

1144. J. FOOT. *An improvement in the manufacture of fringes.* Dated May 22, 1858.

This consists in causing the weft thread to be carried across and be incorporated in both of the warps, only at the alternate motions of the shuttle, the weft threads being securely tied into the heads by being passed to and fro through sheds opened in the one warp, then across to the other warp, and there tied into that warp by passing to and fro through sheds opened into that warp. *Patent completed.*

1145. F. G. UNDERHAY and J. L. CLARK. *Improvements in cocks or taps, and in apparatus for flushing.* Dated May 22, 1858.

Here, means are provided for the passage of water from the face of the valve which closes the water-way, or passage, to the back of another valve or piston, so as to complete, more or less, an equilibrium in regard to the pressure of the water. *Patent completed.*

1146. T. S. CRESSY. *Improvements in apparatus for calculating wages.* Dated May 22, 1858.

Here an endless sheet is used, on which is marked in columns the amounts of wages for a week, days, and hours, and this endless fabric is carried by rollers, so that any one of the columns of figures may be brought into position at a particular part of the frame carrying the combined apparatus. At this part of the frame there are covered openings (generally twelve for the several days and double days of a week, nine for the hours of a day, and three for the fractions of the hours, but these may be varied to serve particular objects). There is also an opening through which can be seen the amount of a week's wages which the column then in position is calculated for. *Patent abandoned*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, JANUARY 28, 1859.

SPECIFICATIONS OF PATENTS FOR INVENTIONS.

LOCOMOTIVES, steam-ships, electric telegraphs, and other modern agencies, have so greatly quickened the pace of the world, that scarcely one man in a hundred is able to resist, even for a moment, the general onward tendency, and turn to gaze on "days that are no more." The man of letters or of leisure may find time to do so; the historian and the antiquarian must. But the words of command of the man of business are—eyes front! quick march! Inventors especially are prone—perhaps beyond all others—to press forward, heedless of all but the future. Once visited by an idea new to himself, and full of seeming promise, the inventive enthusiast straightway demands the "provisional protection" which the law holds out to him, and at once rushes forward to squander his capital, or to make his fortune, as the case may be. So little does he doubt the originality of that which, in his own eye, glitters with novel brightness, that he is often guilty, not only of failing to examine if his conception really be as new as it appears to him, but guilty also of accumulating wealth by means of that which was known, and perhaps in use, years before he was born—the fortunate sinner! To the grudging dispositions of some, this gives terrible offence, and they have sought to remedy it by various devices. But it will never be otherwise; nor do we see why it should be. Of course, if an exclusive privilege to use a machine or to apply a process be granted to one man, it must be presumed that the machine or process is not at present in use by another; and if it be, the latter must not have his proceedings stopped or interfered with by the privileged party. But we cannot see that more than this is necessary. This is, however, a subject on which there is much to be said, and which we will not here pursue further.

The object of this article is to inform inventors that if they desire to satisfy themselves respecting the novelty of any invention of theirs, they may do so with greater ease and certainty, and at less expense, than the inventors of any former age. To facilitate their inquiries, the Commissioners of Patents, appointed under the Act of 1852, have done three very important things. First, they have printed and published the specification of every patent granted in England from the earliest times to the present. Secondly, they have commenced, and proceeded a long way with, the printing and publication of a series of small classified volumes, in which the whole of the specifications are abridged somewhat after the fashion of those which we have ourselves been in the habit of publishing for some years. (See "Abridged Specifications of Patents," in the present number.) Thirdly, they have gratuitously furnished their publications to free libraries in Birmingham, Leeds, Liverpool, Manchester, Nottingham, Sheffield, York, and from sixty to seventy other towns in the United Kingdom, as well as to numerous official departments, seats of learning, colonies, and foreign states; and have also established in London a central free library, where they may be consulted daily. The patents under the old law—that is, patents granted from the time of James I. (in whose reign the first grant was obtained), up to October, 1852—number nearly 15,000. The specifications of these are sold to the public at cost price, which, on the average, we believe is about 1s. These are literal reprints of the original specifications themselves, and, although not absolutely free from defects, have certainly been printed with wonderful accuracy. But as these 15,000 would probably cost nearly £1,000, and as they are added to at the rate of about 3,000 a year—involving a further annual expense of about £150 since 1852—the whole of the specifications of existing patents could not be purchased for much less than £2,000. Now, we need hardly say that many a man may have the brains to contrive an invention without having £2,000 to spend in ascertaining if it be new. In order, therefore, that this might not be necessary, the Commissioners took the second step—that of grouping the inventions into classes, and publishing the classified specifications in an abridged form in small volumes. Several of these are already published, and are now before us.* It is impossible to exaggerate their value. The whole of the books whose titles are given below—forming a pile of 12mo volumes, six inches high—may be purchased for about 22s. Taking the volumes singly, their value becomes still more apparent. In the second, for example, the price of which is 5s., we have an outline description of every invention for the improvement of iron and steel patented between the time of Lord DUDLEY—who, on the 21st of February, 1621, obtained the first patent granted for a successful attempt to improve the manufacture of iron—and the 24th of June, 1857. At the foot of each abstract are given references to notices of the inventions which have appeared in the volumes of the MECHANICS' MAGAZINE and other works, and to the reports of law proceedings for infringements, &c. Of course they are but "outline descriptions," and necessarily afford, in many instances, a mere hint only of the invention. The official compilers have manifestly been subject to the difficulty with which we ourselves are but too familiar—that of extracting *any* pith or point from some specifications, either because of the peculiar nature of the inventions, or because extremely ill-drawn specifications are filed by some patentees, and by some individuals who take upon themselves the office of agent for patentees. Let us notice a few examples of the manner in which the authors of these official abridgements have been compelled to pass over some specifications. Of No. 10,805, they merely say, "the invention relates to ores containing copper;" of No. 10,834, "the invention refers exclusively to ores containing tin;" of No. 12,074, "the specification and drawings describe, under eight heads, various improvements in the self-acting steam hammer;" of No. 1,209, (1852), "these [improvements] apply to the process of smelting sulphuret, copper, and other ores;" of No. 754 (1854), "it relates to stamping and washing machinery suitable for working the precious metals;" of No. 2,419 (1855), "the specification and drawings, which require to be consulted, describe an improved arrangement of valves and valve gearing and pistons applied to forge and other hammers worked by elastic gas, steam, or compressed air;" and so on. Some of these are shorter than the abstracts given in our columns when the specifications were filed. We put these facts forward, because correspondents sometimes suppose that our abstracts are briefer than they need be, and because we often feel dissatisfied ourselves when we are unable to give a condensed statement of an invention, and have to refer readers to the specification itself. The fault chiefly lies with those patentees who either file ill-drawn specifications themselves, or permit such to be filed in their names. A mere drawing with references is often deposited as a specification, without any statement of the nature of the invention, or of the manner in which it is to be performed. Such documents are worth nothing, and the patent rights which depend upon them are, of course, worth no more. Specifications of this kind most frequently proceed from foreign sources—sometimes from foreigners who do not understand the English law, but nevertheless act for themselves; and sometimes from foreigners who understand it no better, but nevertheless act for others! We regret to have to add that there are Englishmen who have no more knowledge, and no greater integrity. On the other hand, specifications of inventions are sometimes either so voluminous or so much in detail as to render any brief statement of the invention impossible—or, if possible, unintelligible. On the whole, we believe—and we may say with perfect confidence that we speak from a longer and more arduous experience in this matter than has fallen to the lot of any other person—these "Abridgments" are made with very great care, and are in every respect creditable, in the highest degree, to the Commissioners of Patents, to Mr. WOODCROFT, their Superintendent of Specifications, and to the Department generally.

We have no space left to speak here of the office—especially the library—in which all these publications are prepared. The *Times* lately denominated it a "gloomy office, only fit to be used as a cellar," although it "has a surplus revenue equal to that of some Principalities, and is stored with treasures of such accumulated knowledge and skill as, if once destroyed, could never be replaced." The *Times* did not exaggerate the truth. We can only now ask the Commissioners,—When is the gloomy cellar to be changed for an appropriate building? This question we shall urge upon them on an early occasion.

* Abridgements of the Specifications (of Patents for Inventions)
Relating to "Drain Tiles and Pipes," 1857.
" "Manufacture of Iron and Steel," 1858.
" "Manure," 1857.
" "Sewing and Embroidering," 1857.
" "Marine Propulsion," Parts I., II., and III., 1858.
" "Preservation of Food," 1857.
" "Aids to Locomotion," 1857.
" "Steam Culture," 1858.
" "Watches, Clocks, and other Timekeepers," 1858.
" "Fire-arms," 1858.

THE SILVER COINAGE.

THE *Times* of Monday last gives publicity to a letter from "H. F. B." on the silver coinage. This correspondent complains to the Editor of the great journal that many of the shillings, sixpences, and other coins of smaller value, now in circulation, are much the worse for wear. He appears, however, not to be aware that the Bank and the Mint are continually endeavouring to meet and to obviate the inconveniences arising from the incessant and inevitable deterioration of the silver coinage. When the constant moving from hand to hand, from pocket to pocket, and from counter to counter, which the silver family of coins have to undergo is taken into reckoning, it is not strange that they should exhibit the effects of such changings. The sharp edges of the engraving are first taken off by friction, then follow the legend and superscription, and finally the wear "begets a smoothness" which makes their individuality dubious. These are natural results. They are also unavoidable. The newly-minted shilling, with all the bloom of the well-polished die upon its surface, becomes, after a week's contact with the world, dull and spiritless. In a few more weeks, it is found lighter than when issued from the mint, and, in its restless course of existence, must display the effects more and more palpably of the "fast" life it leads. These things are patent to the public, as they necessarily are to those who have to provide a remedy for them. If "H. F. B," in place of writing grumbling letters to the Editor of the

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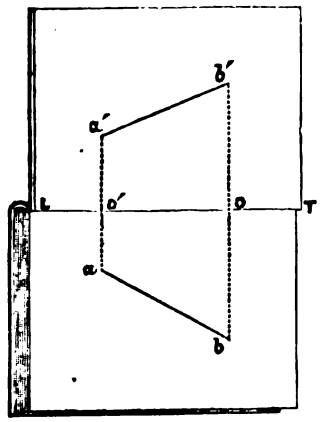
Times, would but take up the Commons' annual return of work done, and expenses incurred in producing at the Royal Mint current coins of all kinds for the convenience of Her Majesty's lieges, he would find that £10,000 is expended yearly in the purchase of worn silver, and that the quantity of new florins, shillings, sixpences, and threepences constantly being struck and sent forth to fill the voids created by its withdrawal, is more than proportionate to the occasion. At the Bank of England there is a constant detention of worn-out coins of the kinds referred to, which reach it from the branch banks of the United Kingdom; and, at intervals, when a sufficient accumulation has been made, they are despatched to Tower-hill, and passed once more through the melting-pot, and subjected to such other processes as are necessary for their conversion into new coin. "H. F. B." will thus learn that the constant and irremediable wearing out of the old metallic currency is met by the continual creation of a new, and that the quantity of old *and* new silver coin at present in circulation is greater now than it has been previously in the annals of England. The quotations of the *Times* correspondent from Macaulay as to what Newton and Bacon thought about the currency in their days, are interesting, because the men alluded to were giants in intellect, but they are not at all relevant to the exigencies of the present time.

LAYING-OFF;
OR, THE GEOMETRY OF SHIP-BUILDING.
No. II.

HAVING shown how points and lines may be projected and the positions and directions of plane surfaces recorded upon *two* planes at right angles to each other, we must now point out the means by which these *projections* and *traces* may be recorded on *one* plane—that of the sheet of paper on which we make a projection drawing. We have seen in fig. 2 (page 39) that the perpendicular distances of a' and b' from the axis are equal to the heights of A and B above the horizontal plane. Now if we bear in mind how these points a' and b' have been obtained, and what they represent, we shall know just as much about the heights of A and B if the cover of the book is turned down until it is in the same plane as the first leaf, as in fig. 5, as we should were it held at right angles thereto, as in fig. 2.

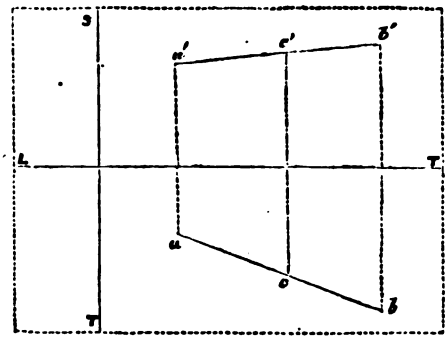
FIG. 5.



Let us suppose, then, that the vertical plane is made to turn about the axis until it comes into the same level as the horizontal plane. The projections (a, a') and (b, b') of the points A and B, and the projections (a, b) (a', b') of the line $A\,B$, will then appear as shown in fig. 5, $L\,T$ being the joint or axis. It must be observed that the projections of any particular point in $A\,B$ as of A will be immediately over each other, so that the line $a\,o'\,a'$ joining a and a' will be perpendicular to the axis.

This will be seen at once if we imagine a plane to be drawn across the two planes of projection in fig. 2, page 39, perpendicular to the axis, and therefore cutting each of these planes in a straight line at right angles to the axis—the two lines meeting in the same point in the axis. Now, it is evident that the *projecting lines* of A in that figure, viz., $A\,a'$ and $A\,a$, will be parallel to this supposed plane, and that therefore the projections a and a' will be at the same distance from its traces as A is from the plane itself. But when the vertical and horizontal planes are brought into the same level as in fig 5, the vertical and horizontal traces of the supposed plane will form one straight line S, T, fig. 6, at right angles to the axis; and as a and a' have been shown to be equally distant from these traces, it will follow that the line joining a and a' is also at right angles to the axis (fig. 6). The same might be proved of the line joining the projections of B, or of any other point, either in the line $A\,B$, or in space. From this

FIG. 6.

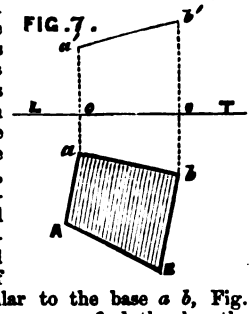


will follow the important fact, that if c is known to be the horizontal projection of a point C in the line $A\,B$, then c', the vertical projection of C, may be found by drawing a line from c at right angles to the axis to meet the line $a'\,b'$. We have shown by dotted lines, in the last figure, the boundaries of the planes of projection, but it will be seen that they answer no end, and may be dispensed with if we are careful to preserve the position of the axis L, T; for the future, therefore, we shall only give the axis, and suppose that all above this line belongs to the vertical plane—all below it, to the horizontal plane.

We shall now proceed to show, as we have promised, that the projections a, b and a', b' record the *length* of the line A, B as well as its position.

Since a and b, Fig. 7, are the horizontal projections of the points A and B respectively, we know that these points lie immediately over a and b, *i.e.*, in lines drawn up from them perpendicular to the paper, so that the line $A\,B$, its projection a, b, and the perpendiculars from A to a and from B to b, form together a four-sided figure, the sides of which are perpendicular to the base $a\,b$, Fig. 2, (page 39); if, then, we can find the lengths of the perpendicular sides, and construct the figure, we shall obtain the true length of $A\,B$. But we have seen before, that the length of the line $A\,a$ is $o'\,a'$, and the length of $B\,b$ is $o\,b'$; construct therefore the four-sided figure A, B, b, a, and $A\,B$ is the length required. It is the same thing as if, keeping $a\,b$, (in Fig. 2) fixed, we had turned the four-sided figure, $A\,B\,b\,a$, down upon the plane, that we might look at it. This operation of throwing the figures down that we may see them in their true shape and dimensions is called *rabatment*, the English of which is "throwing down." As we shall frequently have occasion to adopt this method, we should recommend the reader to be quite sure that he understands it before we pass on. It would be good exercise to

FIG. 7.

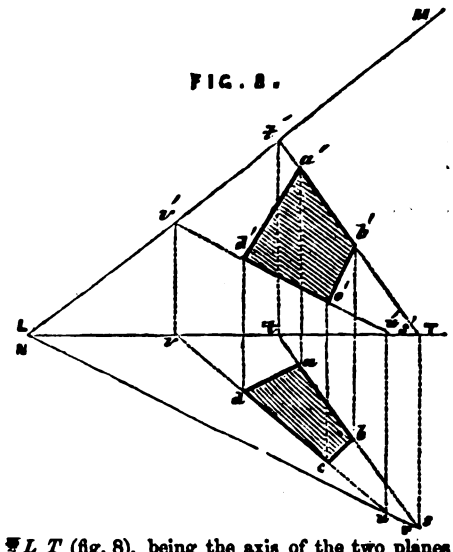


draw fig. 7 on a piece of paper, and to cut with a penknife along the lines $a\,A$, $A\,B$, and $B\,b$; then if the shaded figure is turned up until it is square to the paper, and the paper be bent at $L\,T$ until the vertical plane is perpendicular to the horizontal plane, it will be seen that $A\,B$ is really the line of which $a\,b$ and $a'\,b'$ are the projections.

As we are anxious to proceed to the drawings of a ship, we shall conclude these introductory considerations with a problem which is so far advanced in the theory of projections that we shall lay ourselves open to the charge of incautiousness in taking beginners beyond their depth. We must, therefore, beg them to proceed with care, and to give due heed to every step; and we promise, on our part, that where any explanation is really necessary, in addition to what has been already given, it shall not be withheld.

The problem is—having given the projections of a plane quadrilateral—*i.e.*, of a four-sided figure, find the true shape.

FIG. 8.



$L\,T$ (fig. 8), being the axis of the two planes of projection, let $a\ b\ c\ d$, and $a'\ b'\ c'\ d'$, be the horizontal and vertical projections respectively of a quadrilateral figure lying in an oblique plane, the position of which is not given. Neither of these projections being the true shape of the figure, it will be necessary to perform a rabatment—*i.e.*, to throw the figure $A\,B\,C\,D$, down upon one of the planes of projection. To do this, we must discover the plane in which the figure is lying, and then turn it about one of its traces until it coincides with the plane of projection. The figure sought may then be drawn upon it. First, to find the plane. Here it may be observed that, since the figure is plane or flat, the plane which contains any two sides of it must contain the whole figure, and that it will be sufficient to discover the plane containing the lines $(a\ b)$, $(a'\ b')$, and $(c\ d)$, $(c'\ d')$. To do this, produce $a'\ b'$ downwards until it meets the axis in s'. Then s' is the vertical projection of a point in the line $A\,B$, the height of which above the horizontal plane is nothing, and which is therefore *in* the horizontal plane. And if s' be the vertical projection of such a point, we have already shown that the horizontal projection s of the same point may be found by drawing a line from s' perpendicular to the axis until it meets $a\,b$—the horizontal projection of the side $A\,B$—produced. s, s' is therefore a point in the line $A\,B$, and also in the horizontal plane of projection, *i. e.*, is the point in which the line $A\,B$ pierces the horizontal plane. This point is called the horizontal *trace* of the line $A\,B$. Again, produce the horizontal projection b, a until it meets the axis in t; then t is the horizontal projection of a point in $A\,B$, the distance of which from the vertical plane is nothing, and which is therefore *in* the vertical plane. The vertical projection of this same point will be t', where a perpendicular from t meets $b'\ a'$ produced;

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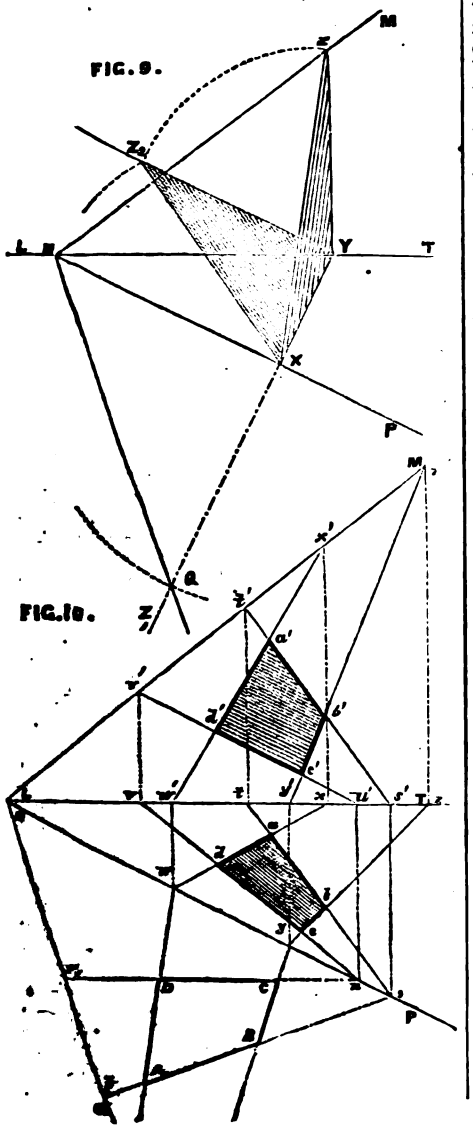
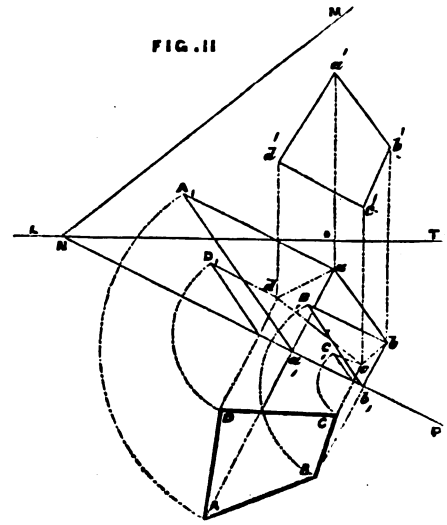
(t t') is therefore the point in which the line $A\,B$ pierces the vertical plane, and is called the vertical *trace of* $A\,B$. If the diagram were now bent so that the part above $L\,T$ were at right angles to that below it, it would be seen that a line stretching from s to t' would have $s\,t$ and $s'\,t'$ for its projections. We may find in a similar manner v' and u the vertical and horizontal *traces* respectively of the line ($c\,d$), ($c'\,d'$) or $C\,D$ produced. As we have now found the points in which two of the sides of the figure, when they are produced or extended, pierce the planes of projection, we are able to determine the lines in which the plane containing these sides cuts the planes of projection, for it is clear that the plane must cut the vertical plane of projection exactly where the lines pierce it, so that its vertical trace will be the straight line $M\,N$, passing through the points v' and t'; and that in the same way it will cut the horizontal plane in the line $P\,N$, joining s and u. $M\,N\,P$ will therefore be the plane containing the lines ($a\,b$), ($a'\,b'$) and ($c\,d$), ($c'\,d'$), and also the figure of which they form two of the sides. We have shown the traces $M\,N$, $P\,N$, discovered as just described, meeting in the axis. If in constructing the figure they should be found not to do so, it may be concluded at once that there is an error in the work, for a moment's consideration will show that $M\,N$ and $P\,N$ could not be the traces of one plane unless they met in the axis. Having thus obtained the plane in which the figure lies, we may proceed to *rabat* the portion $M\,N\,P$ included between the planes of projection.

To avoid confusion we will perform this operation in a separate figure, fig. 9, in which $M\,N\,P$ is the plane to be rabatted—suppose about its *horizontal* trace $N\,P$. Our object will then be to discover where the line $M\,N$ would lie if $M\,N\,P$ were thrown down upon the horizontal plane. It is at once obvious that the point N will remain fixed, and that we have only to find where one other point in the line $M\,N$ will be after the revolution. Let Z be this other point. From Z draw $Z\,Y$ perpendicular to the axis, and from Y draw $Y\,X$ perpendicular to $N\,P$ and join $X\,Z$. It will be evident that $X\,Y\,Z$ is a right-angled triangle, the hypothenuse of which, $X\,Z$, is in the plane $M\,N\,P$, and is perpendicular to the trace $N\,P$. Now any line in the plane $M\,N\,P$, which is perpendicular to $N\,P$ *before* the plane is thrown down, must also be perpendicular to it *after* the rabatment. So that after this operation the line $X\,Z$ must lie in the line $X\,Z_1$, drawn from X perpendicular, to $N\,P$ and the point Z will therefore be found in this line, and it only remains to discover how far it is out from $N\,P$. For this purpose we must find the true length of $X\,Z$. This may be done by remembering that it is the hypothenuse of a right-angled triangle of which $X\,Y$ is the base and $Y\,Z$ the perpendicular. Construct, then, such a right-angled triangle on the plane of the paper by drawing $Y\,Z_2$, perpendicular to $X\,Y$ and equal to $Y\,Z$, then $X\,Z_2$ is the real length of $X\,Z$, and the point Z must lie in $X\,Z_1$, at a distance from $N\,P$ equal to $X\,Z_2$ *i. e.*, at Q, found by sweeping the arc $Z_2\,Q$ from centre X. Join N and Q, and the line $N\,Q$ is $M\,N$ rabatted; and $P\,N\,Q$ is the true shape of $M\,N\,P$, the portion of the plane included between the planes of projection. In Fig. 10, we have added to Fig. 8 the line $N\,Q$ thus discovered, and have found the points (w w') and (y y') in which the other sides $A\,D$ and $B\,C$ of the figure pierce the horizontal plane, and which, for the reasons stated with regard to (s s') and (u u') must lie in $N\,P$. Similarly (x x') and (z z') are the points in which these sides pierce the vertical plane.

When we rabat the plane $M\,N\,P$, the points s, u, y, and w, in which the four sides of figure produced meet the horizontal plane, remain fixed, while the points t', v', z', and x' will be found along $N\,Q$, at the same distances as before from N. Therefore, set off these distances and find the points v t, &c. Then, if u and v be joined, the line $G\,D$, of which ($c\,d$) ($c'\,d'$) are the projections, will be a portion of it; and so, also, if s and t be joined, the line $A\,B$, of which ($a\,b$) and ($a'\,b'$) are the projections, will be a portion of it. Similarly join w and the point in $N\,Q$ produced corresponding to x', and we shall obtain $D\,A$; and by joining y with the point corresponding to z', we shall obtain the fourth side, $C\,B$. Thus is discovered the true shape and size of the figure of which ($a\,b\,c\,d$) ($a'\,b'\,c'\,d'$) are the projections.





This problem might have been solved by rabatting each of the points A, B, C, D without rabatting the plane. Fig. 11 shows the mode of effecting this. We know, for example, that if a plane be drawn through the point A, *before rabatment*, and perpendicular to the line $N\,P$, it will cut the horizontal plane in a line $a\,a_1$, and the plane $M\,N\,P$ in a line through a_1, perpendicular to the line $N\,P$. These two lines, together with the perpendicular leading down from A to its horizontal projection a, form a right-angled triangle of the same dimensions as the triangle $a\,a_1\,A_1$, in which $a\,A_1$ is drawn equal to $o\,a'$. If this triangle be now turned edgewise about the point a_1, and perpendicular to $N\,P$ until its hypothenuse reaches the horizontal plane, the hypothenuse will then coincide with the line $a_1\,A$ the distance $a_1\,A$ being set off equal to $a_1\,A_1$, the distance of the point A in its original position from $N\,P$. Proceeding in a similar manner with regard to the point B, *i.e.*, drawing from b, $b\,B_1$, perpendicular to $b\,b_1$, and therefore to the horizontal plane, and setting up on it the height of b' above the axis, we obtain a triangle in which $b_1\,B_1$ is the distance of the *unrabatted* point B above the axis; upon throwing this triangle down we discover the point B. Find in this way, also, the points C and D, join them, and the figure $A\,B\,C\,D$ is the same as that obtained in fig. 10, viz., the figure of which ($a\,b\,c\,d$) ($a'\,b'\,c'\,d'$) are the projections.

SHIPPING STATISTICS.

(*Concluded from page* 43.)

THE test of dynamic merit, as above set forth, based on the mutual relations of displacement, speed, and power, presumes on the net power effectively applied in propelling the ship being always in a constant and known ratio to the gross indicated power.

The inquiry, therefore, so far, is of such a nature as demands professional knowledge and skill in order to determine and discriminate between the merit that may be due respectively to the type of form of the hull, and to the construction of the engines, propeller, and boilers; for a good type of hull, propelled by an inferior construction of machinery and boilers, or an inferior type of hull propelled by a good construction of machinery and boilers may, by the above formula, produce equal results. This committee, however, considers it of vital importance to the promotion of the objects of this inquiry, viz., "the maturing of a system of statistical record conducive to the improvement of naval architecture," that the owners and charterers of ships, and the directors of shipping companies or agents by whom shipping affairs are conducted, should themselves have the means of ascertaining the relative dynamic merits and working condition of their ships without any reference whatever to the professional assistance of builders or engineers, but be enabled to judge for themselves whether the performance be good or bad by reference to the data afforded by their counting-house records; and this desirable object may be at once effected by the displacement of the ship being known, and by substituting in the foregoing formula the consumption of fuel in a given time (say the weight in cwts. (W) consumed per hour), in lieu of the expression for power, and regarding the hull, machinery, and boilers collectively as an integral equipment of which the co-efficient derived from the formula $\frac{V^3 \times D^{\frac{2}{3}}}{W}$ indicates the dynamic condition with reference to the dynamic condition of other vessels tested by the same rule, viz., multiply the cube of the speed by the square of the cube root of the mean displacement, and divide the product by the consumption of fuel per hour expressed in cwts. The quotient indicates the relative dynamic condition of the vessel. For example: A steam-ship (A) performed out and home voyages amounting to 7,200 nautical miles in 652 hours, being at the average speed of 11·04 knots per hour, the consumption of coal was 1,519 tons or 30,380 cwts., being at the rate of 47 cwts. per hour, and the mean displacement was

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2,934 tons. Hence the co-efficient of dynamic duty indicative of the merits of the performance on this occasion is—

$$\frac{(11{\cdot}04)^3 \times (2934)^{\frac{2}{3}}}{47} = \frac{1345{\cdot}6 \times 205}{47} = 5870.$$

Again, another vessel (B), with a mean displacement of 840 tons, attains on long-continued service the average speed of 12·78 knots per hour, with the average consumption of 50·3 cwts. coal per hour, giving a co-efficient of dynamic duty—

$$\frac{(12{\cdot}78)^3 \times (840)^{\frac{2}{3}}}{50{\cdot}3} = \frac{2087{\cdot}3 \times 89}{50{\cdot}3} = 3693.$$

Thus, in one case (A) the co-efficient of dynamic duty, based on the consumption of fuel, is 5870, whilst in the other case (B) it is only 3693; that is, one cwt. of coal in A performs as much dynamically effective work as is performed by $1\frac{6}{10}$ cwts. in the case of B, a discrepancy which may well induce professional inquiry being instituted by the shipowner, whether the inferior performance of B is occasioned by inferior type of form, or foulness of bottom, or inferior principle of mechanical appliances, or inferior management, or bad coal; for these causes, combined, or indeed either one of them alone, may be sufficient to account for the result.

Now, what are the all-important elements of construction thus proposed to be embraced in public records, and thereby made known to the purchasers and charterers of ships with a view to enable such parties to test the economic working capabilities of ships, so conducive to the reformation above referred to? Why, by the rule above enunciated, the displacement corresponding to the constructor's load draught at which the ship may be tried, and to which approximately, as a general rule, the ship may be loaded, becomes the only item of statistical data that requires to be officially recorded, for the test trial and sea performances of ships, as above shown, will give the capabilities for speed; and the consumption of fuel per hour corresponding thereto will be known from the counting-house ledger.

It is, therefore, suggested that the registration records of every ship give the displacement when the ship is immersed down to some definite line, which may be denominated the constructor's load line.

The assignment of the constructor's load line draught forward and aft, and the corresponding displacement, is all the statistical data that is required to be registered in addition to the details of registration already enforced under the Merchant Shipping Act of 1854, in order to determine the comparative co-efficients, and put the system of practical rivalry hereby suggested into operation, as being the most effective system for inducing improvement in naval architecture.

As regards the existing system of shipping statistics and shipping registration, with reference to its affording data available for promoting shipping improvement, this committee has to observe that, although the aggregate register tonnage of mercantile shipping appears to be a very close approximation to the aggregate weight-carrying capability of the entire mercantile navy, still, when considered in detail with reference to particular ships, it is found that the register tonnage of a ship affords no approximate criterion whatever either of the load displacement or of the weight-carrying capabilities of ships respectively, for, by reference to the Appendix, it will be found that ships are frequently loaded with dead weight of cargo to the extent of double their register tonnage, and the statement shows the following extreme cases of weight-carrying capability with reference to register tonnage:—

Country traded with.	Vessels.	Weight of cargo.	Register Tonnage.	Ratio of Cargo to Tonnage.
		Tons.		
Morocco.....	34	11,576	4,075	2·8 to 1
Tunis	1	780	259	3 to 1
Bolivia	2	2,301	455	5·2 to 1

These cases appeared so remarkable that the committee were anxious to prosecute inquiries with reference to the build and sea performances of those particular ships, and with that view they addressed a letter to the Custom House for the purpose of identifying the vessels thus referred to; but the official fees demanded for responding to such inquiries, put it out of the power of the committee to avail themselves to any useful purpose of the shipping statistics of Government.

Another difficulty which greatly obstructs the collecting of statistics on the sea performances of mercantile shipping, is the great number of vessels bearing the same name. In many cases, there are scores of vessels bearing the same name, thus rendering it extremely difficult to trace and scrutinize the performance of a vessel of any name with certainty as to her identity; for, in publishing the arrivals and departures of shipping in mercantile navy records, the registered number of a ship, which constitutes the only means of identification, is not generally given in connection with her name.

A further instance of the insufficiency of our present system of shipping registration as statistical data indicative of the size of the hull of steam shipping, is afforded by the statement given in the Appendix, which has been deduced from a return of the House of Commons, showing the per centage deduction from the gross tonnage allowed for the engine rooms of steam-ships, whence we see that, without any reference whatever being made to the actual weight of the machinery, deductions are made from the gross tonnage varying from 5 per cent. to 92 per cent. of the gross measurement, the remainder only being brought to account as the registered tonnage of the ship.

In conclusion, this committee begs to observe, that if the views thus brought before the notice of the British Association should be deemed worthy of further prosecution, and be favourably entertained by the Government, the statistics of the Post-office, as respects the constructive elements, and test trials, and subsequent sea performances of the various steam-ships employed in H. M. Mail Service, would afford a collection of statistical data which, if duly analysed and applied as herein suggested, would greatly promote the objects of this inquiry which the British Association has thus been pleased to institute.

The committee has the painful duty of announcing the death of one of its members, James Perry, Esq.; whose personal character, practical intelligence, and public usefulness, were of such an order, that his decease may be mourned as a public loss.—(Signed)

WILLIAM FAIRBAIRN, Chairman.
CHARLES ATHERTON.
ANDREW HENDERSON.
HENRY WRIGHT.

LIEBIG ON SEWAGE.—The illustrious Liebig has lately addressed the following impressive letter to an English gentleman:—

My Dear Sir,—Pray accept my best thanks for your continued interest in my lectures on theoretical and practical agriculture; they are being translated by Dr. Blyth, of Cork, who has by this time nearly completed them. Since last week I have been lecturing on sewage; and I am firmly of opinion that if England wishes to remain an agricultural country she must use as manure the nightsoil and similar residues produced in large cities. This necessity would be increased in the event of a war with America, when the supplies of guano would cease. The price of corn depends upon that of guano, and it is most unnatural that, in a country like England, the production of corn and meat should be so dependent on the supplies of foreign manure. The heads of even the most enlightened agriculturists have been turned by a theory propounded by Mr. Lawes,—viz., that nitrogen or ammonia are the most necessary ingredients in manure, and that consequently solid excrements are valueless, the urine alone being of use. These views expose utter ignorance, and prove that in England leading agriculturists do not pay sufficient attention to the fundamental principles of chemistry. It is difficult, nay, perhaps impossible, at this moment, to convince them of their error. I have tried to do so in my "Letters on Chemistry" I have just published, and I shall feel most grateful to you, as well as to all who, like yourself, take an interest in the welfare of their country, for any assistance that may be tendered me in propagating this great truth.—Yours, JUSTUS VON LIEBIG.

LITERATURE.

The Construction of Wrought-Iron Bridges, embracing the practical application of the Principles of Mechanics to Wrought-Iron Girder Work. By JOHN HERBERT LATHAM, M.A., Civil Engineer, Fellow of Clare College, Cambridge. *With Numerous Detail Plates.* Cambridge: Macmillan and Co., and 23 Henrietta-street, Covent Garden, London. 1858.

MR. LATHAM, the author of this work, has had advantages which hitherto have not often been possessed by the same individual, for to his mathematical training at Cambridge has been added some valuable practical experience under the late distinguished engineer, Mr. J. M. Rendel. It affords us great satisfaction to see such a work issued from the press, for engineering practice has far outstripped the theoretical knowledge which exists upon the subject, and it is high time that the profession set about properly combining the two. It is undeniable that very few of our eminent engineers have possessed, or even now possess, any considerable knowledge of abstract science. For this they have had to depend almost exclusively upon others, and it has unfortunately happened that their dependence has sometimes been placed in men who have not themselves been either sound or skilled mathematicians. It is most desirable, manifestly, that this state of things should be brought to an end as soon as possible. We want to see the pure but unproductive virgin, *theory*, wedded to lusty *practice*, that from their union may spring a race of useful and comely works, such as we now look for in vain. We would cast no slur upon the engineers of either the past or present. Their want of theory to guide them has been no fault of their own, and without it they have filled the world with marvels. Common men, without position, without education, springing from the workshop, the colliery, the mine, have with their own unaided brains and hands devised and wrought out works which make the miracles of the past ridiculous, and throw the gods of the ancients eternally into shade. All honour to such men! Still, we must systematize the knowledge we have been accumulating by experience; we must bring it into order in the light of true theory. In the writings of Willis, Hodgkinson, Tredgold, and others, we have welcomed every attempt at this, and we now greet Mr. Latham in the same field with a cordial welcome. If he is a young man, as he seems to be, there is a splendid path open for him. He endeavours to narrow the chasm between the literature of our "highest experience" and our "highest reasoning;" and he temperately urges the propriety of shaping the theoretical studies of our universities to a certain extent by what is going on in the practical world. May he gain some success in these respects! In this matter, at least, there need be no "bridal dawn of thunder peals" at the wedding of *thought* with *fact*. The necessary progress may be made gradually, peacefully, and with the happiest results. Only readers who have mastered a moderate amount of mathematics will be able to read the whole of Mr. Latham's work, but it will amply repay the perusal of those who can read it. We have not space to review it here; our readers must content themselves with our assurance that it contains invaluable investigations and information respecting bridges and bridge-work, and that no cultivated engineer should attempt to do without it. The price (15s.) will appear to some rather high, perhaps; but those who know the expense of getting up mathematical matter and engraved plates, and who are able to estimate the intrinsic worth of the volume, will be far from grudging it.

The Literary and Educational Year Book for 1859. London: Kent and Co., Paternoster Row, and Fleet Street.

WE have already expressed a high opinion of this work, but we cannot allow its appearance (after an unexpected delay) to pass without again giving it a good word. It consists of more than 200 pages of tightly-packed information of very various character, and it is difficult to conceive

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of a person by whom it would not be found of great use. To many it will be invaluable. We are very glad to find that the editor has had the good sense to give scientific persons and scientific matters their just position—which is a very prominent one; and we hope that an extensive sale among scientific individuals and institutions will prove to him that his wisdom in that respect is properly appreciated.

Electricity and the Electric Telegraph; together with the Chemistry of the Stars; an argument touching the Stars and their Inhabitants. By GEORGE WILSON, M.D., F.R.S.E., Regius Professor of Technology, University of Edinburgh, and Director of the Industrial Museum of Scotland. *New Edition, revised,* with the addition of a Description of the Atlantic Cable. London: Longman, Brown, Green, Longmans, and Roberts. 1858.

PROFESSOR G. W. WILSON in this little volume furnishes us with two very eloquent discourses, and besides these a poem. To eloquence he happily adds scientific soundness—which few eloquent men do. His discourse on electricity and the electric telegraph is a very excellent resumé of the principal known facts and theories bearing upon them. His discourse on the chemistry of the stars goes to show that we have no ground for supposing that anything like terrestrial life exists in what are called the "fixed" orbs of heaven. This essay is a very singular and interesting production, and as its first appearance preceded the celebrated "Plurality of Worlds," it should be consulted by those who studied the discussion which followed the issue of that work. The poem is on the Atlantic Cable, and appeared originally in "*Blackwood.*" Now, as then, we read it with astonishment, both on account of its merits and its defects. It seems incredible that the author who wrote

> "So now, methinks, this Earth of ours
> More like to Heaven should be,
> When we have seen an end of Time,
> And there is no more Sea,"

should also have written

> "Then rose the Demon of the Storm,
> And lashed the Vassal-sea,
> Until with desperate hands the link
> He broke in his great agony."

Why, in the name of all the Muses, was the word "great" forced into that last line, which would have been so incomparably superior without it? As specimens of the higher style of Professor Wilson's prose we quote the following passage from the first discourse:—

"In the year 1517, as the historians of the Reformation tells us, the Elector, Frederick of Saxony, had a strange dream. The monk Luther appeared to him, writing upon the door of the palace-chapel at Wittemberg, in his dominions. The pen which Luther handled was so long that its feather-end reached to Rome, and shook the Pope's triple crown on his head. The cardinals and princes of the empire ran up hastily to support the tiara, and one after another tried in vain to break the pen. It crackled, however, as if it had been made of iron, and would not break; and whilst they were wondering at its strength, a loud cry arose, 'and from the monk's long pen issued a host of other pens.' The Elector's dream has been fulfilled in our own day. The long pen of iron sprouting forth hosts of pens is in our hands, and every day grows longer. It *has* reached to Rome, and much further; it has shaken popes' and kings' and emperors' crown; and foretold, like the pen which Belshazzar saw, the fall of thrones and the ruin of dynasties. It has written much of wars and revolutions, and garments rolled in blood, and must write much more. But it is the emblem and minister of peace, and the long pen shall yet vanquish the long sword."

In his second discourse, the author takes the opinions of a lamp-lighter, a stoker, a sailor, a soldier, a poet, and other disinterested parties, upon the starry universe. Let us hear one of them express his views. We will take the sailor, who finishes thus:—

"If there are all these differences among our sailing vessels, are there likely to be fewer among the ships of heaven? Do you think it probable that if by means of some loudest speaking-trumpet we could hail each shining orb with 'Star-a-hoy!' and thereafter, by means of some farthest echoing, reverberating hearing-horn, could get back an answer, that from every one would be returned the same doleful or trivial earthly murmur—*Californian Diggings; Kaffre War; Ministers Outvoted; Fête at Paris; Insurrection in China; His Holiness the Pope's last Bull.* My friends, think of this. In the azure sea above us, there are no shores or landing-places; it is one boundless PACIFIC OCEAN, where the frailest bark never hides behind a bulwark, or drops anchor in a storm. The fleets of heaven are all phantom ships, for ever sailing, but never nearing port. If they are all, then, as nearly as possible identical, why are there so many? If the nature and object of each is the same, why are they not pieced together so as to make up one huge vessel? They might as well have been nailed and hammered into a single mighty sun, or sun-earth, lighting up and darkening itself, while it floated through space, like a gigantic Noah's ark, laden with every living creature."

Who Invented the Locomotive Engine? with a Review of Smiles's "Life of Stephenson." By OSWALD DODD HEDLEY. "*Palmam qui Meruit Ferat.*" London: Ward and Lock, 158 Fleet-street. 1858.

VERY few know how to write the lives of great men wisely. Biographers, with but few exceptions, first make the mistake of overlooking the elements which constitute the true greatness of their heroes, and then commit the further error of supplying what they consider becoming in a great man. The veritable greatness which God gives to the man has substituted for it the best artificial excellencies which the poor author can invent for him. Hence, we are often painfully reminded that His ways are not man's ways, nor His thoughts man's thoughts. We should be very sorry indeed to imply that Mr. Smiles's much-discussed "Life of George Stephenson" is any other than a very excellent work; but, while we give it that credit, we cannot believe that his conception of his hero is precisely a true one. We do not think the illustrious engineer was a less noble or less able man than Mr. Smiles represents; but we do think that gentleman has, to a certain extent, covered ground belonging to others with his monument. This belief is suggested not by the appearance of the volume now before us only, but by several things that have transpired lately, and by others that we knew before. Mr. Oswald Dodd Hedley is decidedly of our opinion in this matter; and, for aught we yet know, of much more than our opinion; for he believes that, in his pages, evidence is adduced "that most irrefragably proves Mr. William Hedley to have been the inventor of the locomotive engine on the present principle." The author (a son of William Hedley, we presume) writes warmly, but ably nevertheless, and should be read by all who take an interest in the question which he discusses. As the whole subject is likely again to come before our notice, and to claim our consideration on an early occasion, we shall at present content ourselves with having stated the object of Mr. Hedley's book, and brought it to the notice of our readers.

On the Military and Naval uses of very large Shells, and the comparative Powers of Shells in relation to Diameter. A Paper read at the United Service Institution, London, May, 1858. By ROBERT MALLET, Memb. Inst., C.E., F.R.S., Hon. Memb. U. S. Inst. From the *Journal of the United Service Institution*, vol. ii. 1858.

IN this paper, which Mr. Mallet has wisely reprinted, we find, 1, on elaborate investigation of the general relations as to power of shells in proportion to calibre, and the proportionate power of 3-foot shells as compared with 13-ins., which are the largest at present in common use in European armies; 2, a description of the construction and form of the celebrated 36-ins. mortars, with which the author, under the personal sanction of the Prince Consort and Lord Palmerston, startled us all a year or two since; 3, a statement of some of the peculiar purposes to which these very large shells are specially applicable. Mr. Mallet is not only a cultivated and sagacious engineer, but is also possessed of such experience in military matters as was to be acquired by presence at the siege of the citadel of Antwerp by the French in 1832. His paper is most valuable. At the very outset of it; he corrects a popular misconception respecting the objects of his large shells, and explains that they are for use, not against troops in the field, but against works—are "the means, in fact, of transferring to any point within range of the besieger an ignited mine, whose penetrative power shall bury it to the required depth before its explosion." After setting forth, first the purposes, and then the construction of his huge mortars, he gives a very excellent review of the history of shells, in which he evinces great research, and then explains in detail what he conceives to be the advantages which would result from the application of his great-shell system to siege operations. The entire paper is of a most entertaining character, and we almost regret that it is not less lengthy, and less remote, as a whole, from our objects; were it so, we should gladly give it *in extenso*. We commend it to the attention of our readers, many of whom have, we know, both naval and military tastes.

A Discourse on the Study of Science in its Relations to Individuals and to Society. By HENRY HENNESSY, F.R.S., M.R.I.A., Professor of Natural Philosophy in the Catholic University of Ireland. *Second Edition.* Dublin: W. B. Kelly, 8, Grafton Street. London: Simpkin, Marshall, and Co., Stationers' Hall Court. 1859.

THIS is an exceedingly healthy and invigorating discourse, and does great honour, in many ways, to the author. He is evidently imbued, not only with a noble appreciation of science, but also with a consciousness of the harmony which exists between the faculties to which *truth* appeals and those by which *beauty* is embraced. It is from first to last a very manly and generous production. We cannot, of course, attempt to reconcile his liberal language with his religious profession as a Roman catholic; but we care but little for this, especially as his only appeal to his fellow-catholics is designed to stimulate them to intellectual pursuits. We entirely sympathize with his belief that catholics have a right to cultivate science if they please, in halls of their own. Let them do so by all means. The study of science will never make them worse citizens, or greater fanatics; nor will it in any way tend to strengthen that unnatural arrogation of political power by a priesthood, which is now the one great barrier between catholics and protestants.

Description of Griffith's Patent Screw Propeller: with its Recent Improvements. London: Soul, Leadenhall-street, 1858.

WHEN he first introduced his propeller, Mr. Griffiths expected, he here tells us, that considerable advantages would result from an arrangement in its construction, whereby the "pitch," or angle of the blades, could be increased or diminished, and even "feathered," during the voyage with facility, to suit the varying exigencies of sea-going steam-vessels. Experience, however, obtained from many experiments and careful observation, has convinced him, he says, that the risk of derangement, incident to the machinery requisite for this purpose, is too great to admit of practical success, and also that the advantages to be obtained thereby are far less than was supposed; and having lately patented some further improvements in his screw propeller (which is now very generally known), whereby greater speed is obtained, and also greater stability in its construction, with increased facilities for altering the pitch or replacing a broken blade in case of accident without the necessity of docking the vessel, he now draws attention to it by means of this pamphlet. From the engravings, figs. 1 to 6, (next page,) these improvements can be seen. From experiments lately made, he finds that the extremities of the blades do not propel, but act as feeders for the supply of water to the central part of the screw. By curving the blades, as shown on the engraving, from the front or propelling side towards the vessel, the screw (according to Mr. Griffiths) is enabled to get a greater hold of the water, and offer much greater resistance to the power of the engine, in consequence of the water that is drawn from outside the disc in front coming against the propelling side of the blades, instead of their backs, as with straight blades. "The improvements in the construction of my screws," says Mr. Griffiths, "consist in the mode of fixing the blades in their places, and were adopted in consequence of one or two accidents which arose from the giving way of the cast-iron lugs by which the blades were previously fixed. I now substitute for these cast-iron lugs a strong wrought-iron cotter, which

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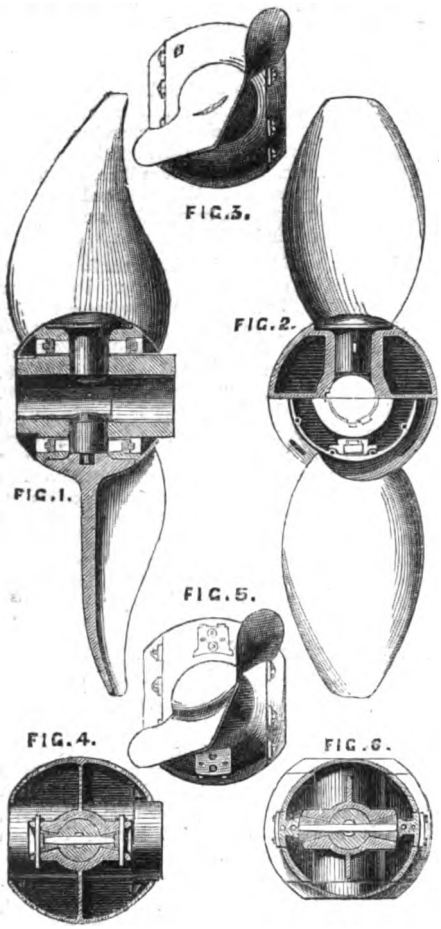


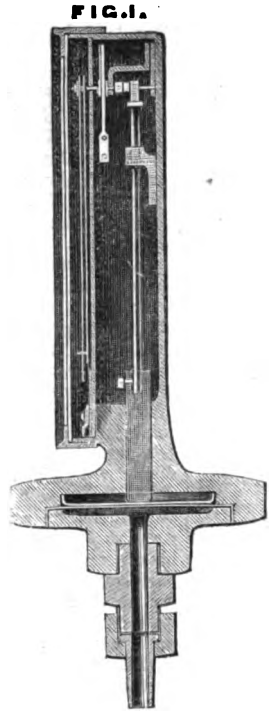
passes through the centre of the shank of the blades, and will entirely do away with any *possibility* of accident from this source. I also considerably increased the diameter of the shanks, and now fit them in such a way that the pitch of the screw can be altered, or a blade removed with much greater facility than before." Amongst the numerous advantages which Mr. Griffiths considers his propeller to possess over all others are, increased speed of vessel, relative to the power employed; less vibration of the vessel; improved facilities for ascertaining the "best pitch" to suit vessels and engines to which it is fitted; the disuse of a spare *screw*, spare *blades* only, which stow in very little room, being necessary; the absence of all necessity for raising or feathering the screw; and the non-liability of the principal propelling portion of the blade, which is near the water, to be lifted out of the water when the vessel is pitching. Mr. Griffiths' pamphlet is well worthy of perusal.

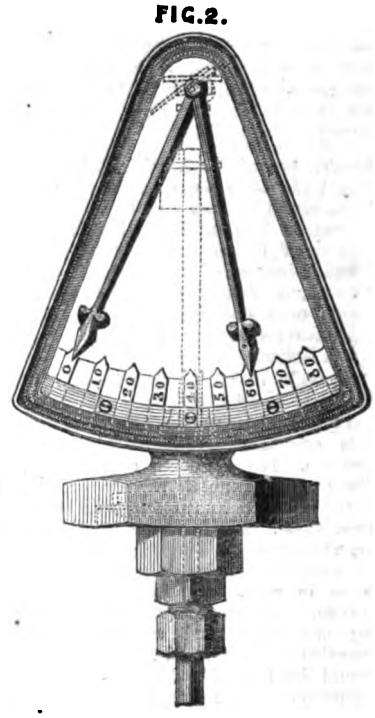
CAPTAIN RAYMOND'S LIFE RAFTS.

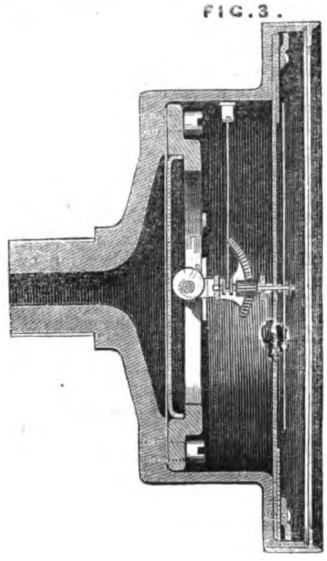
CAPTAIN RAYMOND, of Dalston, last year obtained provisional protection for certain improvements in life rafts, which, we regret to observe, he did not proceed with. He proposed to form his raft of two double galvanised iron cases, cylindrical at top, and flat at bottom. The inner case was to be corrugated, with round ends, and partitioned within; the concave portion filled in with cork, attached by marine glue; then a casing of cork over that, fitting tightly inside the outer case of galvanised sheet iron. To obtain extreme lightness combined with strength, the outer case was to be surrounded at intervals with hollow bands, filled in with cork, to act as fenders, and to contain swivel rings, with the view to prevent numerous lashings in the construction of the life raft. The ends were, also, to be fortified and strengthened by similar means. A space was to be left between the two cases, and the lining of cork even with the openings, fitted with a suitable cover, bag, and plug, to contain rockets, blue lights, lucifer matches, powder, short musketoon, chopper, &c. To the outer were to be fitted iron bars, so arranged that they could be immediately attached to corresponding swivel eyes, thus forming twin tubes with the corresponding bars and marks. When these bars were thrown across and connected, a deck was to be formed on them by means of bamboos or rods of buoyant material. A raft of this description would be speedily constructed, and combine safety, lightness, strength, and durability.

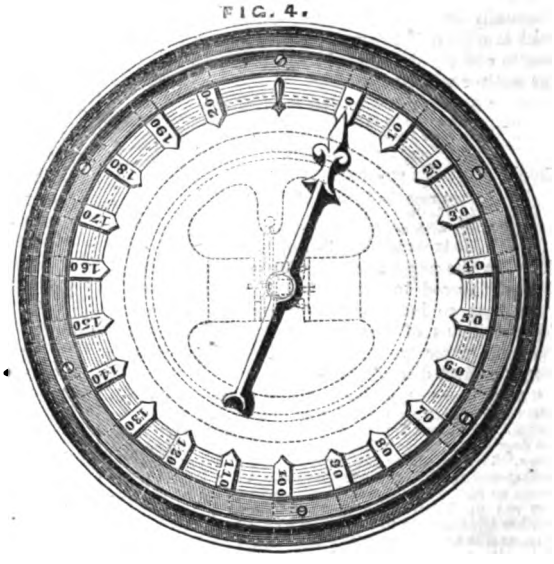
JOHNSON AND VARLEY'S IMPROVED PRESSURE AND VACUUM GAUGES.

Mr. S. W. Johnson and Mr. J. Varley, of Perborough, have submitted to our notice an improved form of pressure gauge, which possesses some important advantages. In the first place, they adopt a new form and arrangement of spring pressure disc or plate, which communicates motion through rods, levers, &c., to the pointer used for indicating the pressure or vacuum. They take a circular plate or disc, and bend up the edge all round till it forms a right angle, or nearly so, with the flat part or body of the disc. They then fit this dished or flanged plate truly into a recess without any other description of fastening, when it is to indicate pressure, with the flanged edge upwards, and in the reverse position when it is to indicate a vacuum. When pressure is exerted on the bottom or back of the disc, the plate springs, or is deflected, and moves about the edge of the flange. In the next place they employ moveable figures on a dial plate, so that the gauge can









be adjusted or changed without disturbing the dial plate itself. Even a new pressure disc may be applied, and the figures be adjusted to it, without any alteration of the dial plate being required.

The annexed engravings illustrate the improvements of Messrs. Johnson and Varley. Fig. 1 is a cross section, and fig. 2 a front elevation of one of their low pressure gauges; fig. 3 is a cross section, and fig. 4 a front elevation of one of their high pressure gauges. The figures are so clearly cut, and the action of such gauges is so well understood by engineers, that we have not thought it necessary to indicate the respective parts by letters of reference. In addition to the advantages mentioned above, it is evident that the form of spring disc adopted in them, being in no way fastened or bound at the edge, will move with great freedom; at the same time a stronger plate than usual can be applied, and greater deflection be given out with safety. In the low pressure gauge an additional pointer is employed for showing the maximum pressure attained. The improved gauges work with great precision and certainty of action, and will, we doubt not, prove very durable.

H. EDWARDS' IMPROVED PIPE-STEM OR TUBE FOR SMOKING.—Mr. Henry Edwards, among other useful patented inventions, has devised a new and improved pipe-stem or tube for smoking, which is adapted for any bowl—meerschaum, china, clay, &c.—prevents the essential oil of the tobacco being drawn into the mouth, and is easily cleaned. This patent Cornucopian pipe, after the insertion in the tube of a small piece of wool, with a few drops of scented water, acts on the principle of the Hookah, and forms what smokers would doubtless consider a luxurious fire-side pipe, imparting fragrance, and destroying the unpleasantness of the tobacco to others. We much approve of the pipe, and as we understand it will be inexpensive, it will, we think, become a favourite with smokers.

NEW ELECTRIC CONDUCTOR.—The power of straw as a conductor of electricty has been utilized in the south of France, no less than eighteen Communes in the neighbourhood of Tarbes having been provided with conductors composed of straw. Experiments show that an electrical shock sufficiently powerful to kill an ox may be discharged by a single straw.—*Athenæum.*

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THE CONSERVATION OF FORCE.

(Continued from p. 27)

METAPHYSICS and mental philosophy enter largely into Mr. Grove's disquisitions on natural science. I would not voluntarily enter on a discussion of metaphysical theories, in which the inquirer is like an unfortunate squirrel in a whirling cage, leaping with dizzy speed from bar to bar, but making no progress on his journey. I have been inducted into this doubtful region by my author, and must call for the aid of common sense to help me out again. He will admit nothing into his list of external realities beyond matter and motion. All else is mere mental abstraction. Matter and motion are the only objective facts; all else is subjective fancy. He apologises for using the terms "particles" and "molecules," saying, that they are only employed as the geometer makes use of the terms "lines" or "points," and "in an abstract sense; though there does not exist in fact a thing which has length and breadth without thickness, and though a thing without parts or dimensions is nothing." This statement I should think is narrower than Mr. Grove intended, for it excludes everything except solid space, and perhaps matter. For if he cannot admit an area to be a reality, he will equally object to distance, which has neither breadth nor depth. And if he excludes distance, how can we accept motion, of which distance is a constituent idea? How, too, can depth have the marvellous power of turning nothing into something. If length, breadth, and depth be each equal to nothing, how can the three taken together make up a compound something. Then, again, since we cannot say of a portion of time it is ten feet long, five feet broad, and two feet deep, therefore time itself is "*nothing*." Mind and thought no one will imagine of three linear dimensions, so mind and thought are "*nothing*." Hence follows the outrageous *reductio ad absurdum* (as logicians say): *everything is nothing*. I do not wish to go any further in that direction, so I will turn to the statement of Mr. Grove's views with regard to heat. To this subject, however, the above remarks have a direct relation. Mr. Grove desires his reader to "divest his mind of the impression that heat is anything substantive," and to "put aside the sensation which heat produces in our own bodies," and to judge of the phenomena by the eye only. And what we thus learn, he tells us, amounts to this, "that matter has pertaining to it a molecular repulsive power, a power of dilatation which is communicable by contiguity or proximity." Now, I do not think it philosophical to put aside the sensation which heat produces in our own bodies, when the subject of heat is under investigation. By sensation alone can we examine the external world, and to ignore the sensation of heat if it can teach us anything, is eminently blameworthy. "Heat, thus viewed, is motion, and this molecular motion we may readily change into the motion of masses, or motion in the most ordinary and palpable form; for example, in the steam engine, the piston and all its concomitant masses of matter are moved by the molecular dilatation of the vapour of water."

The same confusion of terms may be observed in these quotations as I alluded to last week; heat is in the same breath stated to be repulsive power and to be motion. Beyond this peculiarity, Mr. Grove's account of the various phenomena associated with the idea of heat does not differ essentially from that ordinarily adopted. He takes great pains to show that the doctrine of what is commonly called *heat* may be intelligibly stated without the use of that term, and without the hypothesis of any substantive cause for the effects which we generally ascribe to heat. But he does not succeed very well, for he seems unable to get through a sentence without introducing the term heat, or some exact equivalent, such as "repellent force," or "repellent power." But if success were attained, as I believe it might be, no good could result from the achievement. The analytic mind, on witnessing the phenomena, would naturally conceive the idea of heat, and would demand for this idea a distinct verbal symbol. What matter whether the name adopted be *heat*, *caloric*, repellent force, expansiveness? The last would perhaps come nearest to Mr. Grove's ideal of a scientific term. But there is this objection to it, that heat manifests itself not always as an expansive, but sometimes also as a contractive agent—an objection which Mr. Grove endeavours to answer and remove; but I think his effort ineffectual. On this account the term heat is preferable to those in favour with Mr. Grove, as it does not imply uniformity of manifestation, while it connects the phenomena in question with one of our most common and constant sensations.

It may be readily shown that the law of the equality and opposition of action and re-action holds in all the ordinary phenomena of heat. When two bodies of different temperatures are put in communication, in no very long time the temperature of one will be diminished, and that of the other increased, till both assume exactly the same condition. Now in this interchange of actions it is proved by a variety of calculations and of experiments that the heat abstracted from the warmer body is exacly equal to that acquired by the colder. You cannot indeed make the body which has received restore the heat to the giver, and so prove the doctrine by causing the two bodies to return to their original state without a fresh supply of heat, or its equivalent. But it may be shown by using an independent source of heat, that the same action as will restore to the one body the heat which it has lost, would have been exactly sufficient to produce the change which has taken place in the other. This I believe is the correct statement of the principal property of heat, and it is, perhaps, a complete expression of the law of action and reaction in all natural phenomena, in which heat alone is concerned. But Mr. Grove's statement of the conservative properties of this agent is of a very different character; and therefore is, in my opinion, open to serious objection. A good deal which he advances I do not understand, and therefore shall not attempt to criticise, but there are a few statements and modes of argument for the rejection of which I believe I can show sufficient reason. Take the following extract:—

"Assuming that (with the exception of bodies which expand in freezing, where through a limited range of temperature the converse effects obtain) whenever a body is compressed it is heated—*i.e.*, it expands neighbouring substances; whenever it is dilated or increased in volume it is cooled—*i.e.*, it contracts neighbouring substances, the conclusion appears to me inevitable that the mechanical power produced by heat will be definite, or the same for a given amount or intensity of heat, whatever be the substance acted on."

I should not be able, for my own part, to perceive the necessary connection of this grand conclusion with the facts cited, even if the important exceptions given in the parenthesis did not exist. Still less, then, are my faculties equal to the leap which separates the above premises from the conclusion when these wide barriers come between. Here follows, however, a proof which is intended to bridge the chasm:—

"Thus let *A* be a definite source of heat, say a pound of mercury at a temperature of 400°; let *B* be another and similar source of heat. Suppose *A* to be employed to raise a piston by the dilatation of air, and *B* to raise another piston by the dilatation of the vapour of water. Imagine the pistons attached to a beam, so that they oppose each other's action, and thus represent a sort of colorific balance. If *A* being applied to air could conquer *B*, which is applied to water, it would depress or throw back the piston of the latter, and, by compressing the vapour, occasion an increase of temperature; this in its turn would raise the temperature of the source of heat, so that we should have the anomally that a pound of mercury at 400° could heat another pound of mercury at 400° to 401°, or to some point higher than its original temperature, and this without any adventitious aid: it will be obvious that this is impossible, at least contradictory to our whole range of experience."

One seldom meets with so complete a sophism as this. Major proposition is wrong, minor proposition is wrong, conclusion is wrong. The argument stands thus:—

I. One pound of mercury at 400° cannot, without adventitious aid, heat another pound of mercury at 400° to a temperature higher than 400°.

II. If, after the application of the two separate pounds of mercury to the two gases, as described in the above extract, the pressure of one gas preponderated, the temperature of the opposite pound of mercury would be so raised.

III. Therefore the pressure developed in the one fluid must be equal to that developed in the other.

With regard to the first proposition, if we adopt partially Mr. Grove's own method, we may readily prove that a pound of mercury at 400° may raise another pound of mercury at 400° to a higher temperature. We may make the following assumptions without outrage to any known physical law—viz., that the air is itself at a temperature of 400°; that the steam is at a temperature of 800°; that the area of the pistons are equal; that the beam which connects the two pistons is pivoted at its centre; and that the two fluids at first are of equal pressure and volumes. Now apply the two pounds of mercury at 400° one to each of the fluids. To the air, which is already at 400°, no heat will be communicated, and therefore its pressure will not, by this means, be increased. The steam, however, will receive an accession of temperature from the mercury, its pressure will be augmented, and a consequent expansion of the steam and compression of air will take place. Now, this compression of the air will be accompanied by a corresponding increase of its temperature and pressure. And the increased temperature of the air will be communicated to the mercury with which it is in contact. Hence, one pound of mercury at 400° may, without adventitious aid, raise another pound of mercury from 400° to a higher temperature.

The second proposition is of equal merit, for it by no means follows that the preponderance of the pressure of one of the gases would increase the temperature of the other to a point *above* 400°. If the temperatures of the two gases, to begin with, were both less than 400°, they would still be less than 400° when their temperatures were equalised with the mercury. And thus all that could be said if the pressure of either began to preponderate, would be that the temperature of the other gas would be raised above this mean temperature—not necessarily above the 400°. Indeed, it seems to me that however this experiment is imagined to be varied, in every case in which the first proposition is not falsified the second is untrue.

The conclusion itself so far from being a general truth, will not hold for the most simple variations of this single experiment. It is allowable to suppose that the air and the steam are at first of equal temperatures, equal pressures, equal weights, and enclosed in equal cylinders, and acting on pistons of equal area, attached to an equal armed lever. Now, in such a case, if Amonton's law be worth anything, the pressures of these two quantities of gas will continue equal only while their temperatures are equal. And if, as is likely, their specific heats are different, the same amount of caloric added to each will make their temperatures different, and therefore their pressures unequal, and the pressure of one will conquer that of the other. Mr. Grove attaches to his experiments none of the conditions of equality which I have put forward, and I imagine he did not have them in view. If in addition to the inequality of specific heats there are also inequality of area of pistons, initial temperature, weight of gas, or arms of lever, Mr. Grove's syllogism becomes still more distorted. The difficulty would be to find a case in which the proposition would hold, unless the two parts of the experiment were made with the same gas under identical conditions.

A MECHANIC.

MONUMENT TO DR. KANE.—It is proposed to erect a monument to the memory of the late Dr. Kane in the central Park at New York. A course of lectures in aid of the object will be given at the Cooper Institute.

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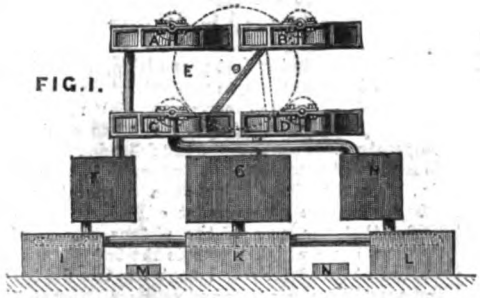
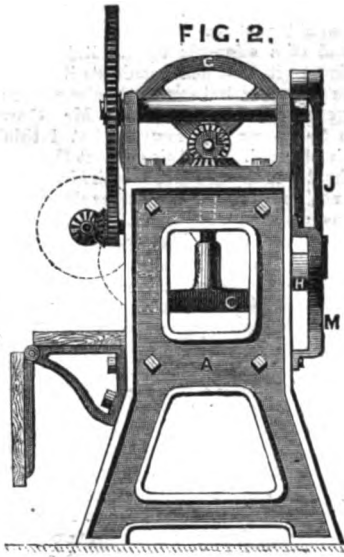
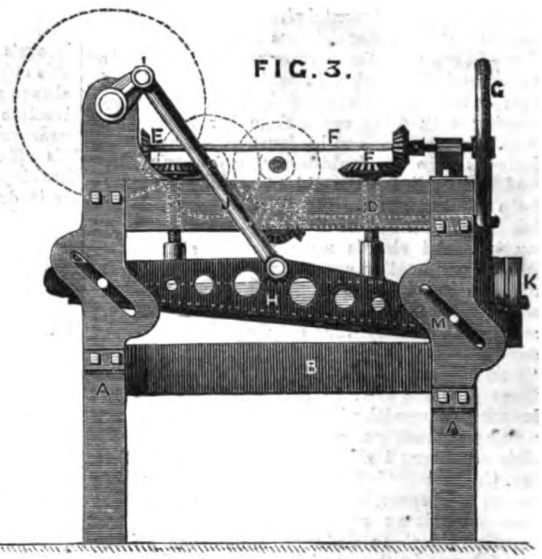
WHITELEY'S APPARATUS FOR MAKING MILLBOARD, ETC.





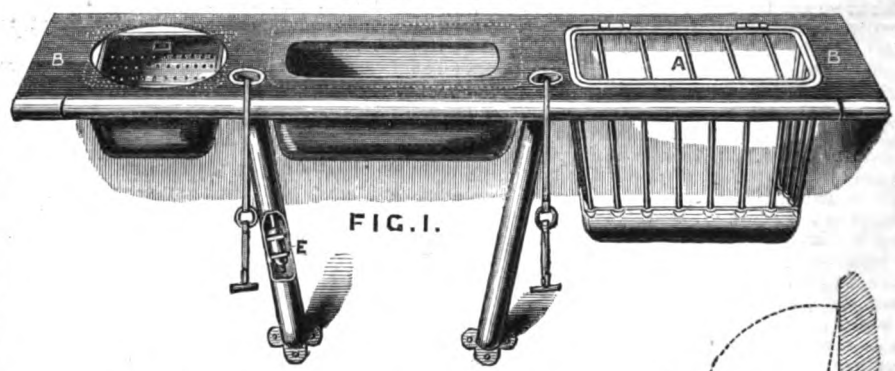


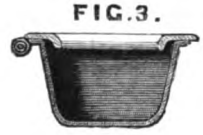
MR. J. WHITELEY, of the firm of J. Whiteley and Son, Firth House Mills, Stainland, near Halifax, have patented the following improvement in apparatus for making millboard and for cutting millboard and paper. These improvements are of a manifestly useful character, and need no recommendation from us. The invention relates, 1, to the manufacture of millboard composed of different qualities and colours of materials, and consists in so arranging and working the machinery or apparatus used for grinding and washing the various pulps simultaneously, and in juxtaposition, that the patentee is enabled to make the middle portion of the millboard of inferior or coarse material, and the outside of a finer quality, and of a different colour, as may be required. Heretofore, paper or pasteboard (resembling millboard) has been made by first forming a millboard middle of coarse or inferior pulps with the outsides of a finer quality and of different colours, but in the process of manufacture each part when formed had to be dried and rolled, and then pasted together; but by these improvements millboards of various qualities and colours can be manufactured at one operation, thereby saving the time required to dry the separate sheets, and also the costs of rolling, pasting, &c. This part of the invention is performed by having several washing and breaking or grinding engines arranged side by side, or in such other relative position that they can be worked simultaneously, in order that one or more of the engines can be operating upon one quality or colour of materials, whilst other engines are operating upon other qualities or colours, the products thereof being conducted to their respective "pulp chests" and "vats," which are placed side by side, or in such relative positions that one workman or more can be making the middle layers of the pulp from coarse materials whilst other workmen are making the outside layers of finer qualities of pulp, or of different colours, as may be required, each man placing his layer of formed pulp in the proper relative position on the same pile to form one millboard, according to the thickness, quality, or variety of colour that may be required. 2, the invention relates to machinery or apparatus employed for cutting off the edge of millboard and paper to form the proper size of sheets, and consists in the application of a straight-edged knife, set or arranged so as to be at an angle with the bed of the machine or press in which the millboard is placed for cutting, and imparting to such knife a slide cut by means of a crank and connecting rod with suitable guides for the knife.

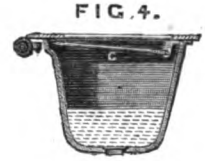
Fig. 1 of the accompanying engravings is an elevation of the apparatus employed for manufacturing millboard, constructed and arranged for carrying out the first part of this invention. *A*, *B*, *C*, *D* are the washing and breaking or grinding engines, which are all driven by spur pinions gearing in with the main driving wheel *E*. The products or pulps are conducted by pipes to the pulp chests *F*, *G*, *H*, from which they are drawn away by other pipes to the vats *I*, *K*, *L*. It will be seen that whilst one, two, or three of the engines are employed in grinding inferior materials for the middles, the other may be employed in grinding a fine quality or coloured material for outsides, the products of each being conducted to separate pulp chests for supplying their respective vats. The conducting pipes from the upper engines are flexible, so that they can be readily changed from one to the other of the lower engines, and the pipes from the engines to the pulp chests and vats are supplied with sluices or stop valves so as to change the course or flow of the pulp to any of the chests or vats as may be required; or flexible pipes may be employed. It will also be readily seen that if a fine qualitity of pulp be conducted to the vat *K*, and an inferior quality to the vats *I*, *L*, the makers at *K* would pass their "dips" to each pile or piller *M*, *N*, whilst the makers at *I* would pass to *M*, and the makers at *K* will pass to *N*, according to the number of dips or layers of each required, by which means the inventor is enabled to make millboard of different qualities or colours of material at one operation.

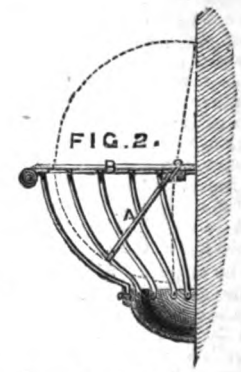
The second part of the invention will be understood by reference to fig. 2, which is an end elevation, and to fig. 3, which is a front elevation of the machine for cutting off the edges of millboard and paper. *A*, *A* are the end frames; *B* is the bed of the machine on which millboards, &c., are laid for cutting; *C* is a presser forced down by the screws *D*, bevil gear *E*, and shaft *F*, with the hand-wheel *G* for holding the materials in position; *H* is a knife set at an angle with the bed, the motion of which is derived through the crank *I* and connecting rod *J*, by the train of spur and bevil gear from the driving pulleys *K*. The knife is caused to slide in an oblique manner by the studs *L*, which are guided by the slot plates *M* affixed to the frame of the machine.

HOOD'S PATENT STABLE FITTINGS.









IRON stable-fittings—consisting of a rack and manger, or a rack, manger, and water-cistern, in one range, by which a horse was enabled to feed in his natural position—were introduced about ten years ago. The previous system of feeding from racks over-head was the cause of much irritation and injury to the animal, and of much trouble to the attendant, from the seeds and dust falling on to the head and into the eyes of the animal; and the introduction of the new fittings, with which these evils were not possible, was consequently regarded as a very great improvement. Even these, however, were found imperfect in some respects. In the first place, horses were found to injure themselves by striking themselves against the fittings, many of which had the top-plates merely turned down in front, presenting a sharp edge against which the knees of the horses frequently got cut. This defect is now obviated in the best kind of fittings by the application of a wrought-iron tube or roller extending along the front, which revolves upon being rubbed or struck against by the horse. In the next place, the waste caused by the feeding has always been a serious drawback to the use of the new iron fittings. This and some other disadvantages have

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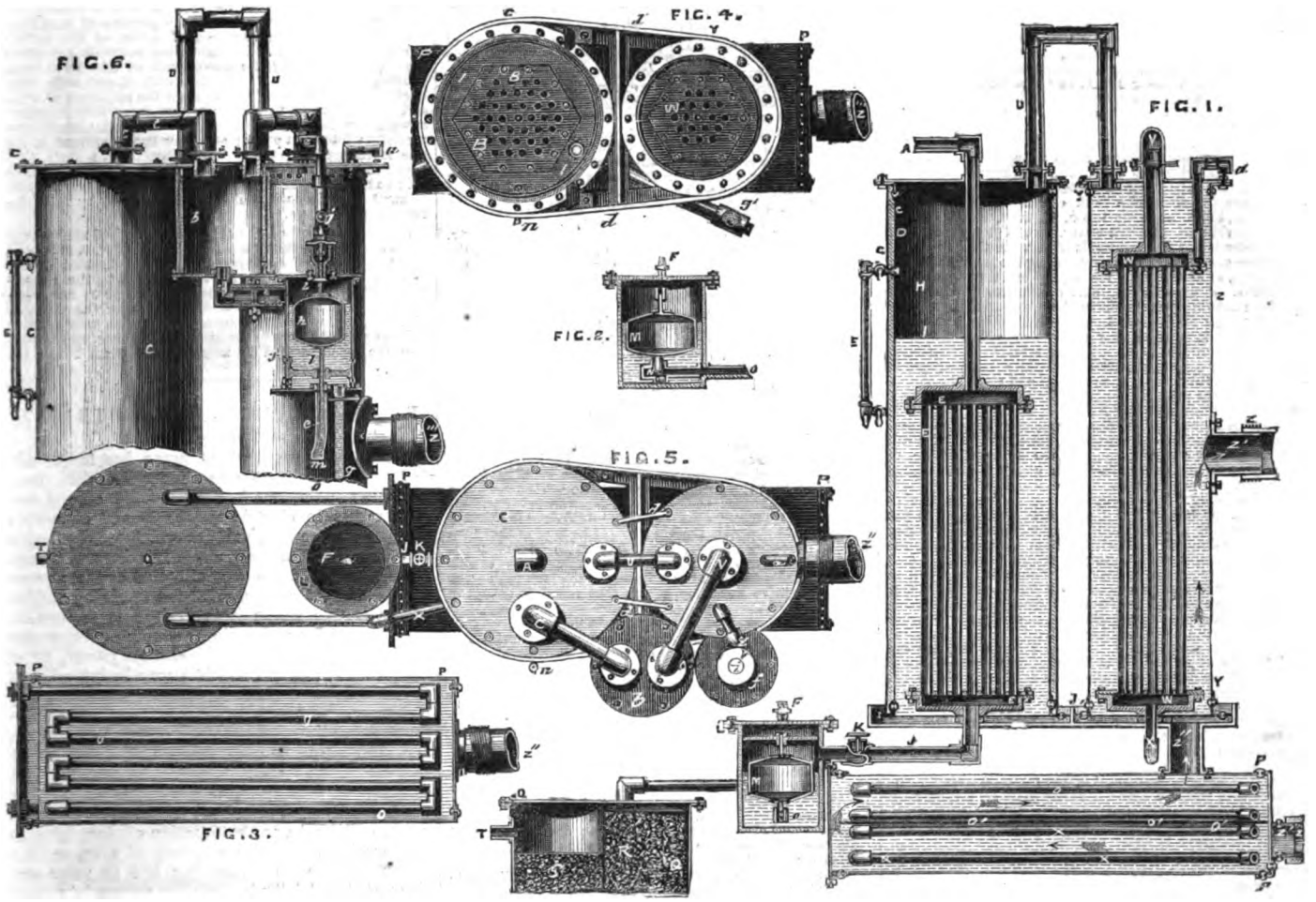
NORMANDY'S PATENT MARINE FRESH WATER APPARATUS.



lately, however, been remedied by Mr. Hood, iron-merchant, of Upper Thames-street, London. The woodcuts annexed illustrate Mr. Hood's improvements. It will be seen that the patentee has, by exceedingly simple and inexpensive contrivances, effected the following improvements, viz.:—1st. Waste from the rack is prevented by a grating, *A*, figs. 1 and 2, fixed to the top-plate, *B*, by means of two spring hinges. This grating opens back to the wall whilst the rack is being filled, and then follows the course indicated by dotted lines in fig. 2 as the hay is being withdrawn, always so compressing it that the horse is unable to withdraw it wastefully. 2nd. The top-plate having a flange projecting inwards all round of the form shown in section, fig. 3, renders it impossible for either corn or chaff to be thrown out of the manger. 3rd. The water-cistern is fitted with a cover, *C*, figs. 1 and 4; for although, as a rule, a horse should always be allowed to drink when he requires, still there are times when —on entering the stable in a state of heat, for example—the privilege should be withdrawn temporarily. In this instance the cover, *C*, consists of perforated metal (the edges being covered with gutta percha or similar substance, to prevent noise and the chipping of the enamel with which the cistern is lined), working in slots so constructed that the horse cannot interfere with its action. 4th. The tubes, *D*, in which the tying apparatus works, act as brackets for the support of the fittings, and also prevent the balls from getting under the horse's feet. The tying apparatus itself is rendered noiseless by the balls, *E*, which work inside of the tubes, being covered with a non-resonant substance. These improvements are manifestly the result of practical experience, and as they will promote economy, security, and comfort, we strongly recommend them.

NORMANDY'S PATENT MARINE FRESH WATER APPARATUS.

A SERIES of experiments has recently been made by direction of the Board of Admiralty, with a view to ascertain by what apparatus the largest and best supply of water can be obtained for the use of ships at sea. The experiments have been made upon the apparatus invented by Mr. (now Sir R.) Grant, and that invented by Dr. Normandy, the well-known chemist, of London. The first was made on Saturday week, on board the *Sphinx*, in the steam-basin, Portsmouth, under the superintendence of Captain G. T. Gordon, C.B., of the *Hannibal*, and Captain Harris, of the *Illustrious*, assisted by Mr. Murdock, inspector of machinery afloat. The quantity of water produced by Dr. Normandy's apparatus is said to have been 92 gallons, with a specified quantity of coals. With the same quantity of fuel, under the same conditions, and with the same boiler, Sir R. Grant's apparatus (under the superintendence of Mr. Miller, of the condensing department) was tested on board the *Erebus*, on Friday last, and the result is said to have been the production of only 32 gallons of water. There is also this important difference in the qualities of the water produced —that Sir R. Grant's is purely distilled water, whereas the other becomes aërated in the process of distillation, and is perfectly cold and fit for use when it leaves the apparatus.

With these experiments before us, we have thought it desirable to publish a description of the improved apparatus, that its nature and advantages may be thoroughly understood and generally known. It should be further stated, that the trials above mentioned are by no means the first that have been made with Dr. Normandy's machines, for they were fitted, to the number of twelve, on the island of Heligoland, while the Foreign Legion was stationed there during the war, giving great satisfaction to the governor, and others have since been purchased by the Peninsular and Oriental Steam Packet Company, the Royal Mail Steam Packet Company, the Prussian Government, &c., &c.

The accompanying engravings represent the apparatus in its most improved form:—

Fig. 1 is a vertical section of the apparatus; fig. 2, a vertical transverse section of the steam trap L; fig. 3 is a horizontal section of the refrigerator *P*; fig. 4 is a horizontal section of the cylinder *C* and condenser *Y*; fig. 5 is a plan of the apparatus; fig. 6 is an elevation of the upper part of the apparatus, showing a vertical section of the priming box and of the feed box. *Description of Figure* 1.—*A*, steam pipe from a boiler leading the steam thereof into the vertical tubes *B*. *B*, evaporating tubes placed in a cylinder, called the evaporator. *C*, cylinder, called the evaporator, containing the tubes and the sea water to be evaporated, and which for this reason is called the evaporator. *D*, felt surrounding the cylinder *C*, in order to prevent loss of heat by radiation. *E*, water gauge. *F*, air cock of the steam trap *L*. *G*, outer casing. *H*, steam room. *I*, sea water to be evaporated. *J*, pipe leading the condensed steam into the steam trap *L*. *K*, intermediate cock between the steam trap and the evaporator, which cock is always left open, and is used only in case the float should become water-logged. *L*, steam trap—it is a cast-iron box containing a float. *M*, provided with a plunger, *N*, acting in such a way that when the cast-iron box *L* contains only steam or a quantity of condensed water insufficient to buoy the float, the plunger closes the exit pipe *O*, but as soon as enough condensed steam has accumulated to buoy up the float, the plunger of course no longer closes the exit pipe *O*, and the condensed water may then escape as fast as it is produced. *M*, float just alluded to in the steam trap *L*. *N*, plunger of float *M* just alluded to. *O*, exit pipe for the condensed steam, which pipe is coiled in two layers in the upper portion of the refrigerator *P*, whence it issues in a cooled state to enter the filter *Q*. *P* is a box, or refrigerator, for the purpose of cooling the water which has been condensed by the tubes B of the evaporator, whence it flows into the steam trap *L*, and thence into the tubes *O*; and also for cooling the water condensed by the tubes *W*, of the condenser, whence it flows into the tubes *X*, in the said refrigerator. This refrigerator, as is seen, has a partition *O'*, for separating the two sets of pipes *O* and *X*, and causing the cold sea water to circulate in the direction of the arrows. *Q* is the filter for receiving the condensed

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water from both pipes, *O*, of the evaporator, and *X*, of the condenser. This filter, as is seen, is divided into two portions, *R*, *S*, each of which is filled with animal charcoal, as represented. *R*, *S*, divisions of the filter. *T* is the pipe for the exit of the perfect fresh water. *U* is the air pipe, leading the air which separates from the water *Z*, used for condensation, into the steam chamber *H* of the evaporator. *V*, pipe admitting the steam from the priming box *b* into the pipes *W* of the condenser *Y*. *X*, exit pipe for the condensed steam, which pipe is subsequently coiled into two layers in the lower portion of the refrigerator *P*, and thence into the filter *Q*. *Y*, condenser, or cylinder, containing the condensing pipes *w*, *w*. *Z*, sea water used for condensation, and which enters the apparatus through the apertures *Z' Z'* and *Z''*, connected with two holes, *Z' Z'*, communicating with the salt water outside, either through the walls of the ship, or through the sides of a tank containing the said salt water. *Z'*, holes, or large tubes, through which the apparatus is charged with salt water. *Z''*, pipe by which the refrigerator is put in communication with the condenser. *Z'''*, tubes of caoutchouc for connecting the tube in the side of the ship, or of the tank containing sea water, with the apparatus. *a*, pipe for the exit of the excess of air, and also for removing pressure from the apparatus.

Descriptions of Figures 3, 4, 5.—*b*, Priming box,—it is simply a box into which any salt water which might be mechanically or otherwise projected, is arrested and carried back again by pipe *e*, into the evaporator *C*, as shown in fig. 6. *c* is a tube carrying the steam and air of the evaporator *C* into the priming box *b*, and thence through pipe *V* into the condensing tubes (*W*, fig. 1) of the condenser *Y*. *d*, *d*, straps of iron uniting the evaporator *C* with the condenser *Y*. *g*, tube by which the evaporator is fed with salt water. *s*, brine cock for removing the saturated water, or preventing saturation by allowing a constant discharge of sea water. *q*, feeding pipe.

Description of Figure 6.—*e*, tube connecting the priming box *b* with the feeding box *f*, and thus returning into the evaporator *C* by means of pipe *g*, any salt water which may be projected into the said priming box. *c*, pipe leading the steam from evaporator *C* into the priming box *b*. *f*, feed box containing a float *h*, provided with a valve *i*, and so adjusted that when the evaporator is filled with the proper quantity of water, the float being buoyed up will close the valve, and thus prevent the flow of any more salt water into it. *i*, valve provided at top with a detached vulcanized India rubber covering. *j*, hand cock for regulating the feed, in case of any accident interfering with the proper working of the float *h*, or of the valve *i*. *l*, guide rod hanging freely into a sheath or tube of vulcanized caoutchouc, so that by grasping it through the tube of caoutchouc, the operator may freely move the float to which it is attached up and down, and thus ascertain whether it is working properly or not. *m*, vulcanized caoutchouc tube.

The manner of working the apparatus is as follows:—

The first thing to be done is of course to charge the apparatus with water, and this is easily done by establishing a communication between *Z'* and the external salt water, whereupon the salt water fills up both the refrigerator *P*, and the condenser *Y*, then passes through the feed tube *q*, through the feed cock *j* (which should be left always open except on an emergency, that is to say, except the valve *i*, or the float *h*, should become damaged or out of order, in which case the supply of salt water to the apparatus would have to be regulated by the cock *j*), thence through the valve *i* into the feed box *f*, down through pipe *g* into the evaporator *C*, up to a line standing at about the middle of the gauge glass *E*, where it is maintained at a uniform level by the float *h*, which is then buoyed up so as to close the valve *i*, whereby all supply of salt water is shut off until such time as by evaporation, or blowing off the brine, the level of the water in *E* will have been lowered, whereupon the float *h* sinking, will allow a fresh quantity of salt water to flow in, and the level will be restored. The valve *i*, as it is seen, is provided at its upper extremity with a stem, rounded at the top, and touching, or nearly so, the caoutchouc covering, so that on pushing the caoutchouc covering with the finger, the operator is enabled at any time to feel that the float is acting properly. The apparatus being charged as just said, and admitting that the pipe *A* is in communication with the boiler charged with steam, it is evident that on turning the steam on it will rush through pipe *A* into the pipes *B* of the evaporator, in which it will be condensed by the salt water which surrounds them, and flow in the state of condensed non-aërated water through the pipes *J* into the steam trap *L*, and thence through the pipes *O* in the refrigerator *P* to the filter *Q*, whence it will issue at *T*. But the heat of the steam in the pipes *B* of the evaporator soon brings the water *I* round them to the boiling point, and converts it into steam; that steam passes through the pipe *c*, *c*, *c*, into the priming or safety box *b*, in which any salt water with which the said steam may be mixed, is deposited and returned through pipe *g* to the evaporator whence it came, while the pure steam continues its course through the pipe *V*, *V*, into the condensing pipes *W*, immersed in the salt water contained in the condenser *Y*, whence it flows, in the state of aërated water, into the pipe *X*, coiled up like pipe *O* in the refrigerator *P*, and thence into the filter *Q*, where it mixes with the non-aërated water of pipe *O*; both the aërated and non-aërated water flowing out together at *T* in the state of pure fresh water, containing an average quantity of air equal to that of river water, and perfectly sparkling, palatable, and fresh.

The aëration is thus effected: the steam coming through the pipe *V* at the top of the condenser, and into the pipes *W*, heats the sea water outside of these pipes in the condenser, between the large hole *Z'* and the top of the condenser, to a degree sufficient to liberate or disengage the air contained in that condensing salt water; the air thus liberated ascends into the air pipe *U*, and is poured into the steam-chamber *H*, where it mixes with the steam contained in that space, and thus the steam which passes through pipes *c*, *c*, *c*, and *V*, *V*, is not steam only, but a mixture of steam and air, so that the result of the condensation is fresh water aërated to the maximum, the superabundant air being discharged through the pipe *a*.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

Ordinary Meeting, January 11th, 1859. W. FAIRBAIRN, F.R.S., &c., *President, in the Chair.*

THE President exhibited various specimens of the iron of certain locomotive boilers which had been found to have suffered local corrosion of a dangerous kind, after only a few years' work. The first specimen was from the boiler of the goods locomotive engine "Goliah," built by Messrs. Hick and Son, in 1839. It was a part of the fire-box, through which one of the longitudinal stays had passed. The iron (Low Moor) had been cut away by the corrosive action in grooves radiating from the stay as a centre. The second specimen, taken from the same engine, and likewise of Low Moor iron, was from a part which had been rent asunder in the explosion of the boiler in 1847, before the engine was nine years old. A third specimen was from the boiler of the "Bat" goods locomotive, built by Mr. Woods. It consisted of a part of the angle iron ring at the smoke-box end. A deep groove had been formed by the corrosive action, and water escaped through the angle iron after the engine had worked less than six years. A fourth specimen was taken from the passenger locomotive "Ostrich," built by the Liverpool and Manchester Railway Company. The bottom plate of this boiler, made of Low Moor iron, had been corroded in less than four years to such an extent that water escaped throught it. The President observed that these remarkable effects belonged exclusively to locomotive boilers, and had not been noticed in those of stationary engines. He recommended the subject to the attention of the Society as one of scientific interest, as well as great practical importance, indicating, as it did, a source of hitherto unsuspected danger.

A lengthened conversation ensued, some members being of opinion that the phenomena were owing to the vibratory motion of the engine, predisposing certain parts to chemical action. Others thought that currents might exist in uniform directions, by which the part might be kept in that condition, as to cleanliness, most favourable to oxidation. Several members thought that the action was owing to galvanic currents arising from portions of the iron taking the electro-negative condition, which that metal is so apt to assume.

Professor Roscoe called attention to the pernicious consequences attending the use of unglazed arsenical green paper hangings. His own experience corroborated the observation of Dr. Taylor, that dust collected in rooms, so hung, contained a large quantity of arsenic. He had analyzed the dust from the shelves, &c., of a room occupied by himself, and had found a considerable quantity of this poisonous substance.

Mr. Dyer read a paper on "Imponderable Matter, considered as an *Element*."

He stated, that about two years ago, his first paper on the "Nature of Heat," was read before the Society, and he therein maintained that the "Matter of Heat" was not a misnomer, but, in fact, a material element, that pervaded all space and all bodies in the universe; and in its neutral state was identical with the electrical and magnetic fluids, as also with light, or the luminous principle.

Since then, he had read three other papers, to illustrate and explain his views of elemental heat, and its agency in phenomena, exhibited by its mutations from the elemental state, into and out of the conditions commonly expressed by the terms sensible, radiating, and latent heat; the present paper being intended to give a summary of the views advanced in the former. For the sake of brevity, his own is treated as a "heat-force theory," to denote its being opposed to the "force-heat theory;" and considering that this latter theory has been advocated by many eminent philosophers among the ancients, as well as the moderns, it would be a great temerity in him to oppose that theory, unless he had some strong grounds of objections to offer to it, as well as those in support of his own views. In explanation of these, he said, the common terms applied to heat in its sensible, radiating, and latent states, do not apply to or convey the meaning he attaches to the term "neutral and elemental heat," which condition he defines to be "an imponderable, elastic element" that permeates, and his equally diffused through matter and space, except when its elastic force is exceeded by other disturbing forces. Many instances of such disturbing forces were set forth and explained, and in reference to these he observed, "that great confusion had arisen from the vague and discordant senses in which the term 'physical force' is often employed by very eminent physicists." In treating of the "nature" and "conservation of force," the term is said to mean "that which produces or resists motion," thus implying that force is of itself a substantial existence, whereas it merely indicates action among bodies. These exert force upon one another, and upon their own component parts, so that force means exerted action of matter upon matter, and to give it substantial attributes is absurd.

In support of the identity of heat and electricity, many cases were cited.—(1.) That heat ascends latent in aqueous vapour, which being condensed, the latent heat becomes neutral or elemental in the upper regions, and this *because* no substance is present other than "the thin cold air" with which it can unite and become sensible heat. This neutral element is the electric fluid, and is made known to us in all the forms of electrical phenomena.—(2.) Again, when water descends through the crevices of the earth down to the incandescent mass, it is converted into steam of great force, causing volcanic eruptions and earthquakes, according to the intensities of the forces so generated, by the union of water with heat. This heat latent in the vapour, ascends and is liberated in the upper air, and flashes forth as lightning, always attending those convulsions, and proving the identity of the calorific element with the electrical phenomena so exhibited. It was stated that his (Mr. Dyer's) heat-force theory was in strict accordance with Dr. Black's latent heat doctrine, and that it went to support it, and to explain some anomalous cases that had been adduced against the beautiful system of latent heat so long an established basis of wide ranges of phenomena, alike in nature and in art. Considering that the "force-heat theory" is inconsistent with Dr. Black's, and as this latter is embodied on most of the standard works on physics, it should not be abandoned to make way for another theory that fails to account for such phenomena. Apart from the mutations of heat from chemical changes, the mechanical action of the earth's movements was described as exhibiting magnetic and luminous phenomena, by the movements of elemental heat, proving these also to be identical with it, and with electricity. He then proceeded to show the sameness of light and heat, as proved by the many incontrovertible instances advanced of their inseparable connection, and mutual convertibility into each other; and thus finally arrived at the sole inference fairly to be drawn therefrom, namely, that heat and light, as also heat, electricity, and magnetism, are only so many different conditions in which the one calorific element exists in nature, and manifests itself by its mutations in phenomena.

Dr. Joule described the experiments he had made many years ago on the thermal effects of the dilation of elastic fluids, which he considered fatal to the doctrine of the materiality of heat. He called attention to the experiments which Mr. Dyer had made twenty years ago, indicating the possibility of generating heat by the agitation of water. These experiments, he believed, would prove to be of great interest to the history of science, and trusted that the author would be able to place them before the society.

BAGGS' IMPROVED ELECTRICAL APPARATUS.

MR. ISHAM BAGGS, whose name has frequently been before the public in connection with electrical inventions, has lately patented several improvements in electric telegraphs and apparatus employed therewith, parts of which are applicable to other electrical purposes. His invention consists, 1, in the use and application at the remote end or ends of a wire, or at the receiving station or stations to which it is desired to convey intelligence, of an electric reservoir or reservoirs capable of accumulating the electric power, or of rendering the effects which it may be intended to produce more decisive or concentrated in their character. These reservoirs consist of coated surfaces, formed on the principle of the Leyden jar, arranged either as a simple electrical element or as a compound series. Coiled wire may be used in place of coatings, but the principle used in every case is that of induction. By this arrangement, if there be any retardation of electricity in a submarine wire, or in an overland wire, or in a subterranean wire connecting two or more stations, the electricity is caused to accumulate until it reaches the required intensity or force, when discharge takes place at the remote station or stations. 2. Wherever it may be desirable to exalt the intensity of the induced electricity from a coil, he causes such electricity, whether produced from one or more coils, to accumulate in condensers, or their electrical analogues arranged as a series of Leyden jars, whereby electrical manifestations of any required intensity may be produced. Also, if in any such arrangement only the first surface of a series be connected with the positive and the last with the negative, or vice versâ, or if the first be connected with a source of electricity, whether positive or negative, and the last with the ground, it will be found that the intensity is greatly exalted. 3. Where a succession of makes and breaks of contact are required to be made with great velocity or regularity in developing the successive electrical impulses of the coil, he employs machinery, when necessary, for such purposes, embodying proper mechanical contrivances for the regulation of speed and synchronous discharge, such as multiplying wheels, the fly, a wind or water regulator, &c. 4. His invention consists in the use of electricity to deflect flame, gases, vapours, or light bodies through stencilled plates or otherwise, in order to mark or record telegraphic communications upon substances or materials fit to receive them. He remarks that it is not necessary to use points in all cases for such purposes, as quiet discharge and consequent deflection of some of the bodies referred to will take place between conducting knobs, or, indeed, between conductors of other form. It is necessary, however, that the conductors should not be too near each other, or the effect will be marred by sudden disruption, as, for instance, through an interposed flame. 5. His invention consists in causing telegraphic communications from two or more instruments to pass

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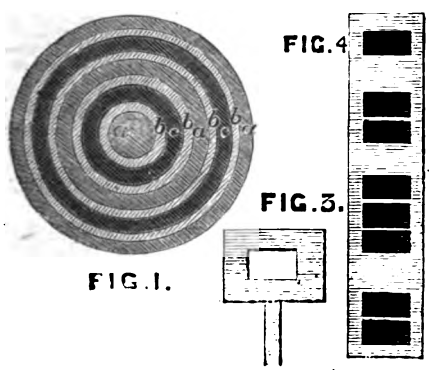
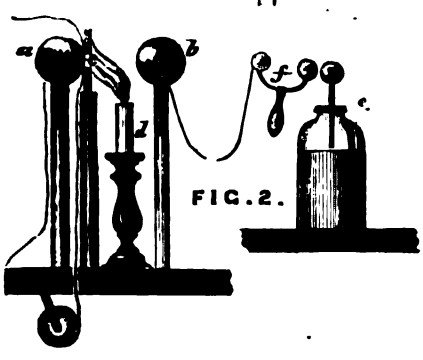
simultaneously through the same wire without interference, by the employment of electricities differing in quantity and intensity from each other, so as to be only capable of acting each one respectively upon a different class of instrument at the receiving station or stations; that is to say, for instance, a magneto-electric or other electric current to deflect a needle; a quantity current through the same wire to effect decompositions on chemically-prepared paper in another instrument; and a series of high intensity discharges through the same wire again to cause a succession of perforations in paper or other indications in a third instrument. The electricity employed for the foregoing purposes may be derived from any convenient source whatever, provided that it is adequate to fulfil the duties required of it. 6. His invention consists in the construction and use of a coil of the following description, which he considers to possess great advantages over those ordinarily used; namely, a core or cores of soft iron are wound with primary and secondary coils of insulated wire, on principles well understood, and over these are placed hollow cases or cylinders of soft iron (either in solid masses or in pieces) similarly wound with insulated wire: or plates of iron following in succession to each other may be used in the same way. He observes that the same principle also applies to hard steel when used in the development of magneto-electricity, and that he sometimes uses such arrangements of magneto-electric machines for the purpose, and the use of them consequently forms a part of his invention. In the accompanying engravings fig. 1 is a cross





section of his improved coil. The parts *a* represent iron; *b*, the primary coils; and *c* the secondary coils. A core of iron is first insulated circumferentially with gutta percha, and two large discs of gutta percha to form flanges are placed at its ends, and firmly fixed by heat, so as to form one unbroken covering of gutta percha from end to end. A primary wire is then wound from end to end upon the covered iron core. This being well insulated, two or three miles of secondary coil are superposed upon the primary. On this last a second coil of primary is wound. This last primary wire, being safely insulated, is covered over with a hollow cylinder of soft iron. Over this hollow cylinder comes another primary coil, then three or four miles of secondary again, then another coil of primary, and, lastly, another soft iron cylinder, so that in the coil here represented there is one iron core and two hollow iron cylinders, four primary wires, and two secondary wires. Every layer of wire must be well insulated from other layers and from the iron. He insulates the successive layers by three or four thicknesses of very thin gutta percha (in bands) followed by a thin covering of calico, also in a band, for each layer of wire. Other systems of insulation may also be used. The wire should properly be all wound the same way. The ends of each coil should be marked and made safe. The secondaries should be connected as a single coil when the machine is finished. The primaries will work better under general circumstances of action if connected as one bundle of four wires, and it will be found greatly to improve the power of the coil if the two primary currents next the core flow in one direction, and two other primary currents in the other direction. This follows from the general theory of magnetism, and its application will be seen where the details of the coil are altered in number or otherwise. The iron core and cylinders may be solid or in pieces, or otherwise. Figs. 2 and 3 show the manner in which a flame is deflected, and fig. 4 is a representation of paper marked at intervals by the deflected flame. The same apparatus applies to gases and vapours. *a*, *b*, are two brass *c* is a glass plate with an aperture therein, as knobs; seen more clearly in the detached view, fig. 3; *d* shows the candle and flame deflected; *e* is the Leyden jar; and *f* the discharging rod.

THE NATIONAL LIFE-BOAT INSTITTION.

During the past year the Royal National Life-boat Institution has incurred the following expenses, on either additional new life-boat stations, or the replacing of old boats, transporting carriages, and houses, by new ones: Norfolk—Cromer, £276 16s. 5d.; Mundesley, £223 9s. 5d.; Bacton, £377 11s. 11d.; Palling, £272 17s. 6d.; Winterton, £400 5s. 11d.; Yarmouth (two boats), £859 3s. 5d.; Suffolk—Lowestoft, £153 14s. 6d.; Southwold, £127 19s. Berwick, £73; Boulmer, £73; Alnmouth, £41; Whitburn, £247 1s., Hornsea, £44 12s.; Exmouth, £140 1s.; Appledore, £4; 12s.; Aberdovey, £138 3s. 1d.; Rhyl, £52 17s.; Penmon4 £72 15s.; Fleetwood, £140 1s.; Fraserburg, £255 2s. 2d.; Lossiemouth, £140 1s. Ireland—Newcastle County Down, £282 7s.; Dundalk, £191 1s.; Kilmore, £140 1s.; Carnsore, £187 8s.; Tramore, £322 18s. 9d.; Dungarvan, £191 1s.; and Ardmore, £81 11s. 5d. The Institution has also expended on the repairs, stores, alterations, and inspection of its numerous life-boats, boat-houses, and transporting carriages, £2,714 5s. 3d., making altogether a total of £8,265 3s. 9d. It has also granted, during the same period, £952 as awards for saving 427 persons from 64 wrecks on our coasts. A most satisfactory result, and clearly showing how much has been accomplished by the well-directed efforts which the Life-boat Institution has brought to bear on this humane cause. This great and national work has, however, only been accomplished by involving the society in a debt of £3,047, and an expenditure of £1,000 from its small reserved capital. Impelled by every feeling which we hold dear, to save a fellow-creature from an appalling death by shipwreck, one would suppose that the National Life-boat Institution had claims which came home to the hearts of every one and there pleaded for support and sympathy; and most particularly does this apply to the United Kingdom, which is so much indebted for so large a portion of its greatness and prosperity to its hardy seamen. In respect, then, of the Life-boat Institution, its objects being so truly national and philanthropic, we do not hesitate to recommend it earnestly, and on all occasions, to the support of those who are able to render it. That help was never more needed than at present, when, through the extraordinary exertions the society has made within the past few years, it has now eighty-one life-boats under its management. To maintain these boats in a state of thorough efficiency, a large permanent annual income is absolutely needed, if its humane mission is to be perpetuated. We feel assured that after this plain statement of facts relative to one of our most useful societies, we shall soon have the pleasure to report a very large increase to its permanent income.

LIST OF NEW BOOKS.

Barry's Theory and Practice of the International Trade of the United States and England, 8vo., cl., 6s.
Exhibition of Art Treasures held at Manchester in 1857: Report of the Executive Committee, royal 8vo., cl., 6s.
Hedley's, Who Invented the Locomotive Engine? 8vo., cl., 4s. 6d.
Inwood's Tables for the Purchasing of Estates, 17th edit., 12mo, cl., 7s.
London (The) Catalogue of Periodicals, Newspapers, &c., 1859, roy. 8vo., sewed, 1s.
Naturalist (The) Vol. VIII., roy. 8vo., cl., 8s.
Notes and Queries, 2nd series, Vol. VI., 4to., cl., 10s. 6d.
Noyce's Boy's Book of Industrial Information, new edit., 12mo, cl., 5s.
Pepper's Art of Modelling and Making Wax Flowers, 12mo., sewed, 1s. 6d.
Rawlinson's Designs for Factory, Furnace, and other Chimney Shafts, imp. folio, cl., 8s. 3d.
Sandeman's Elements of Pure Arithmetic, fc. 8vo., cl., 2s.
Webster's English Dictionary, new edit., 8vo., cl., 7s. 6d.

INDIAN ITEMS.

On the 15th ult., 64½ additional miles were opened by the Great Indian Peninsular Railway Company, which has now 177 miles in operation. The line now opened proceeds from Poonah to Kheirghaum, and thence to Patus, from which place it goes on to Decksal, and eventually will extend to Sholapore. This last portion will not, however, be completed for some months.——Government have sanctioned a proposed permanent establishment for the maintenance of the Vehar Water Works, on their completion, by the contractors at a monthly outlay of 2,500 rupees, as a charge for the management of the works.——An intricate network of telegraphic wire will soon cover the Indian empire. From Bombay, a coast line is being laid down viâ Nagotna, Severndroog, Rutnagherry, and Vingoria to Goa. This will join another line in course of construction, viâ Cochin to Cape Camorin, so that there will be an independent coast line the whole way from Calcutta to Bombay, viâ Madras and Manaar. North of Bombay, another coast line is being constructed viâ Bassein, Mahim, Demaun, and Bulsar to Surat, so that the latter place will communicate with Bombay direct instead of taking the circuit of Nassick. From Surat the line has already been completed to Kurrachee viâ Broach, Baroda, Ahmedabad, and Deesa; and from Kurrachee it is being pushed forward through the Punjaub to Lahore so that the latter will shortly be in direct communication with the western presidency. Another line is to be carried from Bombay to Nagpore viâ Poonah, Seroor, and Ahmednuggur, with a junction between Ahmednuggur and Nassick. From Nagpore a distinct line communicates with Calcutta viâ Benares, so that when Bombay is connected with Nagpore, there will be three separate wires communicating between Bombay and Calcutta, viz., viâ Madras, Nagpore, and Agra, besides a distinct line to Ceylon on the one side, and Lahore on the other (which are being carried out).

EXPLORATION OF AUSTRALIA BY BALLOONS.

Mr. H. Coxwell, of Tottenham, designer and constructor of the balloons ordered in this country by Mr. G. Coppin for use in Australia, gives the following account of the balloon explorations in Australia:—The balloons now at Melbourne were built simply for public amusement. The aëronauts, however, who went out in accordance with Mr. Coxwell's recommendation, were requested to make frequent meteorological observations, both in the higher region and lower currents, especially with a view of observing how far it is likely a balloon would be influenced by inland and return breezes. Mr. C. H. Brown, assisted by Mr. Dean, are now making the required observations, and from the accounts already received there appear to be good grounds for believing that certain reliable currents will facilitate the undertaking. As a matter of course, an expressly-built machine, of ample dimensions, will be requisite, together with every conceivable appliance, to afford a return journey by a diametrically opposite wind to that embraced at the outset. The party will also be provided with an improved and gigantic fire balloon, in a collapsed state, which can be inflated in the most desolate interior locality without gas, a reserve expedient, which in the event of injury or exhaustion to the parent machine, will provide the means for a second trip. Mr. Coxwell is also maturing a totally novel apparatus, to regulate the altitude of the exploring balloon, so as to avoid the continual loss of gas and power resulting from extreme variations in the atmosphere. This contrivance will bring the aërial vehicle under a larger amount of mechanical control. The expedition will be provided with a photographic apparatus for obtaining a series of bird's-eye views, the correctness of which will be invaluable. Viewing calmly the danger likely to accompany such an attempt, I do not think it can fairly be pronounced greater than that which attends an arctic voyage, or any other which originates from a desire to attain useful knowledge by intrepidity and personal risk.

METAL AND COAL TRADES, &c.

[FROM OUR OWN CORRESPONDENT.]

The Iron Trade generally—The Trade in South Wales—In Derbyshire, Yorkshire, and Lancashire—In Staffordshire—The Scotch Market—The Coal trade of the Country—The Labour Market—The general trades of the Country—The Hardware trades of Yorkshire and the Midlands—The Glasgow Pig Market—Prices of English Pigs—Copper and Tin.

Although there has not been so much doing in the past nine days or a fortnight as in the previous three weeks, yet the orders now on the books in most of the iron-making districts of the kingdom show a good demand for finished iron of all kinds, both for home and foreign consumption; such as will afford employment in some of the large works for several months. Less apprehension is entertained as to disturbances on the Continent than was the case a few

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days ago. The fears of a disruption had begun slightly to check the progress which was setting in. It is the almost universal aspiration of the iron interest that peace may be maintained. If a war should not break out, a time of great prosperity is regarded as almost certain. The reports from America, upon which country the iron trade of Great Britain so greatly depends for customers, are very favourable as to the future prospects of that country. Its financial difficulties have been nearly all overcome, and there seems to be no question that as the season advances the advices from the United States will be of an encouraging nature, and if due care is exercised as to the price and quality of the iron sent from this country we may still look upon the Americans as our best customers. Having said this much in regard to the iron trade generally, it may be added upon the particular districts, that

In South Wales a slight advance has taken place in the price of bar iron, and the arrival of several fresh orders has increased confidence, which, it is anticipated, will be further strengthened as the spring advances. There is a tolerably good inquiry for France and Russia.

In the Derbyshire, Yorkshire, and Lancashire district the iron trade is said to be in a most healthy and satisfactory condition. The makers of the best brands of iron are well supplied with orders, but there is a difficulty experienced in disposing of inferior brands. Some large orders for railway iron have been taken by two houses in Yorkshire trade.

The South Staffordshire trade was reported on change at Wolverhampton on Wednesday to be no exception to the existing state of things generally. The first-class works are in full operation, and the makers of less note are steadily creeping up to them. Except at an advance large orders will not be accepted in South Staffordshire.

There is a quietness in the Scotch market which is causing the produce of that market, which is almost constantly oscillating, to move in favour of buyers.

The coal trade of the country is tolerably healthy, and remunerative rates are being got; but the supply is hitherto quite equal to the general demand. The labour market is gradually assuming a state of satisfactory quietude. The Wigan strike, which bore a serious aspect at the date of our last report, may be considered to have terminated. The men were expected to resume work yesterday (Thursday).

With respect to the general trades of the country, whose condition very much affect the metal trades in their early stages, it may be reported of the fabrics of Lancashire and Yorkshire, and Scotland, that, as a whole, they are in the midst of a period of healthy activity, attended with constant employment for the operatives, and good prices for the manufacturers.

The hardware trades of Yorkshire and the Midlands are tolerably well employed, and, except in a few branches, the workmen of Sheffield, of Birmingham, and of Wolverhampton, and of the dense district surrounding the two last-named towns, are working full time.

The Glasgow pig market is an exception to the other iron markets in relation to prices, as well as to the copper and tin market. English pig makers continue to ask higher rates; and copper and tin can only be purchased at the prices that may prevail at the time of delivery.

NOTES FROM THE SOUTH WEST.

[FROM OUR OWN CORRESPONDENT.]

Another Atlantic Cable—Drinking Fountains: Plymouth—South Coast Railway: New Works—The Peninsular and Oriental Company's Service: The Vectis—Water Supply of West Cowes—Experiments with Apparatus for supplying Water to Ships at Sea—The Narrow Gauge at Reading—An Adventurous Little Cutter—Warming Churches—West Somerset Railway—Extension of Railway Communication to Wells—The Bath and West of England Society—Cornwall Railway—H.M.S. Agamemnon—Docks for Falmouth: Important Movement—Loss of the Ceres Steamer—The Isle of Wight Railway—Dockyard Talk: The Mersey and the Howe—Adjustment of the Dispute between the Brighton and South Western Companies—Gunboats at Haslar.

The "Great Ocean Telegraph Company, Limited" have issued a prospectus in which they announce their intention to submerge, if they can find the necessary funds, a submarine cable from the Land's End to Halifax. The system which the Company propose to adopt is that of Mr. Thomas Allan, and lightness is the prominent feature of the proposed cable, which can be submerged without cumbrous paying-out gear from one vessel.——At Plymouth, a Mr. Bryant has addressed a letter to the Mayor announcing his intention to erect six drinking fountains and three cattle troughs at his own expense, only imposing the very fair condition that the water shall be supplied free of charge. *A propos* of this subject it may be stated, that four years since Liverpool did not possess one public fountain, while the number now amounts to 40. There is little doubt that this is one of the most practical efforts ever made in connexion with the temperance movement.——Some interesting facts are stated in the report just presented by the directors of that well-managed undertaking, the London, Brighton, and South-Coast Railway. It appears, that in order to satisfy the wishes of certain leading landowners in the district traversed by the Shoreham, Henfield, and Horsham line, application is to be made to Parliament to sanction a deviation in the northern portion of that branch, without, however, increasing the originally-estimated cost. As regards the southern portion, the directors state that the plans for carrying the line over the river Adur have now received the approval of the Admiralty, and the works are shortly to be commenced. The constant and heavy expense incurred in maintaining the timber viaduct which carries the Horsham line across the Ilfield Mill Pond renders its replacement by a solid embankment desirable, and the directors propose applying for parliamentary sanction to effect this object, and also to construct the short Spur line at Norwood, in accordance with certain arrangements made with the Mid-Kent Company. The extension to Leatherhead will shortly be ready for traffic, and a further extension to Dorking is contemplated.——Captain Hicks, late chief officer of the *Pera*, is appointed to the command of the *Nepaul*, a new screw steamer of 3,000 tons and 200-horse power. The engines of the *Vectis* are to be transferred to a larger ship. All these vessels are part of the magnificent fleet of the Peninsular and Oriental Company.——The West Cowes Local Board of Health propose to purchase the works of the Local Water Company, and have applied to Mr. Stephenson to act as arbitrator in the matter. Mr. Stephenson is unable, however, to undertake the office, but names two gentlemen whom he considers suitable. It is considered that the matter will soon be carried through.——The Board of Admiralty have been conducting a series of interesting experiments with the view of ascertaining by what apparatus the largest and best supply of water can be obtained for the use of ships at sea. (See article on Dr. Normandy's apparatus, p. 77.)——For some time a mixed broad and narrow gauge line has been laid down on the Great Western Railway, between Reading and Oxford, but from the want of a loop-line to connect the Great Western with the South-Eastern and South-Western Railways, goods could not be transmitted from the northern districts without being transferred by vans from one company's depot to the other. This impediment has now been removed by a short narrow-gauge loop being completed at Reading.——A small 28-ton cutter which sailed from Southampton on the 3rd November, arrived at Grenada on the 15th of December, after a very tempestuous passage. The name of the little craft is the *Royal Charlie*.——St. Peter's church, Clifton Wood, (Bristol,) is now reported to be effectively heated by a large descending stove, lined with Stourbridge bars, placed in the school-room under the church. From this stove the heat is conveyed to five ventilators in the floor of the church through as many pipes, covered with hair felt, which prevents the hot air contained in them from being neutralized by the outer cold, so that none of the heat is lost. The apparatus was designed and constructed by Mr. A. A. Harris, Marsh-street iron works.——The works on the West Somerset Railway which will connect the town of Taunton with the harbour of Watchet—and thence by steam communication with the Welsh coast—are to be shortly commenced, the directors having decided to proceed with the construction of the railway. The first sod will probably be turned in a week or two.——The quiet old cathedral town of Wells will be brought into connection with the turbulent world of railways next month.——The next meeting of the Bath and West of England Agricultural Society is to be held at Barnstaple, and the council has determined that the implement yard shall be open for exhibition on Monday and Tuesday, May 30 and 31. The system of prizes for implements has been abandoned, the council at the same time recording thanks to the judges in this department in past years for their valuable services. Mr. Thomas Dyke Acland has submitted a lengthy memorandum to the council embodying a proposition for extending the exhibitions of the Society to arts and manufactures. This memorandum stated that the agricultural implements exhibited at the Society's meetings had increased from 400 in 1852 to 1,100 in 1857; noticed improvements in the practical character of the implements; and added that the attendance of exhibitors from a distance had increased from 16 to upwards of 40 annually. A committee has been appointed to consider Mr. Acland's proposition, and if it is carried out—and there seems every probability that it will be—Exeter will be the town in which the proposed arrangement will be first reduced to practice.——The Cornwall Railway is now in such an advanced state, that the whole line from Plymouth to Truro (54 miles) is expected to be opened in a few weeks. The stations are all more or less advanced, the splendid Royal Albert bridge is nearly complete, and the permanent way has been laid on the Plymouth side as far as Saltash. From Truro to Dubwalls the permanent way is also completed, and from St. German's to within a short distance of Liskeard, while the rails are all prepared for the remainder, and as soon as the contractor, Mr. Ritson, can finish the St. German's viaduct, the whole will be ready for the passage of the locomotive. This line will of course supply through communication between London and Truro; and it is not a little singular that Cornwall should have been so long left without this advantage.——The boilers of H.M.S. *Agamemnon* have undergone a thorough repair, and she has been fitted with a new water casing.——An important effort is being made to promote the formation of docks at Falmouth. The tonnage of ships calling at the port—notwithstanding the want of any adequate accommodation beyond the natural advantages of the place—has more than doubled within the last nine years, 1,519 ships with a tonnage of 319,242 tons having entered in 1850, against 2,700 ships with a tonnage of 776,330 tons in 1858. The promoters of the proposed docks estimate that this trade would have been still further augmented if docks and slips had been provided; and it is also urged that as Truro is on the eve of being connected with the metropolis by railway, the mails will probably be restored to Falmouth, which is only ten miles from Truro, and is the most western point in the kingdom. Various attempts have from time to time been made, but without success, to induce the Government to re-establish the packet station at Falmouth, the removal of the mails to Southampton having been severely felt. An important county meeting has been held at Truro, at which Mr. T. H. Tilly entered into a variety of interesting details on the subject. It seems that the proposed tidal harbour is to comprise 12½ acres, and the close dock 8 acres, two graving docks to be constructed in the latter, and two patent slips in the former. The mouth of the tidal harbour is to be 350 feet wide, and it is proposed that the channel should be deepened to 18 feet at low water. This would require 9 feet of dredging, but the light character of the bottom—mud and shells—renders this part of the undertaking, it is said, comparatively easy. Mr. Tilly, referring to Southampton, drew a comparison with Falmouth, adverse to the former port. In Falmouth, he said, the entrance to the tidal harbour would be straight, and the passage from that harbour into the close docks inside it would be straight also—a great advantage for large vessels. The entrance to Southampton is at right angles, and the large steamers have to be warped round. The tidal harbour in Southampton is 16 acres in extent, and the dock inside is 10 acres, the breadth of the entrance being only 40 feet, as it was constructed when ships were not of their present capacity. The entrance to the Falmouth docks, on the other hand, is to be 80 feet. The average rise of tide is 18 feet springs and 13 feet neap, and it is intended to deepen the channel so as to make it 18 feet at low water. The beautiful harbour of Falmouth, (said Mr. Tilly, waxing eloquent), the outlet of the kingdom, the eye of the British Channel, had been allowed to run to decay, and silt up; and it was strange that it was considered national policy to allow the national harbours to fall into decay, while millions and millions were expended on experiments. Sir Charles Wood, he added, had stated that there never was but one opinion at the Admiralty that Falmouth was the proper packet station; "Make docks," Sir Charles is reported to have said, "and the steamers will come back to you." Mr. Abernethy, Admiralty Engineer—who is said to possess the rare faculty of keeping within his estimates—has been employed in surveying the port, and the expenditure for the proposed docks and other accessories is estimated at £200,000, against £800,000 expended at Southampton.——The *Ceres* steamer struck on the Lizard Point on Saturday afternoon, and foundered.——In the case of the proposed Isle of Wight Railway bill, the official examiner has decided that the standing orders of Parliament have not been complied with.——The *Mersey*, 40, a fine new screw frigate, is progressing rapidly in the steam-basin, Portsmouth Dockyard. Her engines have been tried with a favourable result, and the screw has arrived from the establishment of the Messrs. Maudslay. In consequence of its great size and weight (14 tons), it has been divided into three portions. The two blades are cast with flanges, and screw on to the centre boss with nuts and screws, so that they can be easily taken apart in case of accident. The tonnage of the *Mersey* is 4,000 tons, and she will be ready for her sea trial in February. She is being fitted on both sides with Clifford's patent boat-lowering gear.——The *Howe*, screw steamship of the line, will be launched in the course of the summer. The *Howe* will be a noble line-of-battle ship, and will carry 130 broadsiders and one pivot-gun. She will be rather larger than the *Duke of Wellington*. Great activity prevails in Pembroke Dockyard in getting ready for launching several fine vessels which are on the stocks; the first launch will take place in April.——It is stated that the unfortunate dispute between the Brighton and South-Western Companies, with reference to the Portsmouth traffic, has been amicably arranged; happily there does not seem to be such an appetite for law as formerly.——Forty gunboats are now hauled up on the slip at Haslar, and could within a few hours be made ready for sea.

NOTES FROM THE EASTERN DISTRICT.

[FROM OUR OWN CORRESPONDENT.]

East Suffolk Railway—Implement Makers and Prizes at Local Agricultural Exhibitions—Steam Plough Trial—Branch Railway at Lincoln—Embanking Marshes near Wells-next-the-Sea—West Ham Drainage: The New Metropolitan Works—Boston and Sleaford Railway.

They say the East Suffolk Railway and its tributary branches to Yarmouth and Lowestoft will be ready for traffic by the 1st of March.——The members of the Suffolk Agricultural Society have been discussing at their annual meeting the question whether they shall give prizes for implements and steam cultivators at the next exhibition. The implement makers have long been setting their faces against the expense and vexatious trouble which local societies have expected they should incur in the trial of implements for prizes; and an interesting letter was read to the Suffolk meeting from Mr. J. Allen Ransome, who observed:—"In the present state of the manufacture of the ordinary class of agricultural implements, their relative degrees of merit or superiority cannot be fairly settled unless much more time and tests by scientific instruments be applied than the ordinary facilities afforded by a local meeting will allow; and an award made under these circumstances of a specific prize marking one implement with a badge of superiority when many may be of equal or possibly of even superior merit, is unjust in its effect upon the competitors, and disadvantageous to the purchasers. This feeling is so strong with ourselves, and with several others who have been accustomed to contribute to exhibitions, that we should decline to exhibit as competitors where prizes were offered by local societies, while on the other hand we should be fully disposed to do our best to make such an exhibition as interesting as possible where the element of competition is avoided. It may not be out of place here to state that after very full correspondence and conference with the class of implement exhibitors, the Bath and West of England Society—which, with the exception of the Royal Society, is the largest and most influential of English agricultural societies—has come to the decision to abolish the principle of competition for prizes at their ensuing meeting. The only encouragement which we think lies within the scope of local agricultural associations to promote good exhibitions of implements, lies in the facilities they may afford for providing good places and covering for the machinery, and the material for the various machines to operate upon free of cost to the exhibitors; and possibly, if a society could afford it, facilities of transport from the ordinary railway stations and wharves to and from the place of exhibition. These remarks apply mainly to the general class of implements and machines to be acknowledged as standard implements, but are not intended to apply to any fresh development of agricultural machinery which may be entirely new in its application, as at the present time steam cultivation may be considered." A lengthened discussion took place on the subject, Mr. R. Garrett elaborating the views of Mr. Ransome on the part of the implement

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makers; and Major Parker, on behalf of the farming element of the society, endeavouring to show cause in favour of adherence to a resolution passed by the association at a late meeting at Bury St. Edmund's, "that the committee should offer, if they think fit, a medal or reward to the best specimen of steam cultivation, if they deem it of sufficient merit." Steam, said the gallant major, had made rapid strides; Mr. Fowler's machine had received the approbation of the Royal Society, and the premium of £500 for the application of steam to land; and Mr. Smith had obtained a medal. Looking, too, at what took place at the Baker Street Exhibition, one was led to the conclusion, that public feeling was in favour of bringing steam into general use; and he must express his surprise that eminent agricultural implement makers should endeavour to throw cold water on a movement so fraught with good. Mr. Garrett, in reply, denied that he wished to do this, but urged that local societies would have immense difficulties in arriving at a proper conclusion on the subject. The Royal Society undertook elaborate trials, and if their decisions were impugned or reversed by local societies, the public mind could be only perplexed and disturbed. The trial of three or four steam machines would occupy a week, with endless expense to exhibitors, besides which the society did not know where to look for proper judges. The chairman (Sir Edward Kerrison) and Mr. Hawkins, supported the views of Mr. Garrett and Mr. Ransome; and jeventually Major Parker, who adhered to his proposition with some tenacity, consented to withdraw it—the chairman suggesting that the society should give all possible assistance to prove reaping machines, mowing machines, and steam cultivators; and that suitable fields and other facilities should with this view be provided. So the implement makers carried the day. ——A steam plough, manufactured at the establishment of Messrs. Clayton, Shuttleworth, and Co., of Lincoln, has been tested on the farm of Mr. Clarke, at Red Hall, in the presence of Mr. Amos, C.E., and a large party of agriculturists. Two men in the employment of Mr. Fowler, the patentee, took the management; and a local paper states that the work was accomplished in a satisfactory manner. ——At Lincoln a branch railway from the Midland station to the Great Northern has been visited by the Government inspecting-officer, and will soon be opened for traffic.—— Some operations have been for some time in progress for embanking an extensive tract of marsh land (700 acres), in the neighbourhood of Wells-next-the-Sea, Norfolk, the Earl of Leicester—descendant of "Coke, of Holkham," of world-wide agricultural celebrity—being the prime mover in the matter. The sea was shut out a few days since, on the completion of the embankment. Mr. Buxton has been contractor for the work.——With regard to the drainage of West Ham, it is stated that the works of the main outlet will be in all probability finished in the course of the summer. The Rev. A. J. Ram has directed the attention of the Local Board of Health to the circumstance of the great metropolitan sewer about to be constructed coming across the sewer of this district. The centre line of the sewer at Stratford will pass through Waterworks-row, and will diverge in the direction of West Ham Abbey. Some slight deviations will probably be made from the original plan in the sewer in the Stratford district, with the view of meeting the levels of the outlying districts of the London docks, and adjacent neighbourhoods. The sewer, it is stated, will materially interfere with the high-road east of Peg's-hole bridge, extending to near Christ church, Stratford Marsh, which will, it is said, be necessarily raised from 12 to 14 feet.——The new railway from Sleaford to Boston will be opened in the summer, or possibly late in the spring.

CURRENT EVENTS

IN THE CENTRES OF THE IRON, COAL, MACHINE, AND SHIPPING TRADES.

[COMPILED BY OUR OWN CORRESPONDENT.]

Opposition to the South-Eastern Harrogate Stray Scheme —St. Helen's Canal Company and the London and North Western—The Line from Garston to Liverpool—Launch of a large Iron Screw Steamer—Operations on the Worcester and Hereford Railway—Fearful Boiler Explosion —Meeting of Collier Delegates at Wigan—Protest against the Truck System by South Staffordshire Colliers—The War between the Glass Blowers and their Employers— The Wages Question of the Factory Operatives of Lancashire, Yorkshire, Derbyshire, and Cheshire—Decision of the Judge of Preston County Court as to Damage of Machinery.

THE owners of Harrogate Stray resolved that the most active measures ought to be taken to prevent the North Eastern Railway Company from obtaining possession of any portion of the Stray, for the purpose of converting it into a line of railway. A borough meeting at Knaresborough has resolved to oppose the scheme in Parliament.——The long-pending negotiations between the St. Helen's Canal Company and the London and North-Western Railway Company have at length been brought to a very satisfactory conclusion. The London and North-Western Railway have agreed to rent that portion of the line extending from Warrington to Garston. It is reported that the rental will be fixed at £9,000 for the first year, £10,000 for the second year, £12,000 for the third year, the lease being for three years.——The bill for the extension of the line from Garston to Liverpool will be brought forward in Parliament early in the ensuing session. The branch line from St. Helens to Eccleston is rapidly approaching to completion; when finished it will greatly facilitate the coal and stone trade of that district.——A large iron screw-steamer has been launched at Newcastle-upon-Tyne. She is named the *Empress of India*, and has been built with unprecedented strength, to be used in the whale fishing trade in the Arctic Seas. After being built under the special inspection of Lloyd's surveyors, she is classed 12 years A1., and in addition is fortified with cellular chambers, on the principle of the *Great Eastern*, besides double plating forward, the internal plates of which exceed 30 feet in length. Indeed, it is almost impossible to conceive anything stronger. She is fitted with two large permanent tanks, and other moveable tanks equal to a capacity of six hundred tuns of oil. In addition to the machinery, the vessel is full rigged. When the vessel is ready for sea there will be upwards of 100 men on board, the largest crew of any vessel in that trade. The engines are of 100-horse power. The screw is so constructed that it may be disconnected, and raised on deck in a few minutes.——The construction of the Worcester and Hereford Railway has so far progressed that the portion between Worcester and Malvern is expected to be opened at Midsummer. From the tunnel near the Shrub-hill station of the Oxford, Worcester, and Wolverhampton, and Midland Railways, to the Foregate-street, the line will pass over a huge embankment of brick and earthworks. The Foregate will be spanned by a handsome open ironwork bridge, at an altitude of about 20 feet, the piers to support which are nearly, if not quite completed. A succession of bridges then carries the line on to the river, and here a graceful iron structure of two arches, rising 47 feet above the water-level, is being constructed. The length of this bridge will be about 250 feet. The remainder of the line through Henwick and Malvern involves no work beyond the ordinary character, and here about a quarter of the permanent way is already laid. The boring of the tunnel through the Malvern range of hills is a most difficult and protracted undertaking, but there appears no doubt that in time it will be successfully accomplished.——A most fearful boiler explosion occurred on the Brunton and Shields Railway on Tuesday. The coals are sent down this railway by incline to the staiths in the Tyne, and a man named William Brunton was in charge of a standing engine about a mile and a half from Percy Main, when the boiler exploded with fearful force. The engine-house was completely demolished, and Brunton was buried under the roof and ruins of the building, whence he was dug out, dreadfully mutilated, an hour and a half afterwards. There was considerable damage of property, with miraculous escapes. Deficiency of water is supposed to have occasioned the calamity.——Another pit-chain has broken, near to Wolverhampton, occasioning the death of one man and the expected decease of a second. A long-standing defect in a link in the chain has been discovered.——At a meeting of collier delegates at Wigan on Tuesday, it was resolved to cease the strike.——The South Staffordshire colliers assembled at an open-air meeting on Monday in large numbers, to protest against the truck system practised by some of the iron and coal masters there.——The war between the glass-blowers and their employers continues to be waged with much determination on either side.—— The factory operatives in the manufacturing districts of Lancashire, Yorkshire, Derbyshire, and Cheshire, have for some time past contemplated a general movement for securing an increase of wages, considering that the prosperity of the cotton trade would amply justify them in such a course. The spinners and self-actor minders have taken action in the matter, and the general body representing the four counties above mentioned, has made a draft of a memorial to the employers, setting forth the views of the workers on the subject. The agitation assumes entirely the character of a request to the employers; in many instances the amount of the advance of wages desired is not even named. In case of a refusal, there is no intention, we believe, of attempting to gain the object by a "strike." From the prevalent feeling among the manufacturers and spinners, it is not improbable that an increase will be generally conceded. The power-loom weavers contemplate a similar movement, characterised by exactly similar means.——The Judge of the Preston County Court has ruled that an operative who damages machinery by neglecting to properly attend to it must pay for the damage sustained by the master. In this case an operative had neglected to oil his mules sufficiently.

PROVISIONAL PROTECTIONS.

Dated December 3, 1858.

2766. E. S. Jones, of Marylebone-st., Golden-sq., Professor of Music. Improvements in cornets, trumpets, horns, and similar musical wind instruments.

Dated December 21, 1858.

2916. A. S. Beliard, of Bordeaux, Hatter. An improved machine for pumicing felts, tissues, and skins.

Dated December 27, 1858.

2954. J. Radley, of Dublin, Hotel Keeper. An improved cooking apparatus.

Dated December 30, 1858.

2984. H. C. Vion, of Paris, Civil Engineer. A new mode of obtaining atmospheric electricity, and terrestrial electricity, and its industrial applications, and in apparatus for the same.

Dated December 31, 1858.

2999. J. H. Johnson, of Lincoln's-inn-Fields. Improvements in the manufacture or production of boots and shoes or other coverings for the feet, and in the machinery and apparatus employed in such manufacture. A communication.

3001. M. D. Wyatt, of Guildford-st., Russell-sq., Architect. Improvements in tiles and tessaræ and other wall coverings, and in the means of securing the same to walls and buildings.

3003. J. Lees, of Park Bridge, near Ashton-under-Lyne, Roller Maker, and W. Heap, of Ashton-under-Lyne, Tool Maker. Improvements in machinery for punching square holes in the ends of rollers and other articles.

3005. F. W. A. Casper and G. H. Schmahl, of Paris. Using spart or Spanish broom in manufacturing seats of all descriptions.

3007. J. H. Johnson, of Lincoln's-inn-fields. Improvements in the manufacture or production and casting of steel, and in the apparatus employed therein. A communication.

Dated January 1, 1859.

1. J. T. Pitman, of Gracechurch-st. An improved mode of making and fitting bungs to casks and other vessels. A communication.

2. H. C. Traphagen, of New York. Improvements in skirts for ladies.

3. A. Anderson, of Lancaster, United States. An improvement in governors for machinery.

4. B. J. Gosteau, of Paris, Merchant. An improved grid-iron which may form a complete cooking apparatus.

5. J. E. Drouot, of Paris, Baker. Improvements in bakers' ovens.

6. W. Footman, of Water-st., Strand. Improvements in breaks for retarding and stopping railway trains, carriages, or other vehicles.

7. J. Oliver, of White Bank, near Chesterfield. Improvements in lubricators for steam-engine cylinders.

9. J. Garforth, of Dunkinfield, Engineer. Certain improvements in steam engines.

10. H. Ashworth, of Littleborough, Manager. Certain improvement in power looms for weaving.

11. R. Smith, of Beith, Ayr, Wright. Improvements in casting, applicable to printing surfaces, and for other purposes.

12. P. E. Guérinot, of Paris, Jeweller. Improvements in the application of an apparatus to railway locomotives, waggons, and carriages, for the purpose of lessening the effect of concussion in the event of collision.

13. W. Eccles, of Surrey-st., Strand, Master of Arts. Improving the machinery or apparatus for regulating the tension of the twist threads or warp whilst it is weaving in power looms into cloth.

15. A. Prince, of Trafalgar-sq. Improvements in the construction of cylindrical presses. A communication.

16. W. A. Von Kanig, of Leipsic, Gentleman. Improvements in machinery or apparatus for digging and cultivating land.

17. J. Harris, of Hanwell, Engineer. Improvements in apparatuses for regulating the pressure and flow of steam, water, and other fluids.

19. G. Skinner and J. Whalley, of Stockton-on-Tees, Earthenware Manufacturers. Improvements in the manufacture of ornamental and other tiles, and other similar articles.

20. J. Brown, jun., of Rotherham, Ironfounder. Improvements in buffers, draw springs, and bearing springs.

21 G. T. Bousfield, of Brixton. Improvements in machinery for forming dough into cakes or bread crackers. A communication.

22. A. L. Lévêque, of Paris, Gentleman. An improved apparatus for subduing or stopping runaway or restive horses.

23. J. B. Morgan; of Liverpool, Cotton Broker. Improvements in propelling navigable vessels.

Dated January 3, 1859.

24. J. Luis, of Welbeck-st. New economical candles. A communication from A. Michaut.

25. R. Tempest and J. Tomlinson, of Rochdale, Machine Makers. Improvements in certain machines for preparing cotton and other fibrous materials.

27. C. B. Blyth, of Dundee, Mill Manager. Improvements in machinery for preparing and treating jute, hemp, flax, and other fibrous materials.

29. W. Renton, of Leeds, Cloth Dresser, T. Renton, of Leeds, Millwright, and W. Binns, of Leeds, Cloth Finisher. Improvements in raising the nap or pile of textile fabrics.

30. J. Furnival, of Leamington, T. Furnival, of Cobridge, J. Derbyshire, of Longton, and F. J. Emery, of Burslem. Improvements in apparatus for supporting articles of china and earthenware in kilns and ovens.

Dated January 4, 1859.

31. L. J. Higham, of Edmund-pl., City, Mechanic. Improved means for obtaining submarine electrical conduction.

32. J. Buchanan, of Greenock, Gentleman. Improvements in oil cans or lubricating apparatus.

33. J. B. Joyce, of Bradford, Machine Maker. Improvement in means, machinery, or apparatus, applicable to wool combing.

34. W. Hood, of Upper Thames-st., Iron Merchant. Improvements in racks and water cisterns for stables.

35. A. Bedborough, of Southampton, Architect and Surveyor. An improved chimney cowl and ventilator.

36. C. de Forest, of Leicester-sq., Gentleman. An improvement in the manufacture of springs for carriages, and other uses. A communication from C. Goodyear, jun.

Dated January 5, 1859.

37. F. Clark, of King-st., Bloomsbury, Turner. Improvements in connecting knobs and handles to the spindles of locks and latches, and other articles of a like nature.

38. W. Draper, of Brixton. Improvements in machinery for printing on paper and other fabrics.

39. J. Howard, of Bedford, Agricultural Implement Maker. An improved construction of lever-neck plough.

40. R. Rumney, of Manchester, Manufacturing Chemist, and W. S. Macdonald, of the same place, Mechanic. Improvements in printing and dyeing woven fabrics and yarns or threads.

41. A. V. Newton, of Chancery-lane. An improvement in the process of, and improved apparatus for, separating metals from their ores. A communication from L. Solomon, of New York.

Dated January 6, 1859.

43. J. Kirkman, of Bolton-le-Moors, Manufacturer, and I. Grundy, of the same place, Cotton Spinner. Improvements in certain kinds of bed covers or counterpanes, and other textile fabrics of similar character, and in the mode or method of weaving the same.

44. G. Bury, of Everton, near Liverpool, Overlooker. Improvements in part or parts of apparatus commonly used and applied for effecting the pick in power looms for weaving.

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45. H. G. Coombs, of Union-st., Borough, Ironfounder. An improved method of constructing railings, bars, gates, gratings, columns, and all other builder's work, of a like nature or description.

46. E. T. Hughes, of Chancery-lane. Improvements in machinery or apparatus for preparing cotton and other fibrous materials to be spun. A communication from C. Vallée.

47. W. Renton, of Leeds, Cloth Dresser, T. Renton, of Leeds, Millwright, and W. Binns, of Leeds, Cloth Finisher. Improvements in finishing woollen and other fabrics.

48. J. Aspinall, of Great Tower-st., Civil Engineer. Improvements in machines for the manufacture of bolts, rivets, and spikes.

49. J. H. Johnson, of Lincoln's-inn-fields. An improved textile fabric, applicable to the manufacture of varnished cloths, and to other purposes. A communication from A. P. Roger.

50. J. H. Johnson, of Lincoln's-inn-fields. Improvements in machinery or apparatus for boring or piercing rocks, applicable also to the dressing or working of stone, and as a power hammer generally. A communication from G. Sommeiller.

Dated January 7, 1859.

51. W. Spence, of Chancery-lane. Improvements in the mode of taking photographic pictures on wood. A communication from C. B. Boyle.

53. E. Heywood, of Halifax. Improvements in weaving.

55. G. K. Geyelin, of London, Civil Engineer. Regulating gas burners, which he calls the "Universal Gas Burner Regulator."

57. J. Paterson, of Wood-st., City, Warehouseman. An improvement in bands and belts for the waist.

59. W. E. Newton, of Chancery-lane. Improvements in machinery for winding, twisting, and doubling fibrous materials. A communication from L. B. Duboc, jun.

Dated January 8, 1859.

61. C. F. Vasserot, of Essex-st., Strand. An improved chain and bucket pump. A communication from A. X. Dubrulle-Chevalier.

63. T. B. Hubbell, of Castle-st., Manufacturer. An improved trap for rabbits, rats, mice, and other like animals and vermin. A communication from C. B. Hubbell.

65. A. W. Williamson, of University College. Improvements in condensers for steam engines and other purposes.

67. W. Clark, of Chancery-lane. Improvements in purifying natural phosphates of lime. A communication from E. C. Martin.

69. J. T. Forster, of Kensington, Gentleman. Improvements in bed births, applicable for bunks, hammocks, cots, and other fixed and moveable sleeping places.

71. W. A. Lyttle, of General Post-office, Ireland. Taking the place of springs in many, if not all, of the combinations into which they enter, and also for equilibrating a varying force or weight.

Dated January 10, 1859.

73. L. A. Normandy, jun., of Judd-st. Improvements in the process of distilling and clarifying resinous substances. A communication.

75. F. Lehr, of Hoboken, New Jersey. Improvements in machinery for manufacturing metallic ribs for umbrellas, parasols, and other articles.

77. J. White, of Finchley, Surgeon. Improvements in cleansing or purifying air, and in increasing or reducing the temperature thereof, and in the application of air so treated to sanitary and other uses.

Dated January 11, 1859.

79. E. Agneni, of Devonshire-st., Bloomsbury, Painter. Increasing the effect of decorative pictures, landscapes, drawings, and prints, through looking-glasses.

81. J. Biers, jun., of Kentish Town, Coach Maker. A self-acting carriage wheel break.

83. W. Tillie, of Londonderry, Shirt Manufacturer. An improvement in the manufacture of shirts and shirt fronts.

85. B. J. Rubenstein, of London, Dentist. Improvements in dentistry.

87. C. W. Siemens, of John-st., Adelphi. Improvements in supports for electric telegraphic line wires, and in tools or apparatus to be used in the construction of such supports, part of which improvements are applicable to the joining of pipes and other articles.

89. N. P. Burgh, of Sheerness, Engineer. Improvements in steam engines.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

2071. W. Thomson. Bleaching.
2088. S. St. C. Massia. Fire Places. A communication.
2102. C. Hadley. Omnibuses, &c.
2108. J. B. Beasley. Guns.
2110. H. W. Grylls. Laying down cables.
2113. H. Barrow. Cartridge boxes.
2114. H. Firmin. Cleansing chaff, &c.
2119. L. de Pariente. Gas burners. A communication.
2120. J. C. E. Malvesin. Tubes, pipes, or mains.
2121. J. Bethell. Treating pyrites.
2124. A. M. Perkins. Surface condensers.
2137. A. F. Jalourcau. Pipes.
2139. T. C. Hinde. Iron and steel.
2175. J. Morrison. Sewing machines.
2181. A. Normand. Ships and vessels.
2207. A. Bessemer. Iron and steel.
2213. J. H. Brown. Cartridges.
2217. J. Luis. Joining tubes.
2239. R. Searle. Insulating and laying cables.
2445. A. Barclay. Telegraphs.
2456. P. A. Mawdsley. Yarns and woven fabrics.
2457. P. A. Mawdsley. Paper.
2573. J. Samuel. Sleepers for rails.
2804. J. V. Scarborough. Boots and shoes.
2829. H. Wilson. Pumps.
2836. A. Barclay. Obtaining motive power.
2878. T. Moss. Printing bank notes, &c.
2900. J. MacKenzie. Gas burners.
2937. A. Barclay. Obtaining motive power.
2958. W. A. Gilbee. Treating fatty bodies. A communication.
2984. H. C. Vlon. Obtaining electricity.
2996. J. Knowelden and R. D. Edwards. Hydraulic engines.
9. J. Garforth. Steam engines.
13. W. Eccles. Power looms.
21. G. T. Bousfield. Dough. A communication.
25. R. Tempest and J. Tomlinson. Preparing cotton, &c.
50. J. H. Johnson. Boring rocks. A communication.
75. F. Lehr. Ribs for umbrellas.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

142. F. J. Manceaux.
160. J. W. Robson.
162. P. L. Tiefté-Lacroix.
163. J. B. P. A. Thierry, J. L. Richard, and H. de Martiny.
171. J. Francis.
181. J. Hopkinson, jun.
193. G. B. Pettit and H. F. Smith.
197. F. Chanchard.
203. J. Beads.
218. W. Beasley.
227. P. E. Guérinot.
250. C. F. Claus.

LIST OF SEALED PATENTS.

Sealed January 21, 1859.

1529. A. W. Sleigh.
1615. M. Matley.
1651. D. W. Warder.
1658. H. Higgins and T. S. Whitworth.
1662. H. Barber.
1671. J. F. Belleville.
1675. C. F. Vasserot.
1697. A. Kellermann.
1698. A. Pougault.
1832. W. Knowles.
1915. T. Averill.
2672. F. C. Calvert and C. Lowe.

Sealed January 25, 1859.

1676. A. Sax.
1678. J. Hardie.
1683. E. Jones.
1684. H. Jackson.
1687. P. A. Godfrey.
1688. H. Glover.
1691. J. Emes.
1693. A. Taylor.
1694. C. N. Kottula.
1696. G. Hurn.
1705. H. Harden.
1711. J. Musgrave.
1713. G. S. Parkinson.
1715. J. L. Hinks.
1740. C. de Bergue.
1749. W. B. B. Harvey.
1774. J. B. Pascoe and J. R. Thomas.
1783. D. McCrummen.
1784. C. Mather.
1799. J. Smith, jun.
1802. J. Imray.
1803. J. Taylor.
1843. H. Smith and T. W. Ashby.
1849. T. Rickett.
1945. A. V. Newton.
1967. L. Wiart.
2186. J. T. P. Newbon, T. Smith, and J. Brown.
2450. S. Bottomley.
2609. B. Rider.
2643. J. Young.
2661. W. Warne, J. A. Jaques, and J. A. Fanshawe.
2681. C. Mather.
2783. E. L. Benzon.

LIST OF SPECIFICATIONS, &c.

Published during the week ending January 20, 1858.

No.	Pr.	No.	Pr.	No	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s d		s d		s d		s d		s d		s d
23	0 3	1351	0 6	1363	1 6	1373	0 4	1383	0 3	1396	0 3
158	0 3	1353	0 10	1364	0 10	1374	0 3	1385	0 3	1397	1 3
1248	0 7	1354	0 3	1365	0 3	1375	0 8	1386	0 7	1398	0 8
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1344	0 9	1358	0 3	1368	0 7	1378	0 3	1389	0 6	1401	0 3
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1346	0 6	1360	0 10	1370	0 3	1380	0 3	1391	0 6	1405	0 3
1348	1 1	1361	0 9	1371	0 3	1381	0 6	1393	0 3	1408	0 3
1349	0 7	1362	0 3	1372	0 3	1382	0 3	1394	0 3	1411	0 3
1350	0 7										

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Dates of Registration.	Nos. in Register.	Names and Addresses.	Subjects of Design.
1858.			
Dec. 27,	4143	J. H. Powell, Newgate-street	Stereoscopic Camera.
,, 28,	4144	J. Cowburn, Manchester	Steam pump eng.
1859.			
Jan. 3,	4145	A. McDougall, Addle-hill	Pulley tail, for carts, waggons, &c.
,, 5,	4146	J. Lee, Dublin	Mantle.
,, 6,	4147	P. Currie, Birmingham	Fastener.
,, 6,	4148	W. Blenkiron, Wood-st.	Brace.
,, 25,	4149	E. Lyons & Son, Sutton, St. Helens	Bottle.

1858. PROVISIONAL REGISTRATIONS.

Dec. 21,	1037	S. Lyons, Wood-st.	Cape.
,, 30,	1038	J. Rider, Bristol	Closet Valve.
,, 30,	1039	S. W. Silver & Co., Bishopsgate-st. Within	Hat ventilator.
1859.			
Jan. 18,	1040	W. D. Sorrell, Reading	Weighing mach.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table:—

STEAM ENGINES, &c., 1200, 1214.

BOILERS AND THEIR FURNACES, 1169, 1206.

ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c. 1151, 1183, 1191, 1200, 1203, 1206.

SHIPS AND BOATS, including their fittings, 1161, 1163, 1169, 1173, 1216.

CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 1182, 1184, 1196, 1198.

FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 1150, 1192, 1198, 1207.

FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1155, 1157, 1158, 1174, 1179, 1183, 1186, 1190, 1193, 1209, 1210, 1217.

BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c. 1160, 1176, 1180, 1181, 1199.

LIGHTING, HEATING, AND VENTILATING, 1195.

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1147, 1153, 1156, 1211, 1212.

METALS, including apparatus for their manufacture, 1148, 1149, 1162, 1171, 1188, 1189.

CHEMISTRY AND PHOTOGRAPHY, 1187, 1217.

ELECTRICAL APPARATUS, 1152.

WARFARE. 1159, 1164, 1172.

LETTER PRESS PRINTING &c., *None*.

MISCELLANEOUS, 1151, 1154, 1160, 1166, 1167, 1168, 1170, 1175, 1177, 1178, 1182, 1194, 1197, 1201, 1202, 1204, 1205, 1211, 1213, 1215, 1217.

1147. J. H. JOHNSON. *Improvements in curtain rods.* (A communication.) Dated May 22, 1858.

This rod has spiral grooves formed upon it, and may be made to rotate upon its longitudinal axis by barrels having cords wound round them in opposite directions. The curtain rings are each contained in a separate groove of the series formed by the spiral, so that on turning the rod they will run along its surface in either direction. *Patent completed.*

1148. A. P. PRICE. *Improvements in the treatment and smelting of certain argentiferous or silver ores.* Dated May 22, 1858.

This consists in combining silver ores when in a fine state of division with bituminous coal, or with coal or carbonaceous matter and bituminous coal, or with coal or carbonaceous matters and pitch, tar, asphalte, or bitumen or other bituminous matter (such materials being by preference employed in a state of division), and subjects such mixtures to compression. It further consists in the admixture of suitable fluxes with the silver ores, together with the carbonaceous or bituminous tarry or pitchy materials, also in the use of all such materials for the reduction of the silver ores in the manufacture of silver in a cupola blast, or other suitable furnace. *Patent completed.*

1149. A. P. PRICE. *Improvements in the treatment of certain zinc ores and compounds of zinc, and in the manufacture of zinc and oxide of zinc.* Dated May 22, 1858.

To render more advantageous the use of calcined ores of zinc, or of artificially prepared oxides of zinc for obtaining metallic zinc, the patentee proceeds as follows:—He by preference reduces the ore to a fine state of division, and subjects it to a process of calcination or oxidation. He then mixes calcined blendes, carbonates or oxides of zinc, oxides of zinc when artificially obtained or prepared, or metallic zinc, with bituminous coal, with coal or carbonaceous matter and bituminous coal, or with coal or carbonaceous matter and pitch, tar, asphalte, or bitumen, and subjects such mixtures to pressure. It further consists in the admixture of suitable fluxes. Also in the use of all such materials, in any suitably arranged blast cupola, or other furnaces for obtaining metallic zinc or oxide of zinc. *Patent completed.*

1150. G. WHITE. *A liquor suitable for manufacturing beverages, and for culinary purposes.* (A communication.) Dated May 22, 1858.

This consists in forming by means of tartaric acid dissolved in any suitable solvent such as water, spirits of wine, or others, a liquor to which flavour is imparted by mixing therewith any suitable essential oil, such, for instance, as the oils of lemon or orange peel, neroli, or others, and to which may be added cane, grape, beetroot, or other suitable sugar, thus forming a concentrated liquor for instantly preparing refreshing beverages by being mixed with water, wine, arrack, tea, or other drinks, or which may be used as a condiment for culinary purposes. *Patent completed.*

1151. A. ELLISSEN. *Improvements in signalling in railway trains.* Dated May 22, 1858.

The patentee claims an adaptation of tubes for operating pistons, bells, and other signals for signalling in railway trains. The invention is not described apart from the drawings. *Patent completed.*

1152. I. BAGGS. *Improvements in electric telegraphs, and in the apparatus employed therein and therewith, parts of which are applicable to other electrical purposes.* Dated May 22, 1858.

This invention is described at page 78 of this Number. *Patent completed.*

1153. G. F. PARKE and J. BRIANT. *Improvements in bonnets.* Dated May 22, 1858.

The body of the bonnet consists of four pieces, two of which form the head piece, and two the sides. The head

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pieces are cut of such form that when united at a certain line they retain the required form. *Patent abandoned.*

1154. W. CLARK. *Improvements in machinery or apparatus for moulding articles of cement.* (A communication.) Dated May 22, 1858.

This relates to manufacturing paving blocks or squares, flags, bricks, sculptured ornaments, pipes for gas, water, &c. Plain articles are conducted into a mould-frame which shapes them. They are taken out of the moulds by a machine, having a lever, cam, and treadle, which removes the bottom of the mould. For pipes, the inventor uses a hollow mould having a conical part which forms the collar or socket. In the centre of this tube is another tube having a longitudinal hinge which forms a core. To remove the pipe from the mould the moveable axis is removed from the hinges, which allows of the core being withdrawn. The pipe is then taken out of the exterior mould all in one piece. *Patent abandoned.*

1155. R. HATTERSLEY. *Improvements in looms for weaving.* Dated May 20, 1858.

This relates to looms with rotary motion shuttle-boxes, and consists, 1, In the use of portable hooks for connecting the levers acted upon by the cam on the picking shaft with the levers which operate the rotary shuttle boxes, such hooks being connected to the boxes at the time only when the boxes require to be changed, by taper rods alone or in connexion with cams or levers which are operated by the jacquards. 2, In having the first-named levers so attached at the fulcrum end as to be capable of lifting therefrom if the shuttle does not box, or go properly into the box, which levers are so constructed as to act upon the strap guide and stop the loom. 3, In working the rotary shuttle boxes by right and left hand ratchet wheels and catches, which catches are kept out of gear therewith at all times except when acted upon by the before named levers through rods for turning or changing the boxes. 4, In applying a friction roller or pulley to the spring pin which acts on the star wheel attached to the rotary boxes for holding them in position. 5, In the use of friction rollers or pulleys at the end of the shuttle boxes for pushing the shuttle back into the box. 6, In having a groove formed in the bottom of each shuttle box for the picker tang to move in to keep the picker steady. *Patent completed.*

1156. J. EDWARDS AND T. LOVERIDGE. *Improvements in the manufacture of buttons and other fastenings for articles of dress.* Dated May 24, 1858.

This relates to making double shell trouser buttons. The front shell is so made that the back shell may be brought over the front, and form a rim round the button. Part of this button is coated with varnish to protect the metal from the action of the atmosphere. *Patent abandoned.*

1157. M. STEVENS. *Improvements in machinery for pulping straw and other vegetable fibres.* Dated May 24, 1858.

The patentee employs a roller with plates secured therein at intervals, so as to leave between every two plates a groove or space. Or he takes a plain roller with grooves along the breadth thereof, and causes this roller to rotate in a bed composed of a semi-cylinder, of a diameter and form corresponding with, but little larger than, that of the roller. The roller is kept clear of the bed, and by shifting bearings, the distance between the roller and bed can be regulated. There is a cover to the pulper, and the fibre is fed in between the roller and bed by an inclined shoot. The roller rotating rapidly reduces the fibre to an even pulp by the rubbing action kept up upon them between the surfaces of the roller and bed. *Patent completed.*

1158. J. SCHOLFIELD and W. CUDWORTH. *Certain improvements in machinery or apparatus for preparing, doubling, and twisting cotton, and other fibrous substances.* Dated May 24, 1858.

This relates principally to the "tubes" or hollow spindles of "dyers' frames." It consists in closing and tapering the delivery end of these tubes, and forming holes in the sides of them, in such a position that the sliver may pass from the inside of the tube to the outside and thence to the inside again, as many times as required, and be finally delivered to the bobbins from one of the holes in the opposite side of the tube, by which a more permanent twist is given to the sliver. The tubes and connected apparatus are driven in the ordinary manner. *Patent abandoned.*

1159. W. HARDING. *Improvements in revolver fire-arms.* Dated May 24, 1858.

Here the cylinder turns on two centres. The body of the firearm is in two pieces, one fixed to the stock and the other made part of the barrel. The two pieces are readily separated in order to take out the cylinder. The lock or action is thus made:—On the trigger is a projection which, when the trigger is drawn back, acts on an incline on the hammer, and thus raises the hammer. When the projection on the trigger comes to the end of the incline the hammer escapes, and by falling explodes the cap, the trigger then returns by the action of its spring, the incline receding. When the hammer has been raised a short distance by hand certain notches lock together, and the hammer is then held at half-cock. If the hammer is raised a little higher than it can be raised by pulling the trigger, then the end of the projection on the trigger drops into a notch on the projection from the hammer, and holds it at full-cock. By pulling the trigger the projection from it is lifted, and the hammer falls and explodes the cap. *Patent completed.*

1160. G. HAMILTON and W. H. NASH. *Improvements in locks and keys.* Dated May 24, 1858.

Here a lock is constructed of two or more discs which turn round the drill pin, and a portion of the circumference of each of the discs projects beyond the case of the lock, and serves as a bolt. A portion of each of the discs is cut away around the hole in its centre, and projections on a key enter the space so formed, which projections act on the discs and move them round. Other forms of lock are also modified by the inventors. *Patent abandoned.*

1161. P. A. GALITZIN, S. SOUSCHKOFF, and P. E. GUERINOT. *An improved apparatus intended to prevent boats or ships to be destroyed and sunk when running full against each other.* Dated May 25, 1858.

This consists of iron rods having one end pointed, whilst the other is provided with a large wooden disc or buffer. The rods run and may slide through guiding pieces placed fore and aft, and can penetrate into the hull of the boats or ships provided with them when the buffers meet with an obstacle. *Patent abandoned.*

1162. J. A. PHILLIPS. *Improvements in the production of zinc, lead, copper, and silver from ores containing these metals.* Dated May 25, 1858.

This consists in roasting the substances either in heaps, kilns, or furnaces. The ores are subsequently heated for the zinc they contain, either by the English, Belgian, or Silesian process. The residues withdrawn from the reducing apparatus are afterwards fused either in a reverberatory or blast furnace, with or without the addition of plumbiferous matter. The copper is obtained in the form of matt, whilst the lead and silver are procured as an alloy. *Patent abandoned.*

1163. W. WEBSTER. *Improvements in machinery for the propulsion of vessels.* Dated May 25, 1858.

This invention is not described apart from the inventor's drawings. *Patent completed.*

1164. G. W. MORSE. *An improvement in fire-arms, and cartridges to be used therewith.* Dated May 25, 1858.

This relates to firearms loaded at the breech, and adapted to the use of a metallic cartridge case, and consists in combining a percussion rod in a moveable breach piece with a sliding bolt, so that the lock in the act of firing shall both lock the breach piece and fire the charge. It also consists in the use of the globular surface on the front end of the moveable breach piece in combination with the cylindrical cartridge case for preventing the escape of gas at the joint, also in the use of the lever as described, for retracting the cartridge case from the barrel. Also in the use of cartridge cases as described, for preventing all escape of gas at the breach joints. The invention is not fully described apart from the drawings. *Patent completed.*

1165. W. WEBSTER. *An improved method of rigging vessels.* Dated May 25, 1858.

This invention is not described apart from the inventor's drawings. *Patent completed.*

1166. C. F. D. MONNIN. *Improvements in the manufacture of rivets, screws, spikes, pins, and nails, and in machinery for that purpose.* (A communication.) Dated May 25, 1858.

This invention relates to modes of, and machinery for, raising or stamping the heads of rivets, screws, spikes, pins, and nails, for turning and nicking the heads of screws, and for threading or worming screws, and also for introducing, feeding, transporting, and removing the screws or blanks into or from one part to another of machines adapted for such purposes. In raising the heads of screws and rivets and similar articles by compression, especially when the heads are of hemispherical form, the metal is apt to be cracked and split, and the heads rendered imperfect or spoiled. This defect is obviated by raising the head at two or more operations. This invention is not susceptible of being intelligibly described apart from the drawings. *Patent completed.*

1167. C. F. VASSEROT. *An improved construction of rails for fences and gates.* (A communication.) Dated May 25, 1858.

This consists in giving either a concave cross T or V shape to the bars, cross bars, and posts, and by rivetting the same together. *Patent abandoned.*

1168. P. GRIFFITHS. *Improvements in manufacturing bushes for firing drums on shafts, and other similar purposes.* Dated May 25, 1858.

These bushes are formed in pieces of the exact form that is required by casting them in suitable iron moulds, by which all turning and cutting into pieces is dispensed with. *Patent completed.*

1169. G. ALTON and J. FERNIE. *An improvement in the construction of steam boilers and other vessels capable of resisting pressure, and in the manufacture of plates for the same.* Dated May 25, 1858.

This invention consists in forming boiler-plates with thickened edges bent into an angular or flanged form. See MECHANICS' MAGAZINE, page 592, No. 1845, Vol. 69. *Patent completed.*

1170. J. F. BELLEVILLE. *An apparatus for indicating the work of pumps.* Dated May 25, 1858.

This consists in leading from the suction pipes of suction pumps, or from the eduction pipe of force pumps, or from both, a pipe open to the suction or eduction pipe at one end, and provided at the other with an indicator, acted upon by the pulsations of the liquid, through a flexible diaphragm, and showing upon a dial the force and frequency of the pulsations. The patentee sometimes fixes a stop-cock in the indicator tube. *Patent completed.*

1171. J. COURAGE. *Improvements in furnaces for smelting and calcining.* Dated May 25, 1858.

This consists in so constructing these furnaces as to be enabled to regulate and distribute the heat therein. The patentee uses a hanging or other bridge, perforated or not, and employs one or more dampers which can be moved to or towards the bridge, to shut off entirely or partially the flame and products of combustion from passing to the melting pots. The same object may also be effected by dispensing with the bride and employing dampers only. *Patent completed.*

1172. W. E. NEWTON. *Improvements in breech-loading fire-arms, and cartridges for the same.* (A communication.) Dated May 25, 1858.

This consists, 1, in using a breech which closes by a forward movement of the barrel, and a ball which fits with its bare lead in contact with the bare metal, so that by closing the breach the ball will be forced forward into the rifle grooves of the barrel; 2, in placing the lock within a hinged unchambered breech piece; 3, in the use of an adjustable screw at the rear of the breech, to force the breech up to a tight joint with the barrel; 4, in the construction of the vent plug with a spring lip or lips, or an elastic mouth, which will be opened by the explosion of the priming, but be closed by the explosion of the charge; 5, in certain methods of constructing an elastic metal lip to the breech or barrel, which will close perfectly the joint between them; 6, in providing for a tight joint at the breech by applying a piece of india-rubber in the form of a piston-packing in the rear of the barrel, protected from the fire, so that it will be compressed against the breech by the explosion and expand itself laterally against the barrel to prevent escape of gas; 7, in an improved metallic cartridge, for firing paper cartridges repeatedly; 8, in a contrivance which is attached to a moveable breach for withdrawing the shells of the exploded metallic cartridges from the barrel by the act of opening the breech. *Patent completed.*

1173. R. C. WITTY. *Improvements in protecting ships of war and land batteries and fortifications from injury from shot and other projectiles.* Dated May 26, 1858.

This consists in applying blocks of vulcanised india-rubber to the sides of the ship of war, or to the face of the battery or fortification to be protected. The blocks are hollow, and of a cylindrical form, and are applied so that the axes of the cylinders run parallel with the side or face to be protected. Over the cylinders, slabs of vulcanised india-rubber are fixed, so as to produce a flush surface to receive the first shock of the shot or other projectile, and this shock it transfers to the cylinders underneath, which act as springs modifying the intensity of the blow, and spreading its action over a considerable surface. *Patent abandoned.*

1174. F. A. GATTY. *Improvements in treating cotton or cotton yarns and fabrics when dyed with certain colours.* Dated May 26, 1858.

After the yarns and fabrics have been printed or prepared with aluminous mordants in the ordinary way, and dyed with any preparation of madder, they are immersed in a solution of a salt which becomes acid by heating for producing an acid reaction upon them. He prefers a solution of alum. When the fibres are well impregnated, the excess of liquid is removed by a hydro-extractor, and the prepared materials are dyed and then heated to from 180 deg. to 212 deg. Fah. for about an hour. *Patent completed.*

1175. R. H. NICOLLS. *Improvements in taps or cocks for drawing off liquids.* Dated May 26, 1858.

To prevent and admit the discharge of the liquid through the tap, the inventor uses a valve or plug, which is *lifted up* out of the socket, by a cross lever fixed on a pin on the side of the tap, and applied to a stem which projects from the valve or plug. This lever is pressed down at one end by the hand being placed upon a key constructed for the purpose. *Patent abandoned.*

1176. J. LUIS. *An apparatus for baking fire-brick clay.* (A communication.) Dated May 26, 1858.

This patentee praises his apparatus, but forgets to describe it satisfactorily without reference to drawings. *Patent completed.*

1177. J. LUIS. *A distilling pipe.* (A communication.) Dated May 26, 1858.

This consists in replacing in the distilling and rectifying pipes the plates fitted up with the bells or knobs by a simple copper plate, pierced with holes, much in the same manner as a skimmer, the clearing pipe or pipes for the descent of the wine being retained as in the old plates. The jutting out of these pipes determining the height of the liquid must be in proportion to the thickness of the liquid; should it be very thick, the pipe must not jut out at all. *Patent completed.*

1178. J. LUIS. *An apparatus for cutting square-headed corks, and for corking bottles with the same.* (A communication.) Dated May 26, 1858.

This invention is not described apart from the inventor's drawings. *Patent completed.*

1179. J. LUIS. *The application and use of the fibrous textile plant, called in Arabia, "Diss," or in Latin, "Arundo festuca patula," or by botanists, "Festu coides et Donax tenuax," in the manufacturing of pulp for paper and tow for thread, tissues, and cordage.* (A communication.) Dated May 26, 1858.

The plants are sorted, cut by a machine into lengths of from 15 in. to 20 in. and placed in a boiler. They are there boiled for two hours in a mixture of soft water and American potash. They are then acted on by pestles moved by machinery, a current of fresh water being kept running over them. The matter thus obtained is carefully sorted, put in a bath of fresh water, taken out, dried, and stowed away ready for convenience. *Patent completed.*

1180. J. C. RIDDEL, D. RITCHIE, A. WATSON, J. F. ALLAN. *Improvements in cooking ranges, and other fire-places.* Dated May 26, 1858.

This embraces several details, including a flue space on top of the oven, provision for heating air, &c. The ranges are so formed as to need no setting. *Patent abandoned.*

1181. G. CHEADLE. *A new or improved flooring cramp.* Dated May 26, 1858.

This consists of a flooring cramp in which the mechanism for compressing the boards is actuated by a worm and worm wheel, the said worm wheel being situated upon the axis of the screw from which the compressing bolt or ram derives its motion. *Patent completed.*

1182. W. BAYLISS. *Iron tubular fencing to be used for general fencing as well as for the purpose of irrigation, and conveying water where required for agricultural or horticultural purposes.* Dated May 26, 1858.

This invention was described and illustrated at page 26 of No. 2, New Series. *Patent completed.*

1183. W. COWAN. *Improvements in machinery or apparatus for disengaging horses from carriages in cases of accident.* Dated May 26, 1858.

In one modification of apparatus there is fitted up, in the centre of the front of the vehicle, a vertical lever set upon a stud centre low down, and capable of a transverse vibratory traverse. This lever has at its lower end a segmental toothed rack in gear with a transverse horizontal rack formed upon the actual disengaging lever. Each end of the rack bar has an underneath elbow piece terminating in a small stud. These terminal studs fit into the double eyes formed upon the splinter and cross bars, taking the place of the joint studs for connecting the shafts to the bars for single harness work. And similarly for double harness

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they fit into double eyes on the crossbar to which the splinter bar for the traces is attached by corresponding single eyes. To disengage the horse or horses, the driver works the actuating lever across from one side to the other, when the attaching studs are traversed out of their eyes, and the shafts or splinter-bar are released. To allow the pole in double harness to get free, provision is made for its attachment to the splinter-bar, so as to let both go together. *Patent abandoned.*

1184. P. A. FOURNASSIE. *An apparatus for clod-crushing, rolling, weeding, and scarifying, clearing, or preparing land.* (A communication.) Dated May 26, 1858.

This consists of a set of wheels or rollers with curved teeth, and combined with a set of arms or blades, so mounted as to be free to rise and fall and clear the earth, &c., thrown up by the teeth on the wheels. *Patent completed.*

1185. M. HENRY. *A new or improved fabric, and improved sewing and stitching machine, especially applicable for manufacturing the same.* (A communication.) Dated May 26, 1858.

Here the materials as they come from the carding engine are arranged in layers super-imposed to the desired thickness, and subjected to the action of needles (to which they are forcibly led by guide rollers), whereby the layers and also their component filaments are stitched together; the fabric is then fulled and finished off. The sewing and stitching machine is not intelligibly described apart from the drawings. *Patent completed.*

1186. S. C. SISTER and J. WARBURTON. *Improvements in spinning.* Dated May 26, 1858.

This consists in combing or heckling flax, &c., and then spinning it either wet or dry upon mules. Also in spinning flax, &c., upon cotton machinery, after being reduced to a state of flax cotton and then heckled or combed, or to a fibre, from half an inch to three inches in length. The patentees prefer to use galvanized iron rollers. Also in spinning the yarn soft, and then passing it through size or water. *Patent completed.*

1187. J. STUART. *An improvement in distilling asphalte, pitch, tar, and other bituminous substances.* Dated May 26 1858.

Here the asphalte, pitch, or tar, &c., is first ground, with lime or chalk, and then introduced into a still or retort, and products are distilled therefrom and condensed by condensing apparatus. *Patent completed.*

1188. F. BOUQUIE. *Improvements in the manufacture of chains.* Dated May 26, 1858.

Here each link is made out of two or more parts, each of which has received by the rolling process a form of such cross sections that one part may be introduced lengthwise and exactly fit into the other, so that when the overlapping sides of the various parts of each link have been brought together they will form joints of great solidity. *Patent completed.*

1189. A. C. ENGERT. *A method of preparing tinfoil or leaf, in order to its employment as a substitute for silver leaf.* (A communication.) Dated May 27, 1858.

This consists in mixing with the metal before being rolled out into leaf or foil, borax and nitrate of potass, or in coating the tin foil or leaf after being rolled with a solution of borax and nitrate of potass. *Patent abandoned.*

1190. J. SCHOLFIELD and G. HARLING. *Improvements in means or apparatus employed in weaving.* Dated May 27, 1858.

These relate to giving motion to shuttle boxes when a series is used, so that any one may be brought in position with the lay. The lever for lifting the series of boxes is connected to a lever or levers, formed with a series of segmental surfaces of varying depths, capable of being operated by rollers or pulleys, and adapted in number and depths to the distance of change of shuttle required. The patentees form the pulleys with bosses, to obtain capability of varying the changes by reversing these pulleys on their axes. *Patent completed.*

1191. C. CUIT and A. GODEFROY. *Improvements in railway breaks.* Dated May 27, 1858.

This relates to a brake having a frame with three sides, two of which are horn beams, between which the beams roll. To put on the break this frame is lowered on to the line of rolls thereon, on rollers, each having double spindles and a flange, and presents an incline to the wheel of the carriage, on which the latter wheel ascends. To remove the brake, the frame is raised between the wheels. *Patent abandoned.*

1192. W. CLARK. *Improvements in preserving butter.* (A communication.) Dated May 27, 1858.

The patentee beats up butter between two thicknesses of linen cloth, within seventy-two hours after it is made, to remove the whey, &c. He covers the butter with paper coated on each side with albumen made from the white of eggs, in which 15½ grains of chloride of sodium and half that quantity of salt of nitre is dissolved for the white of every egg. The paper is submitted to a hot iron. *Patent completed.*

1193. C. COWPER. *Improvements in machinery for combing and preparing wool, cotton, and other fibrous materials.* (A communication.) Dated May 27, 1858.

This relates to an invention patented by J. Heilmann, 25th Feb., 1846. In one of the machines comprised in this former patent the lap silver or fleece, &c., is broken asunder, and the fibres combed at each end, pincers being used to hold the material. Instead of giving the pincers a motion in a direction tangential to the combing drum, they move in a more radical direction, or to and from the centre of the drum, by which the motion of the lower bar of the pincers may be dispensed with. The upper bar may be moved by a crank, eccentric, or cam, the pressure being regulated by a spring. The feeding apparatus is made with a porcupine roller, which receives an intermittent motion from a disc and pin, and a star wheel, &c. A guide plate embracing some parts of the periphery of the porcupine roller serves to force the fibres into its pins. The detaching rollers are carried by levers mounted on an axis on the opposite side of the drum, or so placed as to admit of their moving to and fro from the pincers. These levers are worked by a cam or cams. *Patent completed.*

1194. G. H. BOVILL. *Improvements in the manufacture of fuel.* Dated May 27, 1858.

This consists in mixing with breeze or small coke, coal tar, melted pitch, &c. The materials are pressed into moulds to a density of 68 lb. per cubic foot. It also consists in a mode of carbonising fuel, so as to utilise the products evolved and prevent smoke. The blocks of fuel are placed in a closed chamber, heated to from 500 deg. to 700 deg. The volatile gases pass through a series of pipes in which a portion will condense from these condenser pipes; the uncondensed gases pass into heated retorts charged with coal, coke, charcoal, peat, &c., and are there mixed with the gas from the retorts,, converted into permanent gas, and pass into the gas-holders. The patentee blows into the ovens super-heated steam, to accelerate the process. *Patent completed.*

1195. V. S. VODOZ. *An improvement in the chimneys and glasses of gas and other lamps.* Dated May 27, 1858.

Here a disc of fine iron-wire gauze is raised at its edges, so as to produce a ring or frame suitable to fit on the upper part of a chimney or glass of a lamp. The flame is thereby improved, and smoke prevented. *Patent completed.*

1196. C. CLARKE. *Improvements in machinery for dibbling wheat and other grain or seeds and manure.* Dated May 27, 1858.

Here a series of dibbles are set round on the periphery of a wheel. Each dibble moves on an axis, so that, as it enters the land, it rotates on its axis. To deposit seed and manure in the holes, two apparatus are used in combination with the wheel, one of which contains the seed and the other the manure, and to each apparatus is applied a funnel having a valve at its lower end, which is opened and closed as the wheel is moved. The funnel of one apparatus supplies the seed or grain, and the funnel of the other the manure. *Patent completed.*

1197. J. BOWER. *Improvements in the manufacture of glass.* Dated May 27, 1858.

Here sulphate of barytes, reduced to powder, silica, or fine sand, and muriate of soda, are calcined at a strong red heat till they become a dry powder, consisting of silicate of barytes and sulphate of soda; this compound, with the addition of lime, is then converted into glass. When the glass is required free from colour the sulphate of barytes and sand are first purified with acid. *Patent abandoned.*

1198. S. OSLER. *The manufacture of fish into guano and food.* Dated May 28, 1858.

The patentee claims various methods of preparing fish for manure, by extracting the fluids and reducing the solid parts to a dry powder, by the prolonged application of heat. And preserving fish for food by separating in the same manner the fluid from the solid parts, and treating these solids with salt, saltpetre, sugar, &c., and with pepper, cayenne, or other spices. *Patent completed.*

1199. C. STANLEY and J. FITTALL. *Improvements in skylights and glass roofing.* Dated May 28, 1858.

This consists in giving the glass plates a trough-like figure, the plates being fixed on bars, &c., by clips engaging with the plates, the clips being fixed on the bars.—*Patent completed.*

1200. T. DUNN and W. IRLAM. *Improvements in machinery for altering the position of locomotive engines and carriages on railways.* Dated May, 28, 1858.

This relates, 1, to turn-tables, and consists in casting a flange at or near the lower edge of the ring of the turn-table top. 2, in making turn-tables of large dimensions with low string sides, or with tubular stays. 3, it relates to railway traversers, and consists in making the ends of the traverser rails of iron plates forming spring points, which points are depressed by the wheels of the carriage. 4, in making the ends of the traverse rails to swivel on fixed studs. 5, in placing the cross tram rails for the traversers on different levels. 6, in making a portion of the cross tram rails for the traverser capable of being raised and lowered by levers, screws, &c. *Patent completed.*

1201. M. A. F. MENNONS. *An improved key-joint for connecting detached pieces of wood or metal.* (A communication.) Dated May 28, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

1202. M. A. F. MENNONS. *An aperient biscuit.* (A communication.) Dated May 28, 1858.

This biscuit contains the resin known as "Aleppo scammony." *Patent completed.*

1203. L. TINDALL. *Improvements in machinery or apparatus for sweeping and cleansing roads and streets.* Dated May 28, 1858.

This invention was described and illustrated at page 61 of our last number. *Patent completed.*

1204. J. F. LACKERSTEEN. *Improvements in machinery for cutting and splitting wood.* Dated May 28, 1858.

The pieces of wood are fed into a rectangular frame through which they are pressed at intervals the required distance. The ends of the frame are formed to admit a series of short cuttings to cut into the wood to a depth somewhat greater than that which is to be cut off at the next cut of one of the knives. *Patent completed.*

1205. A. GODET. *Improvements in raising weights.* Dated May 28, 1858.

When a windlass is employed, it is driven from a capstan by cog-wheels. By this means the windlass is driven by a continuous movement. *Patent abandoned.*

1206. A. ARNAL. *A nose-bag for horses.* Dated May 28, 1858.

This consists in forming the bag so that the corn is supplied to the horse in small quantities in place of the mass of corn being in contact with the horse's mouth. *Patent abandoned.*

1207. E. BOND. *An improved aerated liquid.* Dated May 28, 1858.

This consists of citrate of quinine and silicine dissolved in water with a little sulphuric acid. *Patent completed.*

1208. J. SHUTTLEWORTH. *Improvements in portable and other steam engine boilers.* Dated May 29, 1858.

In constructing the fire-boxes of steam boilers, the covering and side plates are made with flanges, which project upwards and outward, and to which the tube plate and front plate are fixed. The upper edges of the flanges of the covering plates and of the tube and front plates receive the ends of the stays which strengthen the covering plate. *Patent completed.*

1209. E., R. and P. SYKES. *Improvements in continuous spinning and roving machines for spinning and roving wool, a part of which is applicable to spinning other fibrous substances.* Dated May 28, 1858.

The patentee claims, 1, the contrivance of a drawing and retarding wing revolver. 2, a regulating and steadier blade. 3, an adjusting screw to raise or depress the regulating and steadier blade. 4, the arrangement and fixing of the tube box and the cap bar to the roller stands. The invention is not described apart from the drawings. *Patent completed.*

1210. W. and H. HODGSON. *Improvements in machinery, or apparatus for preparing and spinning or producing mottey yarns from rovings of unequal thickness of wool or other fibrous substances.* Dated May 29, 1858.

In place of only one pair of back rollers, the patentees use three rollers placed one over the other, and the smaller roving passes first over the top roller and betwixt the two uppermost, and then along with the other or thick roving between the second and third rollers, thus giving to the small roving an individual or independent nip. *Patent completed.*

1211. A. DOLD. *Improved apparatus for winding clocks, which apparatus is also applicable as a motor for all machinery usually turned by hand, horse, or other power, and for preventing the descent of smoke into chambers or other places.* Dated May 29, 1858.

On an upright hollow shaft, the upper end of which shall be in the open air, the inventor fixes a horizontal circular plate, above this a ring, and over the ring a dome; vertical bars or plates (working diagonally) pass from the circular horizontal plate to the ring supporting it. These plates are arranged to allow a greater or less quantity of air to pass through them to cut on fliers; a rod passes through the hollow shaft and circular plate; on the top portion of this, and between the plate and ring, certain volants or fliers are attached. The wind passes through the diagonal vertical plates impinged on the volants, and having turned the rod passes out; the rod thus rotating works into a gearing, and communicates motion thereto. *Patent abandoned.*

1212. S. ROCKEIT and J. J. REYNOLDS. *Improvements in the manufacture of umbrellas and parasols.* Dated May 29, 1858.

Owners of these umbrellas have only to remove a small portion thereof, and the umbrella becomes useless, until the said portion be replaced. *Patent completed.*

1213. J. MARTIN. *Improvements in means or apparatus for the prevention or cure of smoky chimneys.* Dated May 29, 1858.

The inventor forms, on the upper part of the stove, a moveable plate inclining upwards from front towards the back, and in the back of the stove applies a moveable plate extending inwards to within a short distance of the inclined plate, and so as to be overhung by it. This moveable plate has a passage behind it, and there is an opening from the passage thus formed to the apartment under the grate bars. He also forms the chimney pot with inclined plates projecting over, and at a distance from each other. *Patent abandoned.*

1214. T. V. LEE. *Improvements in the construction of steam generators, applicable to marine, locomotive, and all other uses where steam is applied as the motive power.* Dated May 29, 1858.

The inventor constructs the generator in two compartments, and through the under portion are a series of passages leading to a chamber in which a coil is placed. The heat and gases passing through the passages heat the coil, and is fully utilised before leaving the chamber by branch flues leading to the main flue or "take up," within the base of which is a chest to which the termination of the coil is connected; branches from this chest have suitable valves, cocks, &c. The steam generated in the under compartment is passed through the coil to the upper, which is fitted in the interior with suitable piping, a portion of which is perforated for the equal diffusion of the superheated steam or hydro-caloric throughout the water; suitable valves are placed on each compartment of the generator; steam for power is taken from a chest upon the upper portion, and when required a jet of hydro-caloric is taken direct to the cylinders of the engines from the chest within the "take up." *Patent abandoned.*

1215. M. A. F. MENNONS. *An improved fumigating apparatus.* (A communication.) Dated May 29, 1858.

This invention is based on an application of the reacting steam turbine principle to the construction of an apparatus for separating and distributing the volatile constituents of various perfumes and pharmaceutical products. *Patent completed.*

1216. D. HERSON. *Improvements in ships' gear, part of which is applicable to forming ropes for general purposes.* Dated May 29, 1858.

Here the masts, yards, &c., and the standing rigging are formed wholly or partly of steel, alone or in combination with wood. *Patent abandoned.*

1217. M. HENRY. *Improvements in, and in preparing agents for, dyeing, preparing for dyeing and tanning, and applying certain of the resulting products for obtaining pulp for paper and pasteboard, and the manufacture of blacking.* (A communication.) Dated May 29, 1858.

This relates to the treatment with acids or chlorine of vegetable agents for the above purposes. *Patent completed.*

DEATH OF DAVID TOD, ESQ.—We announce with regret the death of David Tod, Esq., of the eminent ship-building firm, Tod and M'Gregor, of Glasgow.

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, FEBRUARY 4, 1859.

THE INCREASE OF THE NAVY.

"THE universal introduction of steam-power into naval warfare will render necessary a temporary increase of expenditure in providing for the reconstruction of the British navy; but I am persuaded that you will cheerfully vote whatever sums you will find to be requisite for an object of such vital importance as the maintenance of the maritime power of the country."—*Queen's Speech.*

THE gentlemen who discover in all taxes raised for naval and military purposes nothing but the cunning devices of a knavish aristocracy, should correct their opinion by what is now transpiring in reference to the navy. The Admiralty have determined to add considerably to the number of our line-of-battle ships; the First Lord of the Admiralty and the Surveyor of the Navy are early and late together, devising the necessary measures; the Chancellor of the Exchequer has coolly added a million or two sterling to his budget for the purpose; and the Navy Estimates will, in all probability, be passed with as great alacrity this year as last, and give equal satisfaction to the country, although the estimates of last year were cut down by the present Minister, and presented to the House as evidences of retrenchment. And yet there have been no aristocratical influences at work, in secretly bringing these things about. The speech of Lord HARDWICKE had, it is true, some slight influence upon the public mind; but it was an influence openly exerted, and in proportion as the statements of his lordship were erroneous—as they undoubtedly were in some respects—they failed in their design. The great and almost the only cause of the contemplated increase of the navy, and of the public approval of that increase, is to be found in the simple announcement of the fact that the French have more steam line-of-battle ships than ourselves. This announcement, which appeared originally in a leading article in the *Times*, and was subsequently confirmed in that journal by an authentic detailed statement from a correspondent, has alone determined the action of the Cabinet, and prepared the public to support them. Even the *Times* itself in no way urged either the Government or the country to pursue the course adopted, but was content to leave the former to act and the latter to think for themselves. When it is remembered that a single steam line-of-battle ship of the first class costs more than £200,000 sterling, and that the determination of the Admiralty therefore involves an extra expenditure of some millions, the all but unanimous approval of that determination by the country at large is the more remarkable.

But, however cheerfully an extra million or two may be granted for the navy, there will, we doubt not, be a strong and universal desire to see the money well spent. That it will be, in so far as the construction of efficient ships is concerned, there is but little ground for doubt. But as an extra half-a-million will probably be expended in the ensuing year in the dockyards on workmen's wages, for the building of the new ships, it will be necessary to consider how this may best be applied. It may be expended, first, by entering extra men in the dockyards; or, secondly, by placing the established workmen upon unlimited earnings, and allowing them to work extra hours; or, thirdly, by both of these methods combined. In our judgment—and we speak from close observation in the matter—the second method is the best. We feel perfectly confident that the work of a Government dockyard can never be well and economically done by any but men who are accustomed to it. Shipwrights brought up in private yards always require some months of training to it before they can perform it with either efficiency or quickness. This is true of the best of them. But, unfortunately, it is generally the worst of them only who are willing to accept temporary employment in Her Majesty's dockyards; and such men of course require much longer training. Besides these considerations, there is the further one that the Government workmen consider it a benefit to be allowed to work extra hours, and to earn wages limited only by the scale of prices under which they work while on day-time, and their desire in the matter should be studied. The entry of new and often worthless men whenever extra money is to be earned, is painful to the established servants of the Government, and exerts a demoralising influence upon them. The Admiralty should study the wishes of their servants in this respect to the fullest extent possible without detriment to the service. As an election may not be far off, and as the dockyard men can return their favourite in several boroughs, the political instincts of the Government will doubtless co-operate with their desire to do justice in the case. The dockyard servants of Her Majesty may therefore expect to work very hard, and to earn very large wages for the next year or two.

DEFECTIVE LINE-OF-BATTLE SHIPS.

A CORRESPONDENT signing himself "An Old Salt," sends us the following letter on a subject which well deserves the attention of the Admiralty, and to which we therefore give a prominent place:—

"Having lately read in your periodical the very able paper of Mr. REED, on the previous and present states of naval architecture in this country, as well as several other articles relating to the navies of England, France, and United States, I am led to draw your attention to a matter of vital importance connected with our steam-fleet, hoping thereby to do good. All ship-builders and naval officers seem now to be perfectly cognisant of the necessity of having ships for war purposes built upon lines which shall produce the steadiest platforms in a seaway for fighting their guns upon, in order to secure *rapidity* and precision of fire. Unfortunately for the navy of this country, it possesses at the present moment a larger number of converted Symondite line-of-battle ships whose previous formidable evil of rolling quick and deep has been, in most instances, much increased by placing steam machinery in them. The following is, I believe, a correct list of these vessels:—*Princess Royal, Hannibal, Algiers, Exmouth, Colossus, Majestic, Centurion, Brunswick, Goliath*, all auxiliary power of 450 and 400-horse power. The lines of the two first on the list were considerably altered while on the stocks, which has improved them, and partially overcome the evil tendency of the late Surveyor's ships; but the latter have merely been altered by the stern, which has in no measure corrected the peg-top form below water, and their tendency to roll deep and quickly has been aggravated by the position of the weights of the machinery and boilers. The officers and men who have had experience in these ships will be able to vouch for the correctness of the following statements. *Exmouth* on her first trip to sea rolled away her main yard, and ran great risk of losing her masts in consequence of the violence of her motion. She has since frequently flung the shot out of her racks on her decks, and obliged her crew when on watch to lie down on the decks, and sustain themselves by the bolts, &c., to prevent their being hurled to leeward by the violence of the rolls. *Colossus, Brunswick*, &c., are equally bad in a seaway, even in moderate weather making it dangerous to cast loose the guns for the ordinary exercise of the hands, while ships in company have not hesitated to do so. Now, in the event of a Channel fleet being formed in the ensuing spring, some of these ships will, in all probability, form portion of it; and if the authorities require yet to be convinced, an opportunity will be given of testing the truth of my statement by desiring the commander of the fleet to exercise the ships at general quarters *under steam alone*, placing the Symondites in one line and the remainder in another, and then, placing himself in a favourable position for observation, decide which line ought to win an action. Only conceive the position of one of these ships in hostile collision with one of the new ships of the French steam navy, rolling 30° each way in a moderate seaway—and this is not overdrawn, for this has been a common occurrence, even when with sail set, which had a tendency to steady them—at every alternate roll exposing a space halfway down from her waterlines to her keel to the guns of the enemy. What would be the result after a couple of broadsides? In all probability she would go to the bottom with her gallant crew before the action was half over. It is to try for a remedy for this monstrous evil in these war-ships, that I am induced to address you, in order that the matter may come to the notice of the authorities, so that, by the aid of bilge-pieces, or by doubling below the waterline, and so altering their lines, they may steady themselves when in action under steam, and so give officers and men fair play in the event of another naval conflict. Dry rot used to have a great affection for the Symondite ships a few years back; what a comfort it would be if it would lay hold severely of some of these wonderful vessels, and so bring them to the end of their days quickly."

The defects of our Symondite line-of-battle ships are in no degree exaggerated, we believe, in the preceding letter, while the number of such ships is understated. To the list of vessels given by our correspondent may be added the *Duke of Wellington, Royal Sovereign, Windsor Castle, Aboukir, Mars*, and *Meanee*, which have been but slightly altered from the lines of Sir WILLIAM SYMONDS. All these, with others now undergoing conversion into screw ships, are open to the serious objections so ably stated by the writer. The application of bilge-pieces, as suggested by him, would doubtless do much to remedy the defects of their form. Such pieces were applied to some of the gunboats built during the late war, and were found to reduce both the time and the extent of their rolling motions *one-half*. This fact, apart from others of like tendency, is sufficient to render an experiment upon one of the larger vessels highly desirable, and we hope to see it made without unnecessary delay. It will be far more pleasant to find that the letter of "An Old Salt" has led to the cure of a dozen costly line-of-battle ships, than to learn that the dry rot has devoured them. To prevent error, we may state that the *Algiers* is of 600-horse power, and not of 450, as our correspondent implies.

PATENT-LAW REFORM.

How many a good cause has suffered from bad patronage! No greater evil can befal a popular movement than that of winning the favour of fools or hypocrites. Who would subscribe to the Field Lane Refuge should URIAH HEEP become the president? Who would attend the special services at St. Paul's, were CHADBAND

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to preach the sermons—who go to hear Mr. GOUGH's oration with STIGGINS in the chair—who vote for Mr. BRIGHT's Reform Bill were PECKSNIFF to move its adoption? And yet who ever knew of a reform movement of any kind that was not beset by a class of persons eager to turn it, by means more or less specious, to their own account, although by so doing they alienated all respectable persons from it?

Ever since the passing of the Patent Law Amendment Act of 1852, there has existed a certain party—and "party," be it remembered, is as often singular as plural—labouring to beget as much dissatisfaction as possible with that Act, and by doing so to gain a little prominence. At one time, we believe, an Association with a very imposing title was formed expressly to bring about an amendment of that amended Act. This Association comprised one member, who had the honour of founding it, and who unanimously elected a council, consisting of himself, and then, having the casting vote, appointed himself successively Chairman, Secretary, and Treasurer—by ballot we presume. When the advertisements of the "Great Universal Cosmopolitan Patent Law Reform Association" appeared, there was found in them a paragraph to the effect that one of the promotors of the Association, who had long advocated Patent-Law Reform, would be very much obliged to anyone who would entrust him with the obtainment of their patents for them, at very moderate charges. It is exceedingly probable that his plea obtained him a client or two, who we trust were ably and faithly served! The plan was doubtless as ingenious as it was patriotic; and as everyone is at liberty to imitate it, be he needy or prosperous, Jew or Gentile, knave or saint, it will probably meet with many imitators. The fundamental idea involved in it is susceptible of numerous developments which will occur to clever fellows who are above the prejudices that keep most men from entering upon professions of which they know nothing.

But by those who are at all intimately acquainted with the working of the present Patent Law, and are cognisant of the views entertained by statesmen respecting it, nine-tenths of all that has been said and written about Patent-Law Reform since 1852 has been properly set down as the injurious babbling of needy men. Well-informed persons knew well that the Houses of Parliament would never force the Government to change a law which was most carefully considered before it was enacted, until the operation of the law had been tried for a moderate period, and the real evils connected with it carefully pointed out. They have, therefore, viewed with disgust the senseless clamour which a few self-seeking individuals have kept up, and have felt that the cause of true reform was suffering from the conduct of these people.

But the Act has now been in operation more than six years, and during the present year a fee of £100 will have to be paid upon patents obtained in 1852, or the existing privilges of the patentees will expire. The time has now come, therefore, when it is essential that a serious re-consideration of the Act should take place, and we observe with pleasure that Mr. FAIRBAIRN and others are moving in the matter. On Friday last a meeting was held at the Town Hall, Manchester, to petition Parliament "to allow the surplus fund arising from the stamp duties on patents to be appropriated to scientific purposes; and for other amendments in the existing laws." Mr. W. FAIRBAIRN presided, and, after announcing the friendliness of the members for Manchester to the movement, said that some time ago it cost £500 to take out a patent; but this sum was reduced in 1852 to about £175. Notwithstanding this reduction, a considerable surplus in the funds of the Patent-office remained every year, and it had gone on increasing yearly, until it amounted last year to £94,167. It had been stated, he continued, that the Chancellor of the Exchequer had no objection to apply this surplus to scientific purposes. A large amount would probably be required for building new Patent-offices, but if, after that, the Government were willing to apply the remaining funds to scientific purposes, and also to reduce the charges of taking out patents, he thought it would be better to allow the Government to make the change spontaneously, than to force them to do so by adopting petitions at special meetings. The inventor was already taxed for all the necessaries of life, and it was too much, he thought, to tax his genius also. After these judicious remarks by Mr. FAIRBAIRN, a petition to Parliament was read and adopted. The nature of this petition we shall discuss next week.

THE PRESERVATION OF STONE BUILDINGS.

FOR some time past, the preservation from decay of absorbent building-stones exposed to the humid atmosphere of our climate—loaded as it often is with acid vapours—has been attempted with more or less apparent success, and has become at length a subject of national importance. We have only to remind our readers of the condition of much of the exterior of the new palace at Westminster which was built of a selected magnesian limestone, and of almost all the buildings erected within the present century of Bath or Caen stone, to justify this remark.

It is well known that most building-stones are composed of grains of limestone or sand, cemented together by some material—generally carbonate of lime—and that such stones will dissolve rapidly in carbonic or very dilute sulphuric acid, or will even be destroyed by moisture alone, when assisted by the frequent contraction and expansion resulting from changes of temperature. By the rotting away of the cementing medium, the grains, though often unaltered in composition, become disconnected, and fall away from each other, sometimes in flakes, sometimes in powder. This is called *disintegration*, and may be observed in almost every limestone building in London. It is prevented for a time, by coating the stone with paint; but paint, consisting of white lead mixed with oil, is itself decomposed by exposure to damp air, and undergoes actual decay, after which it ceases altogether to resist disintegration.

It does not seem possible that any preparation containing animal or vegetable matter, subject to decomposition, can act on stone as a permanent preservative; so that to great public buildings, where neither disfigurement nor a constant repetition of external applications is admissible, all such inventions, however promising in other respects, are inapplicable. We have carefully looked over the specifications of the various patents taken out for the last ten years on this subject, and of these (seventeen in number) we find in no less than eleven the presence of oil, glue, resin, gum, blood, vinegar, or other decomposing animal or vegetable substance. While some of these inventions may be of great value for sheltered and internal work, we cannot but observe that they must all fail as permanent defences against the action of the atmosphere in London and other large towns. This seems to us a chemical necessity—for not one of these substances, no matter how mixed up with other materials, can fail to become oxidised, and ultimately decomposed, if exposed to external atmospheric influences. It is certain that when any one part of a composition, laid as a coating on an absorbed surface to which it can adhere only partially, becomes decomposed and destroyed, the film or coating cannot retain even its original capacity for resisting absorption.

Recognising the importance of avoiding substances that admit of oxidation, five of the inventors whose patents are before us employ silicates or aluminates of soda and potash to wash the stone, expecting to obtain, after evaporation, a mineral film on the surface, or within the surface, which they believe will be found insoluble and non-absorbent. Many trials on a large scale have been made with similar preparations in France, and have been favourably reported on; but it is only too evident that the deposit of a film on the surface of a decomposing stone, however insoluble the film may be, or however perfectly it may for a time seem to answer, must ultimately fail. No such film can be deposited in any other than a porous state, and any decomposition that may have already commenced at the time of its application will go on, and soon throw off the deposited surface, and wherever any moisture has penetrated, the inevitable contraction and expansion must soon produce the same result. There is in this process no adhesion secured to the less decomposing grains of the stone, so that the tendency is for the weak places in the stone to lose their defence the first.

There remains only one of the seventeen patents to be alluded to; but this one proposes to effect its object by a *double decomposition*, and by an actual re-construction of the surface of the stone, replacing the soluble and easily-injured cementing medium by one which is insoluble and indestructible. It is not difficult to explain how this is effected, as the method involved is familiar to all in its practical results. Everyone knows the extraordinary durability of old mortars and cements, and of our hydraulic cements, but the cause is not so well known. In the use of these cements, grains of sand, or of pebbles or other stones, are fastened together by a thin glazing of silicate of lime, deposited on each surface during the setting, owing to the decomposition of part of the silicate of alumina which the cement contains, and the extreme readiness with which lime enters into combination with silica under favourable circumstances. Under the patent in question, the patentee, Mr. FREDERICK RANSOME, of Ipswich, proposes to coat the stone to be preserved with a solution of silicate of soda or potash in water, which he prepares under steam pressure in large quantities in the manufacture of his admirable artificial stone. After this solution is absorbed, it is followed by a second wash, consisting of chloride of calcium. A double decomposition immediately takes place within the substance of the stone; the chlorine, combining with the soda, producing common salt, is washed away during the first rains, and the calcium, combining with the silicic acid, forms a tough insoluble silicate of lime, attaching itself firmly round the surface of each separate grain of the stone, and forming an extremely compact deposit, not acted on either by carbonic or dilute sulphuric acid, and identical with the material which holds together the separate grains or stones in hydraulic cements and concretes.

This ingenious method of re-composing the outer and decaying surface of stone seems to us to offer every prospect of ultimate success; and, as far as experience goes, it is satisfactory to find that when applied between two and three years ago on some of the worst portions of the river front of the new palace at Westminster, the decay that had commenced was absolutely stopped, and the rotten surface is now so hard, that the point of a sharp knife cannot detach the smallest fragment, or disclose any tendency to scaling. This cannot be said of other parts

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treated by different processes, where the destruction, checked for a time, is now advancing as rapidly as ever.

For the information of our readers, we have given on another page a list of the principal inventions which have recently been patented in this country bearing upon the subject.

ON THE PRODUCTION OF ILLUMINATING GAS.

Of all the great manufacturing processes—in which the smallest improvements affecting the result, and visible as an increase in the net profits, is often of the greatest moment in a commercial point of view—probably the most imperfect at the present time is the first and principal operation in the production of coal-gas. It needs very little chemical knowledge to be aware that the products of the destructive distillation of coal may be made to vary almost *ad infinitum*, according to many modifications of the conditions which determine the decomposition. The proportion between the essential constituents of coal-gas, as obtained by the usual process of manufacture, (olefiant gas and light carburetted hydrogen,) and of its most important impurities, (carbonic acid, sulphuretted hydrogen, ammonia, cyanogen compounds, and bisulphide of carbon) ranges within broad limits, and is found to differ in almost every operation. Nevertheless, little attention appears hitherto to have been paid to the study of the conditions under which the decomposition of the coal takes place; and few attempts have been made to bring the scrutiny of science to bear upon the chemical changes which occur within the gas retort. The only important improvement of which we are aware relating to the production of illuminating gas, is that of allowing a jet of steam to pass through the retort; by which means valuable gaseous products, which otherwise would undergo decomposition, are carried off as quickly as they are evolved. A portion of the steam is also decomposed and hydrogen gas produced, together with carbonic oxide. The jet of steam affords, or should afford, a ready means of regulating the temperature of the retort.

Although this process conduces in great measure to the two most important results to be attained in the manufacture of illuminating gas, viz., an increase in the proportion of olefiant gas or heavy carburetted hydrogen, and the substitution of pure hydrogen for a portion of the light carburetted hydrogen, still, it is far from satisfying every requirement. The production of carbonic oxide gas in considerable proportion is in itself a serious objection. In some recent experiments, presently to be alluded to, the carbonic oxide produced is made to promote a chemical action of considerable importance in the newly-discovered process which is adopted, and becomes converted into carbonic acid—readily removed in the purifying apparatus by means of milk of lime.

In considering the action which takes place within the retort, with reference to the low conducting power for heat of the coal, it is evident that while one class of products is being produced from the fuel in close proximity to the heated surface of the retort, another class is evolved from the central portion of the mass. It cannot be doubted that great waste and uncertainty is the result of this unequal distribution of heat. When the central mass has gained the degree of temperature at which the most valuable products are evolved, the surrounding temperature has become sufficiently high to decompose these products. Thus the central portion is first exposed to a heat insufficient for the production of coal-gas, but which volatilizes the most valuable constituents of the coal; and towards the conclusion of the process, the olefiant gas evolved is converted into light carburetted hydrogen, or pure hydrogen and carbon, which is deposited on the sides of the retort as the hard crust known by the name of gas-carbon. The following table is given by HENRY of the gaseous products of the distillation of coal, at various periods of the operation; and it shows that towards the termination the gas evolved must deteriorate by dilution with a large amount of products possessed of little or no illuminating power:—

Time of collection.	In 100 parts of Gas from Wigan Cannel Coal.				
	Absorbed by Chlorine.	Light Carburetted Hydrogen.	Carbonic Oxide.	Hydrogen.	Nitrogen.
In 1st hour.	13	82·5	3·2	0	1·3
	12	73	1·9	8·8	5·3
	12	58	12 3	16	1·7
5 hours after commencement.	7	56	11	21·3	4·7
10 hours after.	0	20	10	60	10

Two remedies suggest themselves to obviate the unequal distribution of heat throughout the coal. The first, presenting many practical difficulties, is to diminish the proportion of the volume of the retorts to their extent of surface; and the second, the possibility of which appears to be confirmed by experiment, is to increase artificially the conducting power for heat of the mass within the retort.

A series of experiments, from which we anticipate valuable results, has been undertaken by Mr. DESMOND G. FITZGERALD, in conjunction with Mr. A. C. KEILY, with a view to the economic production of illuminating gas of superior quality. The process to which these experiments have led, involves several chemical reactions, and the application of catalytic action, combined in an operation sufficiently simple to admit of its adoption beyond the precincts of the laboratory. It will probably before long be described in our columns.

THE WATT MONUMENTAL TOWER.—The ground is being prepared for the reception of the monumental tower which it has been proposed to raise to the memory of Watt, and which will be reared in the Cemetery occupying the heights to the west of the town of Greenock, the birthplace of the great mechanician. Some of the Italian Campanili have been used as types. The testimonial is to be placed on an elevation, so that the top of the tower will be 514 feet above the level of the sea. The upper turret is adapted for the reception of an electric time ball, and for nautical and astronomical observations. Internally the structure will comprise rooms of about thirty feet square, connected by means of a circular staircase and open gallery, and having on their sides a series of niches and recesses suitable for the reception of statues, busts, or other memorials commemorative of men eminent in science or philosophy. In the erection of this testimonial, it is intended to incorporate gifts of materials from every quarter of the globe. Contributions of the most interesting and varied character have already been received from Bombay, Malta, and many places on the shores of the Mediterranean; from various parts of England, Scotland, and Ireland; from Sebastopol, Maryland, Italy, Isle of Man, and from many other parts. A mass of material is promised, including lime and stone sufficient to build the first fourteen feet. An object of this vast character is of necessity slow in progress, but it is hoped that twelve or fourteen years may possibly complete it.

SCIENTIFIC PROGRESS IN AUSTRALIA.

THE day on which the intercolonial telegraph was first opened to the public of New South Wales, Victoria, and South Australia, was the 29th of October; and we are now enabled to throw a little light on the causes which so long delayed the work. It seems that the first contractor in the New South Wales division was unable to carry out his undertaking. His tender was very low, and the Government hesitated as to its acceptance, but apparently satisfactory sureties having been offered, it was not considered advisable to reject the offer, which was the lowest sent in. But the result showed that a mistake had been committed. Time rolled on, and the cheap contractor made so little progress with his work that although there was every disposition to show him reasonable indulgence, it became necessary to cancel the contract, and make arrangements with some other party. The second contractor, from unavoidable circumstances, did not complete his undertaking within the stipulated period; but the work was well performed, and the delay was caused by the difficulties of the soil, the want of suitable timber in some districts, and disputes on the part of the workmen. Another point of interest in connection with this matter has reference to the gutta percha covering of submarine telegraphs, which is found to have received injury in consequence of being stowed away in the hot holds of ships. It is understood that some submarine cable sent to India was rendered useless from this cause; and in South Australia—where the summer heat is very great—the cable submerged in Lake Alexandrina was exposed for some days to a temperature of 100 degrees, and the injury sustained is reported to have been so serious that the work is to be done over again. The cable, it is stated, is to be taken up, and wires are to be carried over the Murray river near its mouth, on posts of a sufficient height to allow the free passage of vessels below. This is a subject well worthy the consideration of all engaged in submarine telegraphy in hot climates like those of India and Australia.

As regards the future, there is some talk of a submarine cable between Victoria and New Zealand. This would be a serious affair, involving an expenditure of nearly £200,000, and as there are at present only 50,000 or 60,000 Europeans scattered over the six settlements of New Zealand—each having, after the approved Australasian fashion, a little legislature—the undertaking seems rather premature at present. It remains to be seen, however, what course events will take. In New South Wales, extensions from the main line just completed are to be proceeded with in the direction of the rising towns of Bathurst and Maitland, the requisite funds being provided by a public loan. This course has been adopted with regard to the New South Wales portion of the intercolonial line, but in South Australia and Victoria the expense has been defrayed out of the current revenue. The recent rush to the supposed new goldfield near Port Curtis has proved a failure; but while the district has not been found all at once to be auriferous, although eminent authorities still believe that it is, there is little difference of opinion as to its beauty and fertility, so that a few years will witness it the home of a population content to forego the feverish pursuits of the gold-digger, and to obtain a livelihood by steady industry. If this should prove to be the case, and it is only a question of time, a further extension of telegraphic communication will be needed in this direction, which, it is contended, will afford the best route for communication with Asia and Europe. Reference to the map will show that this is a likely view of the case, as an enormous length of wire would have to be carried from Adelaide to Swan River, and from Swan River to some point in the neighbourhood of Cambridge Gulf, if operations were determined on on the other side of the continent, while a greater length of submarine cable would be required between Cambridge Gulf and Timor than between Cape York and New Guinea.

The Austrian frigate *Novara*, which is present

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ing a scientific voyage round the world, was at Sydney at the date of the last advices. Port Jackson now affords great facilities for repairs, and the *Novara* has been dismantled and placed in the government dry dock.

The last advices from New South Wales note the commencement of a small portion—only a very few miles—of a railway dignified with the high-sounding title of Great Western. The course which the system is to take has, however, not yet been decided on. Railway works seem to progress but slowly in this colony; and well they may, for, as they are carried on exclusively by Government, and the principle acted on is that they shall be extended equally in all directions, the result is a few bit-by-bit extensions, leading at present to mere geographical points. The Great Southern Railway, which is carried from Sydney as far as Campbelltown, a distance of 34 miles, is taking nearly 30*l.* per mile per week; and, therefore, there seems every reason to hope for a fair return on the capital expended. The aim of the Great Western Railway is Bathurst, and the point at present undecided is where the line shall strike the river Nepean.

The greatest interest seems to have been taken in Australia in the submersion of the Atlantic telegraph, the temporary success of which was the topic of the day at the date of the last advices (the middle of November). Indeed, if one were interrogated as to the salient idea occupying the colonial mind, the answer would probably be, "Telegraphs," which seem to stand before railways. The fact is, the Australians have been so long shut out of the European world that any probability of overcoming the fearful distance which separates them from their commercial and personal friends is eagerly welcomed. One member of one of the Legislatures positively expressed an opinion that it was scarcely worth while to enter into an expensive contract for improving steam communication with England in the face of the Atlantic telegraph being an accomplished fact, which could be soon repeated in the Pacific. By this time, these too hasty anticipations have been probably set at rest.

There is a good deal of chronic grumbling in England with reference to the rates paid for gas; but what would the grumblers say to the rates current in Australia for this important article? An Australian Gas Light Company was first formed in 1836, and lighting operations were commenced at Sydney in 1841. The original capital was £25,000, and as the Company's operations have extended, this has been gradually increased to £81,000. Dividends ranging from 7 to 10 per cent. per annum have been declared, besides five bonuses (one 10 per cent.), in fifteen years; but this return must not be considered an extraordinary one, as at Melbourne another company, established for similar purposes, has received as much as 12 per cent, and some of the banks and commercial associations of the place have divided from 10 to 20 per cent. A bill has recently passed the New South Wales Legislature authorising the Sydney Company to further increase their capital to £300,000. The entire extent of the Sydney Company's mains is now reported to be about 42 miles, and the charge made is 15s. per 1,000 cubic feet; at Melbourne it is still higher, 25s. per 1,000 cubic feet, and the same price remains in the Tasmanian capital. These enormous rates are justified on the ground that every article employed in the manufacture of gas costs in Australia three times as much as in England. Some complaints have been made of the quality of the Sydney gas, but this is attributed to the inadequacy of the company's machinery to produce an article of the requisite purity to meet the largely-increased demand. This difficulty is, however, being provided against. There are 300 public lamps in Sydney, but these are situated a considerable distance apart, and the lighters have to traverse 84 miles of street every day. The Company's principal engineer is Mr. Barlow. It employs 120 men, while three ships are regularly employed in bringing coal from Newcastle—a port to the north of Sydney.

The New South Wales Government has lately placed a steam-dredge on the Hunter river, which disembogues in the sea at the harbour of Newcastle. The Hunter, which was formerly termed the "coal river," is formed by several streams flowing from the Blue Mountains, and has been navigable 50 miles from Newcastle by small craft of 30 to 40 tons. Beyond this distance there are several shallows. The river has three branches—the upper, lower, and middle—and the two former are navigable for boats for 120 miles, while the latter can be ascended 200 miles. All the branches are subject to sudden floods from the rapid of waters from the Blue Mountains. The steam-dredge is designed to remove as far as possible the impediments to navigation on the Hunter, and also to improve the port of Newcastle. The dredging portion of the machinery has been constructed by Messrs. Russell and Co., of Sydney; and the dredge has been designed by Mr. Moriarty, Government Engineer. The length between perpendiculars is 105 feet; length of keel for tonnage, 84 feet 9 inches; extreme breadth, 30 feet; breadth for tonnage, 29 feet 10 inches; burden, new measurement, 230 tons. There are two sets of ladders and buckets, one on each side with 29 buckets on each frame. The engine is of the ordinary side-lever description; diameter of cylinder, 30 inches; and length of stroke, 36 inches. The screw-propeller makes 100 revolutions per minute, and is 5 feet diameter, and 8 feet pitch. The dredge is shifted in position while at work by the engine.

NORMANDY'S PATENT MARINE FRESH WATER APPARATUS.

In order to explain more fully the principles upon which the apparatus described in our last number has been designed, we condense the following remarks from a paper by Dr. Normandy now before us. He writes as follows:—

"At first sight, one would think that it is sufficient to submit sea water to distillation to convert it into fresh water, and that the solution of the problem is altogether dependent upon a still, constructed so as to produce, by evaporation, a great quantity of distilled water, with a consumption of fuel sufficiently small to become practicable. Distillation, at a cheap rate, is doubtless an important item; but there are besides other desiderata of a no less primary importance, and it is from having neglected, ignored, or been unable to realise them, that all the apparatuses for transforming sea water into fresh water, which have, from time to time, been brought before the public, have hitherto proved failures, or fulfil the object in view in a very imperfect or precarious manner. When water, whether salt or fresh, is submitted to distillation, the condensed steam, instead of yielding a pure, tasteless, and odourless liquid, has *always* an almost intolerably nauseous, empyreumatic taste and odour, which it retains for many weeks. This taste and odour are so disagreeable, and the water so produced being, as is the case with ordinary distilled water, deprived of air by boiling, is, on that account, so heavy, indigestible, and vapid, that the crews invariably refuse it as long as they can obtain a supply from natural sources, even though this may be of so bad a quality as to endanger their health or their lives. To remedy these defects, chemical re-agents, such as alum, sulphuric acid, muriatic acid, chlorine, chloride of lime, &c, to be added to the distilled water, have been proposed; but it is evident that the continuous and daily absorption of chemical re-agents might, and doubtless would, cause accidents of a more or less serious nature, not to speak of the trouble and care required in making such additions, an excess of which might be attended with dangerous, and possibly with fatal consequences; besides, as a general rule, we have the authority of Liebig to say, that the use of chemicals should never be recommended for culinary purposes, for chemicals are seldom met with in commerce in a state of purity, and are frequently contaminated by poisonous substances. On the other hand, the pumps, ventilators bellows, agitators, the percolation through porous substances, through plaster, chalk, sand, &c., which have been proposed to aërate the water obtained, and render it palatable, are of a difficult, inconvenient, or impossible application; they are costly, complicated, bulky, or unmanageable. Another desideratum lost sight of in the endeavours which have been made to accomplish the object (and it is a condition of extreme importance) is to obviate or prevent the deposit of saline matter which takes place in the apparatus when the limit of saturation has been attained, and which, in a short time after use, interferes temporarily at least, often permanently, with the working of the apparatus, renders frequent repairs necessary, and in all cases eventually destroys it. The expansion of metals by heat and their contraction by cold, is another source of failure; so much so, that it can be most truly asserted, without fear of contradiction, that any fresh-water distilling apparatus for marine purposes, in any part of which solder is employed, is, *ipso facto*, defective, and ought not to be trusted, and this perhaps (as the event has unfortunately more than once proved) at a time when the machine was most wanted, its unsoundness thus creating the most distressing sufferings, and putting the lives of all on board in imminent jeopardy. The question, which has hitherto been left unanswered, and yet which must be integrally solved before success could be hoped for, is the following:—To obtain, with a small proportion of fuel, large quantities of fresh, inodorous, salubrious, aërated water, without the help of machinery or of chemical re-agents, by means of a small and compact apparatus, incapable of becoming incrusted, or otherwise going out of order. It is to the solution of this difficult and complex problem that I now beg to call attention, and I will proceed to explain the construction of the apparatus by which the object is attained. It is known that natural waters are saturated with air containing a larger proportion of oxygen and of carbonic acid than exists in the air we breathe. Whilst ordinary rain water contains, on an average, about 15 cubic inches of oxygenised air per gallon (of which about 6 are carbonic acid), sea water contains only, on an average, about 5 cubic inches (of which about 0·6 or 0·7 are carbonic acid). or, in other words, one gallon of sea water contains about two-thirds less air than ordinary rain or river water. I have also ascertained that air begins to be expelled from such waters when the temperature reached about 130° Fahr. Now, my apparatus consists of two parts—an evaporator and a condenser—joined so as to form one compact and solid mass, screwed and bolted, without solderings or brazings of any kind. The evaporator consists of a space which is pervaded by steam-pipes containing steam, and immersed in a certain quantity of sea water, a portion of which is to be evaporated; steam, at a pressure of about seven pounds, is then admitted into the steam pipes of the evaporator, which steam-pipes are constantly surrounded by the sea water to be operated upon, and which thus becomes heated by them. The steam is procured on board of steamers directly from their boilers, and, consequently, at a trifling cost: in sailing-ships it is obtained from a small boiler, which may or may not be connected with the hearth, galley, or caboose. The steam of the above-mentioned pressure being of course hotter than ordinary boiling water, serves to convert a portion of the water contained in the evaporator into ordinary or *low-pressure* steam, which, as it reaches the condenser, is resolved therein into fresh water. By thus evaporating water under a slight pressure, one fire performs double duty, and thus the first condition, that of economy, is completely fulfilled, for whilst, in the usual way, 1 lb. of coal evaporates 8 or 9 lbs. of water, the same quantity of coals is thus made to evaporate 16 or 18 lbs. of water. With an apparatus constructed on the principle which was sent to Copiapo, in Chili, 30,000 gallons of fresh water per diem are obtained from the sea. The steam issuing from the evaporator, and which is condensed by the water in the condenser,

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imparts, of course, its heat to the sea water in it, and as this water is admitted cold at the bottom, whilst the steam of the evaporator is admitted at the top of the condenser, the water therein becomes hotter and hotter gradually as it ascends, and when it finally reaches the top, its temperature is about 208° Fahr. I have already stated that water begins to part with its air at a temperature of about 130° Fahr., therefore, the greater portion of the air contained in the water which flows constantly and uninterruptedly through the condenser is thus separated, and led through a pipe into the empty space left for steam room within the evaporator, when it mixes with the steam. Now, as about six gallons of sea water must be discharged for every gallon of fresh water which is condensed, it follows that the steam in the evaporator, before it is finally condensed, has been in contact with twice as much air as water can take up, the result being a production of fresh water to the maximum of aëration, that is, containing as much air as in pure rain water, whilst, the upper part of the condenser being open to the atmosphere, all pressure is thus removed from the apparatus. This aëration of the water is a condition of the utmost importance, and, in fact, is a condition which, were it not accomplished, would render the apparatus comparatively useless, even though the other desiderata were fulfilled. The only condition necessary for distilled water not to become putrid or offensive is to saturate it with *pure air*, because in that case there is no room left for other gases to impregnate it, at least, practically speaking, and in the ordinary conditions of domestic or of ship economy. Dr. Stenhouse, several years ago, I believe, found that the power which charcoal possesses of purifying tainted air is owing to its burning in an insensible manner the substances to which its bad odour was due; and acting upon that discovery of Dr. Stenhouse, I found that charcoal has the power of destroying the empyreuma of distilled water *when such water is* AËRATED, that is to say, when it contains atmospheric air, or oxygen. I found by experiments, carried on upon a somewhat extensive scale for many months, that two cubic feet of charcoal are sufficient to remove entirely the empyreumatic odour and taste of distilled water, produced at the rate of 500 gallons per diem, and that the charcoal *never wants renewing*, because it does not act as a filter, but as a burner, the substance burnt being the empyreumatic product, and the result of the slow combustion thereof being carbonic acid and water. I have every reason to believe, from the length of time during which several of my apparatus have been in operation, that such a filter once made will last for ever, because the charcoal disinfects the water, so to speak, as it does air, not by mechanical separation, but by actual though insensible combustion. The water, as it issues from the apparatus, is perfectly sweet, tasteless, inodorous, and completely saturated with a maximum quantity of pure air; it is of sparkling clearness, and being refrigerated in traversing the coiled pipe surrounded by the cold sea water at the lower part of the apparatus, it is fit for immediate use. And thus is the second condition, that of aëration, of digestibility, of wholesomeness accomplished, whereby the water so produced is *at once* drinkable, and so sweet and fresh that it cannot be distinguished from the very best spring water."

EXHIBITION OF INVENTIONS.—The Society of Arts' eleventh annual Exhibition of Inventions will open on the 25th day of April, 1859. The days fixed for receiving articles intended for exhibition are, Thursday the 7th, Friday the 8th, and Saturday the 9th of April. No charge is made for space; the Exhibition is free.

IMPROVED POCKET-BOOKS AND PORTE-MONNAIES.—Messrs. Schloss, of Cannon-street, City, have applied their well-known piston lock to pocket-books, &c. For this especial purpose it seems admirably adapted, and the effect gives a good deal of additional elegance to the new porte-monnaies now so fashionable.

INSTITUTION OF MECHANICAL ENGINEERS.

THE twelfth annual general meeting of this Institution was held on Wednesday, the 26th ult., at the Institution, Newhall-street, Birmingham, John Penn, Esq., president, in the chair.

The Secretary (Mr. W. P. Marshall) having read the minutes of the previous meeting, the annual report of the Council was then read, which showed the satisfactory position of the Institution, and a large increase in the number of members, referring also to the highly successful special meeting held in Newcastle-on-Tyne last summer. The election of officers for the present year then took place, John Penn, Esq., being re-elected President of the Institution. A number of new members were also elected.

A paper was then read "On the Progressive applications of Machinery to Mining Purposes," by Mr. Thos. John Taylor, of Easdon, Newcastle-on-Tyne, giving an account of the several processes and mechanical appliances employed in the Newcastle coal-field from the earliest times, with the various improvements gradually effected, and the progressive applications of machinery introduced into the different branches of coal mining in that district. A simple construction of direct-acting engine was described as being introduced in place of the large beam engines. The points to be kept in view in attempting the substitution of mechanical means for furnace ventilation were also stated. They are, that the same quantity of air should be supplied, and that the supply should be equally constant and certain, and attended with greater economy. The progress and gradual development of railways in the colliery districts was referred to; and the great need at the present time of improvements in the underground arrangements for conveyance of the coal was urged, the cost of conveyance underground being three or four times that above ground. A notice was also given of the rapid advances in coal mining already realised by the development and extended application of the powers of the steam engine. The paper was illustrated by an extensive and interesting series of diagrams.

The next paper, by Mr. Benjamin Fothergill, of Manchester, was a "Description of a Dry-Clay Brick-making Machine." The machine (which we shall probably describe hereafter, when the drawings are before us) is constructed by Messrs. Platt, of Oldham, and one has been at work there for some time; an important economy is stated to be effected in the course of manufacture, as well as superior finish obtained in the bricks produced. Specimens of the bricks made by the machine, burnt and unburnt, were exhibited with samples of the clay from the several stages of the process; also a working model of the brick press.

The meeting then terminated, and in the evening a number of the members dined together at the Hen and Chickens Hotel, in celebration of the twelfth anniversary of the Institution.

MANUFACTURE OF STEEL TINPLATES.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

Gentlemen,—In their anxiety to inform the public of the facts relating to this branch of manufacture, the Mersey Iron and Steel Company have verified the adage of "the more haste the worse speed." Tinplates had never been made from puddled steel before Mr. Spence made them, and so far from the cast steel tinplates which were previously manufactured, having been made from steel manufactured in the ordinary way, they were actually made from cast steel, manufactured in a very extraordinary manner; and as the cost of this manufacture does not exceed £8 per ton, I presume it was not the high price of the cast steel in question which rendered the matter abortive. If Mr. Muntz was legally and equitably entitled to a patent for applying the known metal copper and the known metal zinc to the well-known purpose of making brass, then it follows that Mr. Spence is as clearly entitled to a patent for applying the known metal tin and the known form of iron called "puddled steel," to the known purpose of manufacturing tinplates, and if Lord Campbell can upset this deduction, he will succeed in establishing a dangerous precedent.

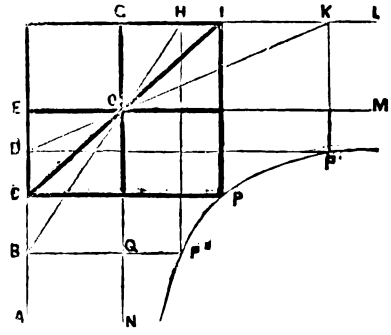
Of the novelty of manufacturing puddled steel tinplates, no unprejudiced person can for a moment entertain a doubt, and the improvement effected is so manifest, that in equity (not, perhaps, legal equity) no impartial judge could refuse to confirm the patent. ROBT. MUSHET.

Coleford, 25th January, 1859.

HYPERBOLIC CONSTRUCTION FOR ESTIMATING THE EXPANSION OF STEAM.

MR. J. SIMON HOLLAND, of Woolwich, sends us the following, on a method of constructing an expansion diagram:—

In your last volume, page 373, you gave a method of constructing rectangular hyperbolas, which appears to have been invented by Mr. Thurnell, and described by him to the British Association, Section A, 1858. I beg to forward a method I invented some time ago, applicable to all hyperbolas, no matter what may be the angle formed by their asymptotes. I have found it useful on several occasions. To find a number of points it is only necessary to have a parallel ruler.



By Euclid 43, the rectangle OP = rectangle FO, being the complements about the diagonal CI. Next if we take the diagonal DK, FO and OP' will be equal. And so with the diagonal BH, $FO = OP''$. Now if we draw a curve through the points $P'PP''$ that curve will be a hyperbola, and the lines OM, ON will be its asymptotes. To find other points, draw oblique lines through the point O, and then from where they cut the lines AF, FL draw lines parallel to AF, FL, and where they intersect we have a point in the curve. All rectangles drawn between the hyperbola and its asymptotes are equal to each other. The rectangles OP, OP', OP'', are each equal to the rectangle FO, and therefore to each other.

The curve eternally approaches its asymptotes, yet never touches them. The diagonal BH never can become parallel to GN, therefore the point P can never touch the line GN. Neither can the point P' touch the line EM, because DK can never can become parallel to that line.

To use this method in making a curve to show the expansion of a steam engine according to Boyle's law, make EA the stroke of the piston, according to any scale, and make EF, on that scale, equal to the part traversed by the piston before expansion. Make GI the scale of lbs. pressure, G being zero, and I the pressure at which steam is cut off. Then $P''Q$ or GH will show its pressure when the piston has arrived at B. A line drawn through the point O from any part of the stroke scale, will pass through the lbs. scale and cut it at a point showing the corresponding pressure. The locus of the point P will be the curve required. J. SIMON HOLLAND.

Woolwich, Jan. 17, 1859.

CHEAP BOOKS.—The committee of the Society for the Diffusion of Pure Literature, have granted to the Council of the Society of Arts the privilege of giving recommendations to the Institutions in Union, enabling them to obtain at half-price libraries of £5 worth and upwards of books, to be selected from a catalogue issued by the Society, and which will be supplied to any Institutions applying for it. The principal objects of the Society are to promote the circulation of such books, periodicals, prints, diagrams, and other publications as the committee may, from time to time, deem really useful and good, whether they are issued by individuals or by Societies. Institutions desiring to avail themselves of this privilege, should communicate with the Secretary of the Society of Arts,

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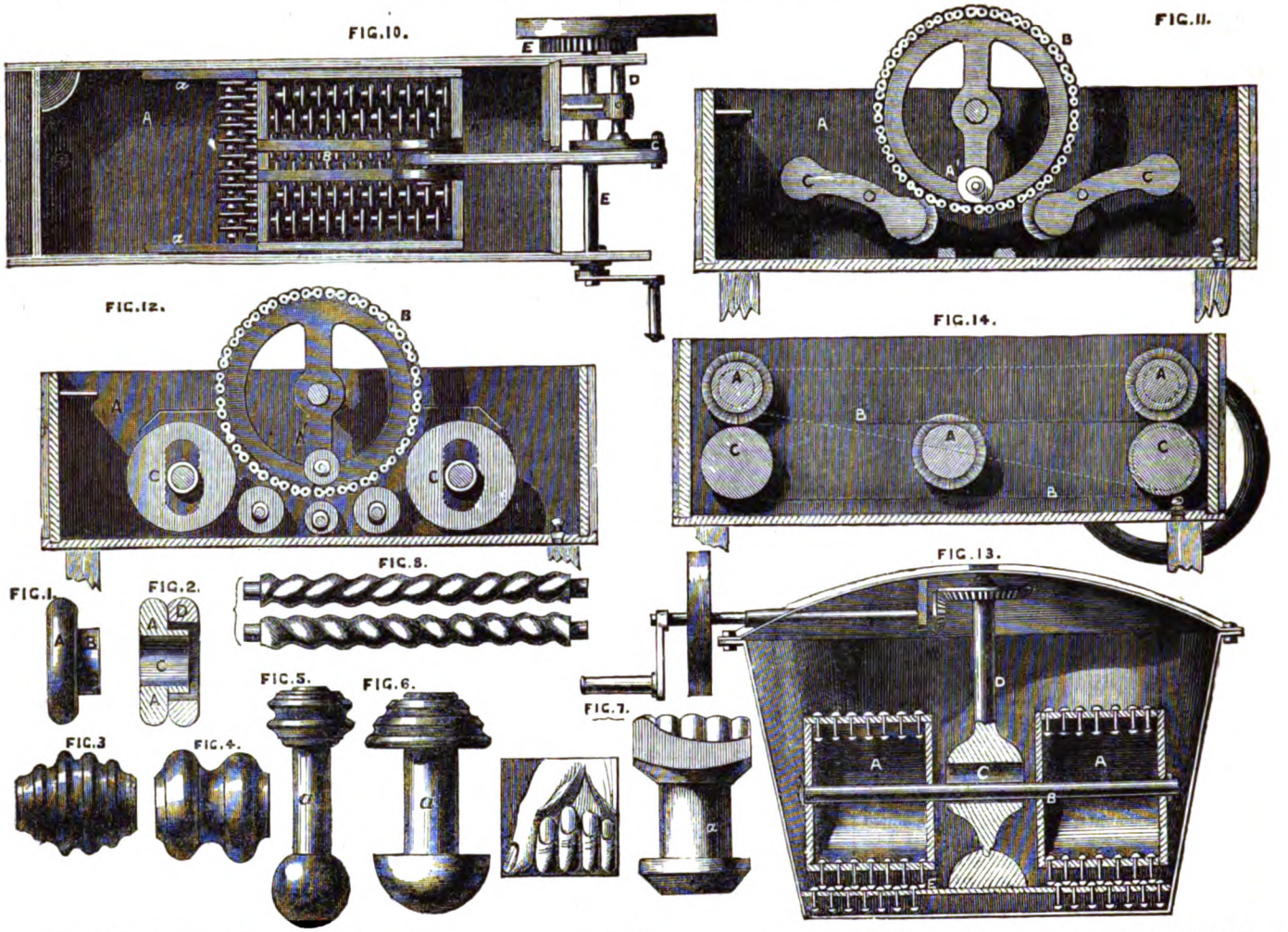
WHEELER'S PATENT WASHING MACHINES.



WHEELER'S PATENT WASHING MACHINES.

AMONG the numerous devices lately brought forward with the view of superseding the arduous labour of washing by hand, a set of machines very recently patented by Mr. Thomas Wheeler, of Oxford, merit especial notice. Considering, apparently, that hand washing, however wearing it may have been, was much more efficient than the washing of many of the apparatuses by which it has been replaced, Mr. Wheeler has endeavoured to imitate by machinery the action of the hand in the operation. The annexed engravings illustrate the principal features of this invention:—

Figs. 1 to 9 inclusive represent detail views of the variously-shaped rubbers which he proposes to adopt in his several washing machines. These rubbers may be composed of wood or other buoyant material; and, in the case of the rubbers shown at Fig. 9, stamped metal may be employed. Fig. 1 is a side and edge view of what is called a "shouldered rubber." It consists simply of a disc, *A*, having a shoulder, *B*, turned upon one or both sides of it. A round, square, oblong, or triangular opening is made through the centre of the rubber for enabling a series of them to be mounted in a frame or holder, as shown in the plan view of a reciprocating washing machine, Fig. 10. Fig. 2 is the shouldered rubber combined with a ring rubber, *D*, the shoulder being made to enter and play freely within the opening of the ring rubber. Fig. 3 is a corrugated rotary rubber, consisting of a cone or cylinder, having corrugations, undulations, or projecting rings formed upon its surface with a central aperture; and fig. 4 is another corrugated rubber having both its projecting rings or corrugations of the same diameter. All these four different rubbers are to be used in the same manner. They may be fitted into frames for receiving a reciprocating motion, as shown at Fig. 10; or they may be fitted into cylinders to receive a rotary or partial rotary motion, or carried on pegs or pins for working in inclined slots, or applied in the form of endless bands by being threaded on cords in any convenient manner to form aprons of rubber. Figs. 5, 6, and 7 are shank rubbers intended to be used either in the reciprocating frames or in rotary cylinders, as shown in the latter case at Fig. 11, the shanks, *a*, fitting into suitable holes in the frame or cylinder to allow of the rubbers

FIG. 9.

floating or working freely therein. These rubbers are formed with a head, *b*, at each end, one or both heads being corrugated or turned into concentric rings, as in Figs. 5 and 6, or formed with other hollows and projections thereon, as in Fig. 7, which represents the form of the human knuckles in the act of washing. Cork or other buoyant materials may be added; or they may be made hollow to increase their buoyancy. The whole of the rubbers assimilate in their action to that of the knuckles of the hand, and therefore are termed knuckle-rubbers. Fig. 8 represents two of a series of spiral rubbers to be arranged side by side in a reciprocating frame; and Fig. 9 is a reciprocating rubber composed of a number of imitation knuckles formed of stamped metal, or of wood, gutta percha, or other suitable substance, and secured to a flat board, or to a cylindrical or curved surface. Fig. 10 represents a plan of a reciprocating washing machine, fitted with the "shouldered rubber," Fig. 1. This machine consists of an oblong box or tank, *A*, fitted at the bottom of the tank with a number of shouldered rubbers, or with any of the forms of floating rubbers before referred to. When the revolving rubbers are employed, that is, any of those illustrated at figs. 1, 2, 3 and 4, they are threaded upon wooden or metal spindles, which are placed side by side in suitable holes in the side pieces, *a*, *a*, fixed into the tank, *A*, the holes being sufficiently large, or of such a shape, as to allow the spindle to float and play freely therein, whilst the holes in the rubbers are also made large enough to allow the rubbers themselves to float and play freely upon the spindles. The reciprocating frame, *B*, is similarly furnished with a set of floating rubbers. These rubbers are arranged at right angles or otherwise to the rubbers beneath them in the tank. The frame is worked to and fro by a connecting rod and a crank or eccentric, *C*, on the second motion shaft, *D*, which receives a quick motion from a spur wheel, *E*, or by a driving band on the first motion shaft, which may be driven by hand or by a small engine attached to the side of the tank, the escape steam from which may be passed into the tank, and employed for heating or keeping hot the water therein; the bottom set of rubbers may, in some cases, be made reciprocating or rotating as well as the upper one. Any of the rubbers may be fitted into frames and used in the machine, Fig. 10. Another rubber consists simply of a brush, and another is merely a combination of the rubbers shown at Fig. 2. Fig. 11 represents a washing machine composed of a tank, *A*, a rotatory cylinder, *B*, and a number of floating rubbers in the form of levers, *C*, *C*, fitted with brushes at their extremities, and bearing against the surface of the cylinder, to which cylinder the clothes, flax, wool, or other materials to be washed are attached by means of loops or bands. In the machine, Fig. 12, the levers are replaced by circular floating rubbers, *C*, *C*, constructed after one of the methods before described. Fig. 13 represents a rotatory washing machine composed of a pair of hollow cylinders, *A*, *A*, revolving on a spindle, *B*, passed through a slot, *C*, in the vertical shaft, *D*, which is driven in any convenient manner. The cylinders may be fitted on this surface with any of the rubbers. We have represented the corrugated rubbers (Figs. 5 and 6) as being applied thereto, and working in conjunction with similar, or with any of the other rubbers in a frame or species of false bottom, *E*. The spindle and cylinders are free to rise or fall in the slot, *C*, according to the varying thickness of the clothes or other substances between the two sets of rubbers. The patentee is aware that rollers revolving in a tub or vessel have been previously employed in washing machines, and therefore claims only the application of hollow cylinders, fitted either internally or externally, or on both surfaces, with any of the improved rubbers. When the patentee uses cylinders, as in the machinery shown in Figs. 11 and 12, he proposes to wash smaller or lighter articles by placing them inside such cylinders, and submitting them to the action of rubbers strung together as shown at *A'*, Figs. 11 and 12, or otherwise placed loosely therein. By these machines three different sets of clothes or goods may be washed simultaneously. Thus, some articles may be attached to the tapes or loops on the outer surface of the cylinder; others

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contained inside the same, and a third set laid upon the floating or other rubbers at the bottom of the tank. A series of any of the rubbers shown at Figs. 1, 2, 3, and 4, may be connected by cords in the form of an endless band of rubbers, and placed on the surface of the cylinder to be used in combination with other rubbers in the tank or washing vessel. Fig. 14 represents a washing machine composed of circular brushes, *A*, *A*, acting in combination with an endless travelling net, *B*, of open or large mesh, and combined or not with rubbers as before referred to. This net is carried on rollers, *C*, *C*, and has the articles to be washed attached thereto in any convenient manner, whilst the brushes, *A*, will act through the net so as to cleanse or rub both sides of the linen simultaneously. In place of rotatory brushes a reciprocating rubber in combination with the open net may be employed, and fitted either with benches or with any of the other rubbers.

ON A QUICK-WORKING POWER-ENGINE.

ABOUT two years since, an English Baronet addressed us a manuscript bearing the above title, requesting that it might be printed in our columns. Believing it unsound, we refused the communication, and were at some pains to satisfy the author, who had spent much time and energy upon the invention, that he was incorrect in some of his views. After much further study and research, the author has again addressed us upon the subject in the following note, which was accompanied by the paper in a revised form. As his request is a moderate, and, all things considered, a very natural one, we have consented to comply with it. Should any of our readers feel disposed to offer any observations upon the author's paper, it will be convenient for them to defer doing so until the publication of the document itself is completed :—

GENTLEMEN,—The enclosed paper, the subject of which is "A Quick-working Power-Engine, by a Variety of the Application of the Natural Principle of the Hydraulic Press," is divided into four sections, under the heads of—the principle, the plan, the working and management, and the motive power; and I beg the favour of you to publish these parts severally in successive numbers of your Magazine.

Every attempt of this kind by a mechanical method was sure to fail, because what could be gained in time must be lost in power. The method now proposed is dynamical, with no reliance on mechanical gain for either speed or power. The principle is founded on the law that what is called the hydrostatic paradox can be realised only in a vessel which is both full of water and close, excepting where it is open to admit of pressure from without on the contents.

I enclose my card, and have only to add that I shall most willingly give explanations asked for by any of your correspondents, if you will be so good as to answer applications for my name and address. Your obedient servant,

Dec., 1858. G. B.

ON A QUICK-WORKING POWER-ENGINE, BY A VARIETY IN THE APPLICATION OF THE NATURAL PRINCIPLE OF THE HYDRAULIC PRESS.

The Principle.

It was long ago conceived by reason and proved by experiment that a peculiar and gratuitous power may be derived, with some appliance of force by art, from confined water; and at a later time, the discovery was turned to account in the invention of the hydraulic press. Water, confined in a pipe a small section of one inch in diameter, and pressing from a high level on the liquid contents of a close and full barrel, may cause it to burst as if the volume pressing were of the diameter of the barrel itself. This is accounted for by the incompressibility of water by less than thirty thousand atmospheres, and by its faculty of pressing with equal force in all directions; so that a very small extent or amount of pressure from without may cause an equal degree of pressure within to the extent of all the inner surfaces of a close and full vessel. And thus, if a piston forms a part of the inclosure, it is pressed on the whole of its exposed surface, however large, by a multiplication of the amount of pressure from a thread of water, which may be injected easily against a very great degree of resistance, because the amount of resistance is small, as is the volume of the water forced in.

But, in the same proportion, the quantity supplied is small to fill up the space through which the large piston is moved; and the consequence is slowness. The quantity is very small, and the movement very slow, because the injection proceeds from a piston as small as the thread of water, and further, because the injection, which is by pressure against a valve that shuts itself between the strokes of the pump, is intermittent. Another imperfection is, that the working must be discontinued to get back the large piston, by letting out the water. Slowness, and the necessity for suspending the work, may be scarcely inconveniences for many purposes; but if the natural and gratuitous power intrinsic, as is above explained, to the hydraulic press, could be employed to give rapid and continuous action, the improvement would be of incalculable value, and really wonderful. The common hydraulic press is wonderful. The most eminent proof of how much more it returns than it receives in amount—a property belonging to it alone of all engines or machines—was displayed in lifting the tubes of the Britannia Bridge at the Menai Straits, by a twenty-horse steam engine forcing a small finger's breadth of water against a tight-fitted piston, twenty inches in diameter, and loaded with that enormous weight.

Then for the supply to the reservoir to be copious enough to give quick motion, it would be necessary that the forcing piston should be large; which would not prevent the volume that entered being very small, if the discharge were contracted in a finely-tapering pipe But, for the forcing piston to be large, it would be necessary to prevent a reaction taking place against it on the principle of the hydraulic paradox above described.

Now, closeness as well as fullness everywhere is indispensable to the operation of that principle. The object, therefore, would be obtained by leaving the passage between the forcing piston and the reservoir open at one place. With an hydraulic press, the passage is closed throughout; and, therefore, if the piston that forces were as large as the other, the degree of reactionary resistance to the injection would be multiplied in amount against it according to the extent of its surface, and no advantage could be gained. But it would not be so if the pipe conveying the discharge were divided by a narrow aperture, to be closed and opened by a sliding valve, and through which the water should be driven down upon the contents of a tapering perpendicular part of the pipe beneath. The tapering, as it accelerated the motion, would at once ensure plentiful supply and a great intensity of pressure; nor could any increase of resistance from it be communicated to the forcing piston on the principle of the paradox if the opening were between, and such increase would be a very slight drawback on the benefit from the reduction of volume and the intensifying of force.

(To be continued.)

ALLAN'S ATLANTIC CABLE.

ON Wednesday, the 26th, Mr. Thos Allan, C.E., of London, addressed a numerous meeting of merchants in the Underwriter's Room, in this town, in explanation of his system of submarine telegraphy. Mr. William Brown, M.P., presided. Mr. Allan exhibited a specimen of his patented light cable. The core or conductor is composed of solid copper wire, surrounded with steel wires, covered with two coatings of gutta percha, and an outer one of a mixture partly made from gutta percha, but having the toughness of leather. The lost Atlantic was a type of the heavy cables, and his of the light ones; and although his was less strong than the other, it was for the purposes required probably four or five times stronger, because, from its lightness, it could be so easily payed out, and would sustain seven miles of itself hanging vertically from the ship, if it were possible that could occur. As to strength, it was not so much the breaking point as that at which the cable stretched that had to be considered. When the gutta percha was stretched, insulation was impaired, and that must affect the working of the cable; and a spiral wire must yield under a strain. Instead of sinking 2,000 fathoms in 20 minutes, this cable would take two hours; but of course it would sink, as it was heavier than water. This increased the facility of paying out, which might be done at the rate of eight or ten miles an hour. As compared with the lost cable, this had 120 per cent. more conductibility and about double the insulation. He would go direct from this country to Halifax; and he thought Liverpool ought to be the starting point. The route had not been sounded yet, but it would be desirable that it should be. Mr. Allan said he was promised that the American Congress would vote a subsidy equal to that voted to the last cable, if his was landed on American soil, and he had been in close communication with our Government; and he referred to the confidence with which his plan was submitted so far back as 1853, and to the influential and scientific support it had received, and still possessed. A conversation followed, in which questions were asked by the Chairman, Mr. Bushell, Mr. Heath, Mr. Mondel, and others, and the plan was further elucidated in the answers given by Mr. Allan. Mr. Allan's statement and explanations were listened to with great attention and interest, and some gentlemen expressed their decided preference for Mr. Allan's system as compared with others.—*Liverpool Paper.*

STEAMERS WANTED FOR INDIA.

THE Calcutta correspondent of the *Times* writes as follows :—

"Is there no enterprise left among the shipbuilders of England? We hear month after month that steamers are coming and coming, but they do not come; and the India General Steam Navigation Company declares this month a dividend of 100 and upwards per cent. Nobody at home seems able to comprehend that there is a traffic on the Ganges such as has never been seen there since the days of the Hindoo sages. Even the Home Government do not understand it. They were indented on the other day for six river steamers. They sent one, which they said would be sufficient. Next month the Indian Government had to engage all the freight of six for two trips at a price which would have bought the new vessels they wanted twice over. I saw a professional estimate the other day which proved that there was room and work for 300 steamers on the Ganges alone. Nor is the figure wonderful if you will recall the number on the Mississippi, and remember that if the Ganges is smaller, it flows through a territory with a population of 350 to the square mile, an export trade of £16,000,000, and an internal trade which no man can measure."

THE IRON TRADE OF THE NORTH.

THE Iron trade of the North is in a tolerably satisfactory condition—70 furnaces, out of 87, being in blast. The following statement on the subject will be found interesting :

Locality.	Furnaces in blast.	Out of blast.
Eston	12	0
Middlesborough	8	0
Wilton Park	4	0
Cargo Fleet	5	2
Port Clarence	5	0
Felling	2	0
Wylam	0	1
Washington	2	0
Stockton	3	0
Norton	2	1
Darlington	2	1
Stanhope	0	1
Tow Law	5	0
Consett	16	2
Lemington	1	1
Birtley	2	1
Walker	3	1
Wallsend	0	2
Jarrow	3	1
Bedlington	0	2

Other furnaces will be shortly in operation.

MESSRS. W. G. ARMSTRONG AND Co. of Elswick, near Newcastle-on-Tyne, have decided on extending their gun-factory to the extent of 130 feet beyond the original plans, and have given orders for the immediate execution of the work.—*North of England Advertiser.*

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TAYLOR'S PATENT HORSE-HOES AND DRILLS.

FIG. 1.

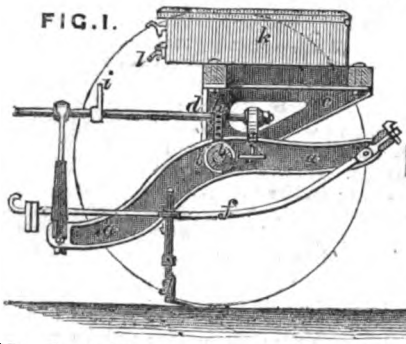
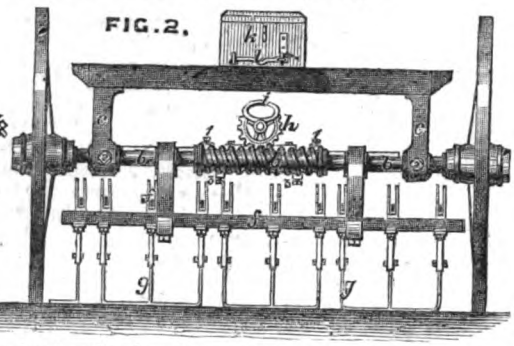


FIG. 2.

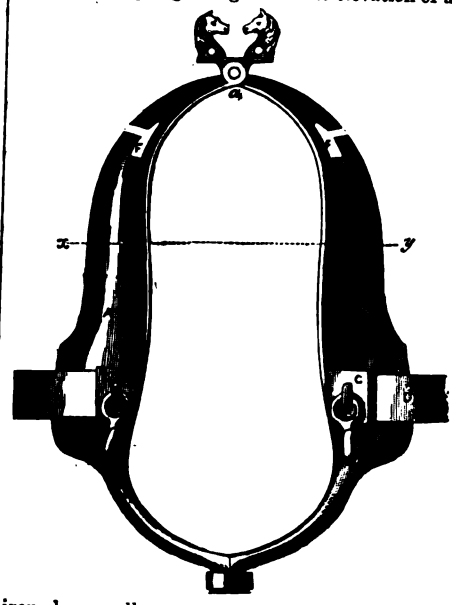


MR. JOHN TAYLOR, farm bailiff, of Swanton Novers, Thetford, Norfolk, has patented "an improvement in horse-hoes, applicable also as drills," which deserves the notice of agriculturalists. The chief object of this invention is to simplify the construction of horse-hoes, and to give to the attendant more complete command than heretofore over the implement when in work, so that while guiding the hoes he may instantly throw them up out of action, and thus avoid the liability common to horse-hoes, of even the most approved construction, of their swaying about and cutting up the crop during the time requisite for lifting the hoes free of the ground. These advantages are attained by mounting the hoes on independent levers, which are severally jointed to the forward end of a balance frame, which is both capable of rocking and sliding upon its fulcrum, and can, therefore, be moved both vertically and horizontally by the same guiding shaft or lever.

In the accompanying engravings, Fig. 1 is a vertical section of a horse-hoe, constructed according to this invention; Fig. 2 is an end elevation showing the gearing for giving the lateral motion to the balance frame. *a*, *a*, is the balance frame, which has for its fulcrum the axle of the carrying wheels. This axle is composed of three parts, viz., the shafts *b*, *b*, and the coupling tube *b'*, and is thus made capable of expansion and contraction to facilitate the adjustment of the wheels breadthwise to the work. This axle carries also the draught frame *c* of the implement. The balance frame *a*, it will be understood, is mounted loosely on the axle *b*, and it receives its motions from a steering rod or lever *d*, which turns in bearings provided for it on the frame. To the forward end of the balance frame, the slotted bar *e* is secured for receiving the levers *f*, which carry the hoes *g*. On the inner or forward end of the steering rod *d* is keyed a segment rack *h*, which gears into a worm rack cast on the tubular coupling *b'* of the axle, and the outer end of the rod is fitted with a hand wheel or handle for the attendant to grasp while the implement is in use. When a lateral motion is required to be given to the hoes to get them into the proper position for working, it will not only be necessary to turn the steering rod in its bearings to the right or left as the case may be, and the whole of the hoes will by reason of the segment rack gearing into the fixed worm rack be shogged in the required direction, and to the amount requisite to bring the several pairs of hoes into the proper position relatively to the rows of growing crop. In order to lift the hoes clear of the ground, or for the purpose of changing the angle of inclination of the cutting edge of the hoes, the guide rod is pressed upwards by the attendant, when, acting as a lever, it will raise the hoes, the movement being facilitated by the counterweight of the portion of the frame which lies on the forward side of the axle *b*, or centre of the rocking motion. Instead of the segment and the straight rack, other gearing, as a pulley and chain, or their equivalent, may be employed for imparting the lateral motion to the balance frame. To facilitate the lateral adjustment of the carrying wheels, the patentee casts the coupling tube *b'* with an internal worm, and fit on the ends of the shafts *b*, *b*, a pin or pins for taking into the worm. In the normal state of the compound axle, the several parts will be held firmly together by the binding screws 1, 1, but when he requires to expand or contract the axle he slackens these binding screws, and also the binding screws 2, which fix the draught frame *c* to the axle, and turns the implement round on one or other of the wheels, the effect of which movement will be to rotate the shafts *b* in the coupling tube to the right or left hand according to the direction of the movement given to the implement, and thus expand or contract the axle to any required amount; 3, 3, are retaining screws for keeping the shafts *b*, *b*, within the coupling tube. To keep the hoes free of the ground when the implement is travelling over roads or to its work, a metal loop *i* is fixed to the steering rod, and the hind end of the tool box *k* is fitted with a hook to receive the loop. A hasp *l* (Fig. 2), also attached to the box, may be used to prevent the loop being jerked off the hook, the hasp being brought under the elevated steering rod, and secured in position by a pin or wedge. The above-described arrangement of balance frame applies also to drills, and serves to facilitate the adjustment of the coulters while those implements are in operation. The mode of applying the improvement to this class of implements will be obvious to any practical mechanic, and therefore no special description will be needed.

IMPROVED HORSE COLLARS.

MR. CHARLES LAMBERT, farmer, of Sunk Island, East Riding of York, has obtained a patent for improved collars for horses and other draught animals, which embody some desirable changes in the manufacture of these articles. His invention consists in forming collars of iron, wood, or other hard substance in two halves or parts, united at top by a hinged joint, and secured at bottom by a thumb-screw passed through two projecting pieces, one from each half of the collar, or by other equivalent means. Tug pins or eyes are formed in a piece with, or are attached to the sides of the collar. The traces are connected to these pins or eyes. The improved collar forms at once a collar and harness; and by shaping the inside of the two side-pieces in conformity with the shoulder of the animal for which the collar is intended little or no padding is required. The accompanying engraving is a front elevation of an



iron horse-collar constructed according to this invention. The collar is formed in two parts, *A* and *B*, united at top by a hinge joint *a*, and fastened at bottom by a collar *b*. The position of the parts of the collar, when placing it on or removing it from the animal, is indicated by the dotted lines. The sides of the collar are adapted to the shoulders of the animal. *C C* are eyes or sockets on both sides of the collar, which the inventor prefers to cast with the collar, and to place at right angles, or nearly so, thereto. In these sockets he fixes the tug hooks *D D*, held by screws or springs. *E E* are hooks attached to the sockets *C C*. *F F* are holes in the collar to pass the reins through. We have seen specimens of the improved collars, and think very highly of them.

HART'S PATENT ECONOMIZING GAS-BURNER.

A GAS-BURNER lately patented by Mr. Hart, and exhibited for some months past on the patentee's premises in Fleet-street, near to our own office, has attracted so much attention, and appears to be selling to so large an extent, that, were it a much less useful article than it is, we should be disposed to gratify public curiosity respecting it. As it is really a very valuable little contrivance—capable of simultaneously economizing the gas, improving the light, and preserving the eyes of those who work or write by gas-light from serious injury—we notice it with pleasure. It does not differ very much in construction from inventions which have previously been brought before the public, but, from all that we can observe and learn, it is more efficient, and less liable to injury of every kind than any burner before produced. That its nature, which is very simple, may be fully understood, we have had the accompanying representations of it engraved.

FIG. 1. FIG. 2.

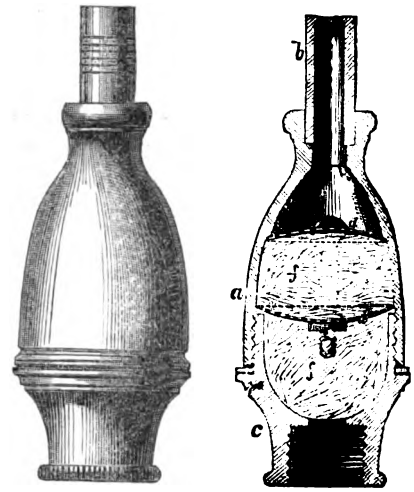


Fig. 1 is an external view, and Fig. 2 a section of it, full size. *a* is the body or principal piece, *b* is the burner-jet which is fixed in *a*, and *c* is the lower part of it which screws into *a*. The thread in the lower end of *c* screws upon the gas pillar or branch like an ordinary burner. Within *a* is placed a diaphragm, composed of two perforated plates *d d*, a piece of loose felt or other like material placed between the plates, and a small threaded rod *e*, with a nut for compressing the felt between the plates. The whole virtue of the burner arises, as we think, from the interposition of the permeable diaphragm, arranged, as shown, between the gas rushing through the pipe and the escape-orifice of the burner. Without the diaphragm the gas rushes out with such a velocity, that it blows the flame out and about, and produces those perpetual variations both in the extent and the position of the flame, which are so fearfully trying to the sight. With the diaphragm, the excessive speed is checked, the gas escapes slowly and steadily, all that so escapes is burnt, and a bright and steady flame results. A small piece of loose felt, *f*, is placed in the lower piece *c*, as shown, to receive any deposit which grossly impure gas may leave behind. This piece of felt can be changed at any time if necessary, it being only needful to unscrew the part *a* from the part *c* for the purpose. Mr. Hart has already found it necessary to provide large works for the manufacture of the improved burners, in order to meet the very large demand made for them. And as doubts have been felt by some respecting the precise manner in which the burner acts in brightening and steadying the light, and economizing the gas, he has offered £50 for the best essay submitted to him upon the subject.

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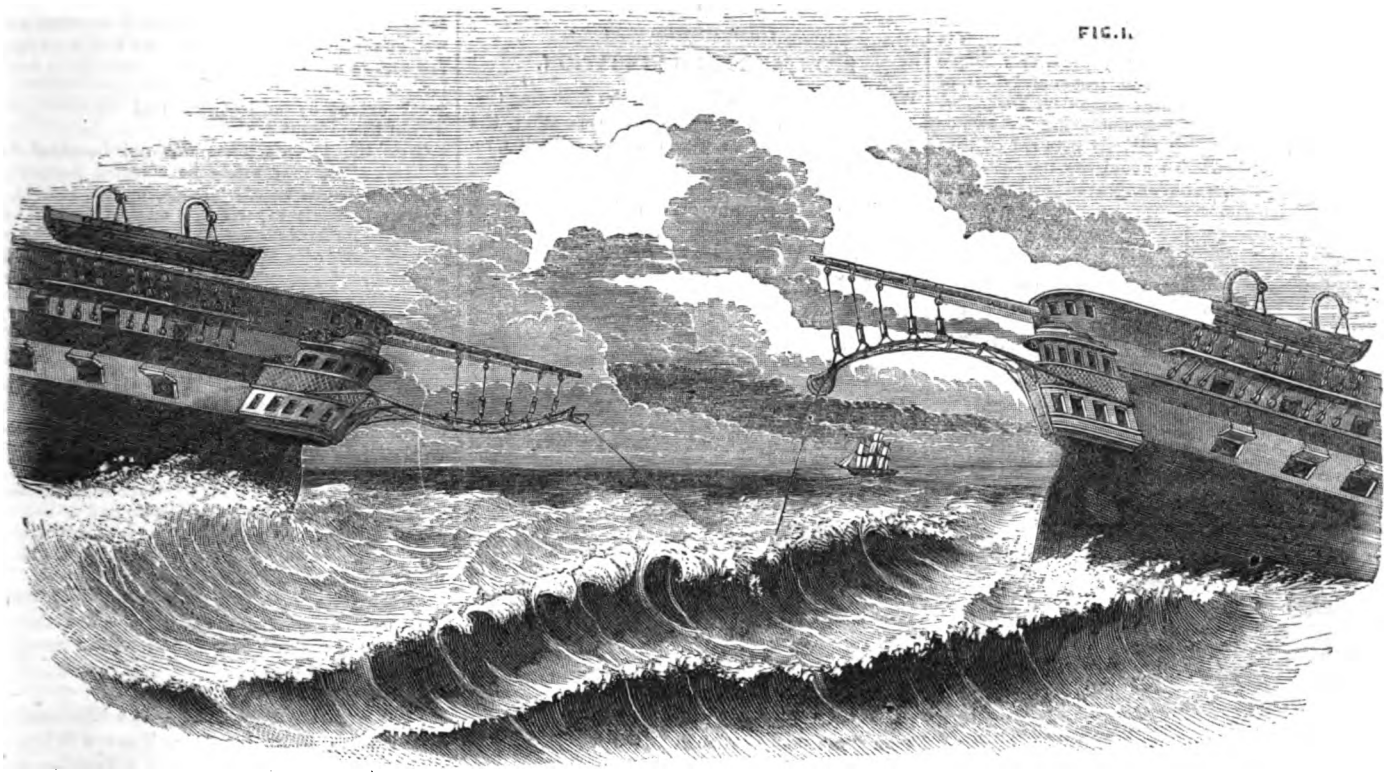
CONYBEARE'S PATENT APPARATUS FOR LAYING SUBMARINE TELEGRAPH CABLES.



CONYBEARE'S PATENT APPARATUS FOR LAYING SUBMARINE TELEGRAPH CABLES.

IT will be recollected that at the last meeting of the British Association Mr. H. Conybeare, C.E., of Abingdon-street, Westminster, read an interesting paper on a new apparatus devised by him for laying submarine telegraph cables. The paper was shortly after published in our columns, and was as follows:—

"My invention consists in the construction of machinery composed of a resilient and articulated series of segments or frames, which extend from the stern of a vessel employed in the submerging of submarine telegraph cables, and over which machinery the cable is to be paid out, being delivered from a trumpet-mouth shaped congeries of friction rollers, situated at the outer extremity of the frame furthest from the stern, in which machinery the resiliency decreases gradually from that part of the apparatus next to the stern to the extreme outer end thereof in a manner similar to that in which the resiliency diminishes from the butt to the top joint of a jointed fishing rod.

"The articulated joints or segments of the apparatus are formed of frames, each frame, starting from the stern, being smaller than that supporting it. Strong springs, such as coach springs, fixed to one frame and linked to the further extremity of the vessel, are employed to give resiliency to the articulations between each frame and that next to it, and the frame furthest from the stern terminates in a semi-conoidal or trumpet-mouth shaped debouchure, consisting of rings of friction rollers breaking joint with each other, and so arranged as to present a rolling surface of moderate curvature to the escaping cable, at whatever angle with the course of the ship it is compelled by side currents or leeway to quit the apparatus.

"Over this resilient and articulated series of frames is a rigid spur of wood or metal, having suspended from it outward as many pulleys as there are joints in the apparatus last described. An equal number of pulleys is provided inboard. A rope or chain is connected to the extremity furthest from the ship of each joint, then to a spring or not as deemed necessary, and then, passing over one of the outboard pulleys and one of the inboard, in the rigid beam, is attached to a spring apparatus, so arranged as to give a resiliency graduated according to the position of such a particular piece in the series.

"This spring apparatus consists of a series of wheels and axles. The resilient springs act on the axles in each case, and the ropes or chain leading to the various parts of the laying apparatus are attached to the wheels. The ratio of the diameter of the wheel to the axle varies in each case, according to the amount of resiliency required by the particular joint or frame of the fishing-rod apparatus with which such wheel and axle are connected. Thus, as the delivery extremity of the apparatus is required to be moved through a comparatively large space by the exertion of a comparatively small strain, the ratio of the wheel to the axle in the resilient apparatus pertaining to this end frame is consequently greater than in that appertaining to any of the frames nearer the stern; and thus a graduated resiliency is obtained; or the same end is obtained by the employment of a spindle-wheel like that of the verge of a watch.

"The required resiliency is obtained either by a vacuum or compressed air cylinder, by volute springs, or by springs of vulcanised India-rubber.

"The required graduated resiliency may be wholly obtained by the coach-like springs which give resiliency to the articulation of the frames; the chains or ropes led inboard from each joint over the rigid spar being merely employed to counterbalance the weight of each frame. Or the resiliency may be wholly given by the wheel and axle apparatus inboard."

We are now able to place illustrations of Mr. Conybeare's apparatus before our readers:—

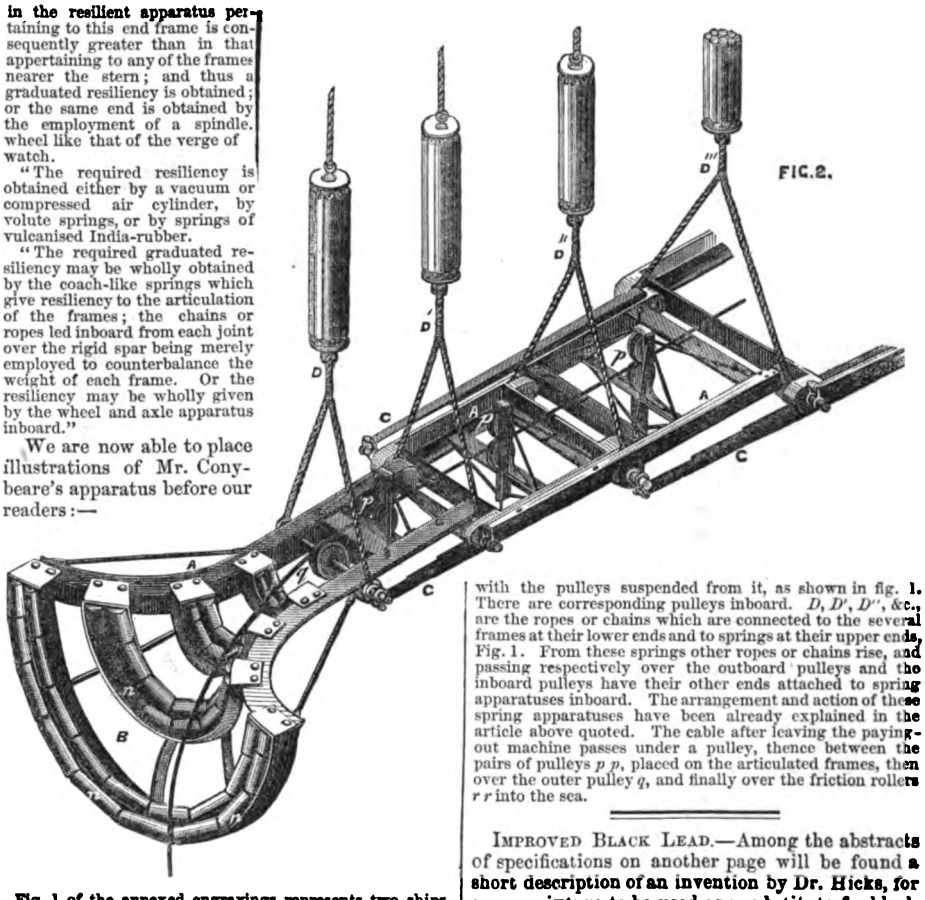


Fig. 1 of the annexed engravings represents two ships fitted with the apparatus delivering the joined ends of the cable in mid ocean. Fig. 2 is an isometrical perspective view of the outer frames and trumpet mouth of the apparatus. *A A* are the articulated frames; *B* is the trumpet mouth on which several sets of friction rollers *n n* are fitted; *C C* are the springs by means of which the resiliency is obtained; there is a rigid spur above the frames with the pulleys suspended from it, as shown in fig. 1. There are corresponding pulleys inboard. *D*, *D'*, *D''*, &c., are the ropes or chains which are connected to the several frames at their lower ends and to springs at their upper ends, Fig. 1. From these springs other ropes or chains rise, and passing respectively over the outboard pulleys and the inboard pulleys have their other ends attached to spring apparatuses inboard. The arrangement and action of these spring apparatuses have been already explained in the article above quoted. The cable after leaving the paying-out machine passes under a pulley, thence between the pairs of pulleys *p p*, placed on the articulated frames, then over the outer pulley *q*, and finally over the friction rollers *r r* into the sea.

IMPROVED BLACK LEAD.—Among the abstracts of specifications on another page will be found a short description of an invention by Dr. Hicks, for a new mixture to be used as a substitute for black lead. We have had specimens of the material submitted to us, and are able to state that, while the cost is but little if at all increased, the polish produced by means of the new mixture is of a very superior character.

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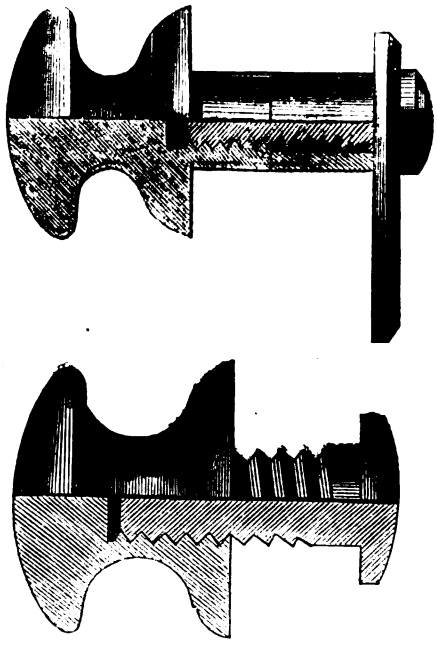
IMPROVED DRAWER KNOBS AND HANDLES.

THE looseness of drawer handles, though comparatively a trifling matter, is so very common a source of annoyance and trouble, that we think it desirable to bring to public notice a very simple form of handle which Messrs. Dixon and Sons, of the Steeton saw mills, near Keighley, Yorkshire, have been extensively manufacturing for two or three years, and which entirely gets rid of that cause of irritation. To avoid the necessity for verbal description, we have engraved two handles of



the improved form, and from these it will be seen that the expedient of the inventors (Messrs. Heywood and Dixon) merely consists in screwing into the knob or handle, from the inside of the drawer, a plug or stop to prevent its withdrawal. This device is so simple, and at the same time so useful, that we need not add a word in its favour. The handles can be obtained, we believe, in any quantity, from Messrs. Dixon and Sons, at the above address.

DIRECT PORTSMOUTH RAILWAY.

THE opening of a direct route, by which Portsmouth can be reached in two hours and a quarter by the ordinary express trains, to say nothing of the saving of time, is of too important a nature to be wholly omitted from our columns. The advantages that thus accrue to our marine and military powers are very great, and must be obvious to all reflecting minds; while, by bringing the coast and the marvellous evidences of England's greatness so much nearer to the metropolis, it affords additional facilities to its inhabitants to visit, either for business or pleasure, that most attractive portion of our isles. By the old routes, a day did not afford sufficient time for even a hurried visit to the dockyards, arsenals, &c.; but, by the present arrangements, the public may leave London even at the advanced period of half-past eleven, and, by returning at half-past seven, p.m., have quite five hours and a half at their disposal. The all-absorbing question of a great city's health is likewise intimately advanced in thus bringing within breathing distance the strength-inspiring breezes of the ocean. Southsea Common, and its admirably-kept promenade, will doubtless see more visitors during the following summers than usual; and the conventional guinea-fee will find its way into the coffers of the South-Western Railway Company rather than into the palm of the physician, in many cases with greater benefit to the patient. The new line turns off at Woking, and, calling at Guildford and Godalming, passes through some of the most lovely and picturesque scenery in Surrey. Indeed, from the constant succession of rustic bits and extensive views of hill and dale, it might not be inaptly termed, "The Artist's Line."

SPONTANEOUS GENERATION.

WE are indebted to a friend for the following:—

The question of spontaneous generation, the dangerous ground on which many scientific reputations have been shipwrecked, is now attracting great attention in France, and is likely to become again a *cause célèbre* before the French Academy. It will be remembered that an English philosopher, Mr. Crosse, endured for many years what may be termed a persecution of scientific orthodoxy on account of his adherence to the doctrine of generation *per se*. It would by no means be an unprecedented fact if the conclusions of our English *savant* should become rehabilitated by the researches of subsequent experimenters. When a little clean hay or other organic matter is placed in distilled water, and exposed to the air at ordinary temperatures, numbers of plants and animalcules speedily make their appearance in the fluid. It has been assumed, and not without reason, that these organised bodies proceed from germs floating in the atmosphere, and becoming fecundated under favourable conditions. For if we allow air to reach the infusions only after passing through a corrosive fluid, such as oil of vitriol, we can then discover no traces of organic life. It is now, however, affirmed that the conclusions hitherto drawn from this fact are disproved by the experiments of M. M. Pouchet and Houzeau. The former *savant*, whose researches on fecundation have been crowned with the completest approbation of the *Académie des Sciences*, states that, after every imaginable precaution having been taken to exclude the external atmosphere from the air and water contained in a flask, he has clearly witnessed in this water the spontaneous growth of various fungi and infusoria among others a plant which will in future be designated *Aspergillus Pouchetii*. According to M. Montagne, this cryptogamic plant belongs to an entirely new species. In a second series of experiments performed in conjunction with M. Houzeau, a chemist well known to the Academy, a portion of hay which had been exposed to a temperature deemed sufficiently high to destroy any animal or vegetable germ, was enclosed with air and water, purified with extreme care. In this mixture, nevertheless, was observed the wonderful generation, not alone of the famous *aspergillus*, but of many species of infusoria. In considering these experiments, we are forced to admit either that spontaneous generation is an indisputable fact, or, on the other hand, one of those hypotheses, viz.: That organic germs may withstand a considerable elevation of temperature; or that the precautions taken to avoid all contact with the external air in these experiments were inadequate. On this point we may anticipate a long and vehement controversy; but we may hope that ultimately there may be but one opinion respecting the doctrine which is now supported by the names of at least two men eminent in scientific acquirements. The question is the more important, inasmuch as the theory of metamorphosis, which assumed that certain algæ might become transformed into various lichens and mosses, or even into infusoria, is now completely disproved.

INVENTIONS AND INVENTORS OF TOOLS.

THE inventors of tools have been great contributors to the present high state that England occupies in the world. Yet how little do we know of them. If you would open your valuable pages for such a subject, I doubt not that much interesting matter might be forthcoming. He who invented the method of cutting screws with stocks and dies was a great benefactor of his species; yet his name is not known, though the invention was so recent, about thirty-six years ago, I was told by a man of eighty-three years of age, that in his early days they cut up *all* screws by hand—the small by filing, the large by chipping and filing. They used a taper tap for nuts of several sizes, the tap being worked in until the nut would go on to the screw. At that time very few screws were used, the cotter, cotteril, or forelock, being used instead. Cotters were used to a great extent by millwrights and wheelwrights within the present century.

That the joiner's plane was not invented in Galileo's time, may safely be affirmed from the following words in his "Dialogues on Motion." Speaking of his experiments on the descent of bodies on inclined planes, he says, "I took a rule, or rather, plank of wood, about 12 yards long, half a yard broad one way and 3 inches the other, we made upon the narrow side or edge a groove a little more than an inch wide: we cut it very straight, *and to make it very smooth and neat, we glued upon it a piece of vellum*, polished and smoothed as exactly as possible, and in that we let fall a very hard, round, and smooth brass ball, raising one of the ends of the plank a yard or two at pleasure above the horizontal line." Now, had the flat plane then been invented, Galileo would have placed two flat boards together angularwise, to make a trough, if he had not had a hollow plane. What an amount of labour must have been required in the ancient palaces and temples before the invention of the plane!

J. SIMON HOLLAND.

P.S.—Can any of your readers give the origin of that very useful tool to engineers, the hanging tool for turning?

THE CASE OF HENRY CORT.—At a late meeting of the South Wales Institute, Thomas Webster, Esq., M.A., F.R.S., the eminent patent-law barrister, read a very interesting paper on "Henry Cort's Invention of the Puddling Furnace and the Grooved Rollers in the Manufacture of Iron," with the official report of which we are now favoured. We shall not publish this report, because the series of papers on the Cort case by the same author, of which the first was published in No. 2, New Series, (and which has been somewhat delayed by the pressure of the author's professional duties) will probably contain all that is essential in it. It is a source of great satisfaction to know that so distinguished a lawyer as Mr. Webster has, in several instances, afforded great inventors and their successors the advantage of his skill and experience in placing their claims dispassionately and truthfully before the public. We do not often meet with like liberality and patriotism among gentlemen at the bar. We hope to resume the publication of Mr. Webster's articles in our next number, and to continue them without material delay.

YATES' PATENT FURNACE.—A furnace which is now, and has for some time been, in operation at the large distillery, Bromley, near Bow, well deserves the attention of persons interested in the modern question of smoke prevention. It is the invention of Mr. W. Yates, the Engineer of the works, a man of fifty years' experience in the profession. The remarkable facts connected with the furnace are, that nothing but coal screenings are burnt, and yet no smoke whatever is produced. The coal, no matter how small, is fed into a hopper or upon a front plate, and by means of a simple apparatus driven by a small shaft from the steam engine, is forced gradually forward into the furnace. The gases distilled from it pass the whole length of the fire-bars over the incandescent fuel, meeting as they pass along with the air rising through the bars, where alone it is admitted. That a good deal of carbonic oxide may escape unburnt from the furnace we do not doubt; but that the emission of smoke is prevented, and great economy obtained by the use of nothing but the cheap screenings of coal, is beyond question. The furnace is also worked with great ease, requiring but a very moderate amount of attention from the stoker.

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NOTICES.

THE THEORY OF NAVAL ARCHITECTURE. — We have reluctantly postponed the publication of our third article on this subject for a week. It contains a new investigation of a highly important and somewhat difficult mathematical problem, and involves the elaborate use of symbols, which require great care in passing through the press. We have, therefore, preferred to delay it rather than to risk inaccuracy by undue haste.

Numbers 1845 and 1846 of the MECHANICS' MAGAZINE (original series), containing the paper read at the Society of Arts, Dec. 15, 1858, "ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY IN RESPECT OF DIMENSIONS, FORM, MEANS OF PROPULSION, AND POWERS OF ATTACK AND DEFENCE," by one of the EDITORS of this Magazine, together with the discussion upon the same, are still on sale.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 6d. per line for any number of insertions less than 13; for 13 insertions, 5d. per line; and for 52 insertions, 4d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 6 o'clock on Thursday evening each week. None can be received after 9 o'clock on Friday morning for the ensuing number.

TO CORRESPONDENTS.

X. Y. Z.—We have expressed no opinion respecting the merits of "A Mechanic's" articles on the "Conservation of Force;" nor have we shown any anxiety to shelter the writer from adverse criticism. We have, however, resolved to admit no such criticism until the series of letters is completed; and this we have done to prevent confusion. We have no desire to avoid the thorough discussion of the subject; on the contrary, we court it. But while no severity of reasoning will lead to the exclusion of correspondence, mere severity of language alone will find no place in our columns. There must be a careful conservation of the force of argument in your letter, or it will not appear. All letters must be privately authenticated by the writer's name.

ENGINEER.—Our statement relative to the further enlargement of this Magazine referred merely to a probable increase in the number of pages. We find the present *form* of the Magazine so much approved that we have not the least desire to alter it.

☞ The practice of publishing a vast quantity of fictitious Notices to Correspondents has become so general in cheap journals, that the public, who are not in the secret, have come to consider it the duty of Editors to answer any and every question that may be put to them by readers. This cannot, however, be done in a journal like our own without entailing an immense amount of labour (often of a very unnecessary character) upon us. We, therefore, beg most respectfully to decline the task. But in order that our correspondents may not be deprived of all advantage in this respect, we shall, as a rule, publish such queries as may be sent in good faith to us, though not such as appear to be sent merely for the sake of giving trouble. To the published queries other correspondents will, we hope, reply, and their replies shall likewise be published. By this arrangement we shall save ourselves much inconvenience, and at the same time secure, we trust, to our readers all the information they may desire. All questions must be stated simply, clearly, and without circumlocution of any kind; and we shall feel grateful to those correspondents who kindly take the trouble to send such information by way of reply as they may possess. Mere questions of business we shall of course answer ourselves; but whenever calculation, reference to published works, &c., are necessary, we shall dispose of the questions sent as stated above.

CORRESPONDENT'S QUERY.

GENTLEMEN,—An answer to the following queries would very greatly favour—yours, &c. C. R. E.

January 24th, 1859.

A C

B

If a current of electricity be communicated to a wire at *A*, it being discontinued at *B*, would the current pass on to *C*, the *wire maintaining its position*; and would a *great power* be necessary to maintain the wire in the position as shown at *B*? Is there any rule by which the *resistance* necessary to a certain charge could be ascertained?

LIGHT, HEAT, AND ACTINISM.

GENTLEMEN,—It is found that the proportion of light, heat, and actinism in the solar ray is not constant, but varies with the different seasons of the year. In the spring the actine principle is most abundant; in the summer, light and heat are in excess; and when autumn comes the heating rays are most powerful. Now, as the reason of this is not, I think, understood, and as it appears to me that individual rays of light must conspire to produce these changes, I have thought of the following hypothesis by which to explain them. Suppose that the solar atmosphere is uniformly constituted, and sends forth these various rays as the earth is turned to it. The rotatory motion of the sun might harmonize with these considerations, and serve to strengthen the hypothesis. J. ALEX. DAVIS.

LIST OF PATENTS FOR PRESERVING STONE, &c.

Date.	Patentee.	Analysis of Process.
1838.	BETHEL.	Treating with coal tar, oil, caoutchouc, or rosin, &c.
1841.	NEWTON.	Treating with silicate of soda or potash.
1846.	TEYCHENNE.	Treating with coal tar, bituminous matter, tallow, or other fatty substances, linseed or other drying oils, rosins and gums.
1847.	HUTCHINSON.	After being dried in a chamber, the stone or other substance is immersed in a boiling solution of rosin admixed with oils, tallow, or other gummy or fatty matter; or pitch admixed with oils, tallow, or other gummy or fatty matter; or coal tar, with or without pitch or other bituminous substances; or glue, gums, and other cohesive and hard substances boiled into a solution with oil, &c.
1848.	BETHEL.	Immersing in hot tar, bitumen, or rosin with bituminous or tarry oil.
1852.	MORREAU.	Treating with silicate of potash.
1853.	BARRETT.	Treating with sulphur dissolved in vinegar or acetic acid, or shell lac, seed lac, common turpentine, and pyroligneous spirits; or gutta percha dissolved in coal-tar naptha; or limestone, water, alum, beer grounds, gall, &c.
1854.	DAINES.	Treating with sulphur dissolved in oil.
1854.	ASSANTI.	Treating with gutta percha dissolved in sulphuret of carbon.
1855.	BELLFORD.	Treating with silicate of potash.
1855.	GILBEE.	Treating with silicate of potash applied by means of suitable pumps.
1855.	PAGE.	Treating with calcined bee's-wax dissolved in coal-tar naptha.
1856.	RANSOME.	*Treating with a solution of silicate of potash or soda, and afterwards with a solution of choride of calcium, producing silicate of lime in the pores of the stone; or solutions of alumina and baryta; or any two solutions, which, by mutual decomposition, produce by deposition an insoluble mineral precipitate in the pores, or on the surface of the stone, &c.*
1856.	CLARK.	Treating with gelatine, isinglass, fish glue, &c., and afterwards with a solution of tanin or nut-gall, sumac or oak bark, &c.
1856.	BROOMAN.	Coating first with a mixture of flour, water, and carbonate of lime, then with a mixture of silicate of potash, phosphate of soda, sulphuret of baryta, zinc-white, and borate of manganese.
1857.	SZERELMEY.	Coating with a mixture of water, blood, ground bricks, powdered copper slag, powdered iron slag, argillaceous earth, and caseous matter produced from milk, boiled together, and afterwards with a mixture of gas or coal tar, or linseed oil, or rosin, or asphalte, with hydraulic lime, grit, and calcined flint, boiled together.
1857.	PAUL.	Treating with aluminates of potash, soda, or any other aluminates, or zincates of potash or soda, or phosphates of alumina, or zinc in solution by alkalies; also similar preparations of lead or molybdenum.

CAPTAIN NORTON'S RIFLE BULLET.

THE following paragraph respecting Captain Norton's bullet, which was described and illustrated in our last volume, appeared in the *Times* of yesterday:—

"Several experiments have been made at Chatham with a new description of rifle bullet for firing at long ranges, the invention of Captain J. Norton, the result of which has been very satisfactory. The superiority of the balls invented by Captain Norton lies in his coating the bullet with a small film of paper, which considerably lessens the tremendous friction which the ordinary rifle bullets undergo before they leave the rifle, thereby materially diminishing their propelling force and affecting the accuracy of aim. Captain Norton also does away with the ordinary 'plug' at the base, one description of bullet having a nail or screw inserted at the base, and in the other kind the hollow for the powder being very large. More than a dozen of the new bullets were fired at the target, the rifle used being the elliptical bore rifle of Mr. Lancaster, which is in use by the Royal Engineers. The range tried was 250 yards, at which distance the accuracy with which the new bullets carried was exceedingly satisfactory, only three failing to strike the target, one miss being not the fault of the bullet. The superiority of the new bullets over those now in use was very manifest. The ordinary expanding shot for the Enfield rifle requires the purest lead for casting, but in the paper-coated ball of Captain Norton any lead will answer. The mould in which the newly invented bullets were cast was made by Mr. Lancaster to correspond with the elliptical bore of his rifle."

Captain Norton communicates the following:—

"Chatham, 28th January, 1859.

"Dear Captain Norton,—The four last bullets you brought, carried up from 250 yards, the distance I was firing at to-day with the men, very well, two centres—two outers. The four with small cavities, nail at the base, one miss—one centre—two outers—the miss *not* the fault of the bullet.

"Five with large cavity or hollow, two misses—three outers. I think you have hit the right nail on the head in the first mentioned.—In haste, very truly yours,

"GEORGE R. LEMPRIERE."

"N.B.—All the above-mentioned shot were paper-coated, and without any plug at the base, they were cast in a mould made by Mr. Lancaster according to my order to correspond with the elliptic bore of his rifle. Specimens are to be seen at the Museum of the United Service Institution.

"Any kind of lead answers for casting these shots, but it requires the *purest* lead for casting the expanding-shot for the Enfield rifle. For the above reasons, and the greater facility of cleaning out, and the interior of the barrel receiving no injury from the use of the ramrod, I prefer the Lancaster to the Enfield rifle as a military arm.

"Rosherville, 29th January. J. NORTON."

CURRENT EVENTS

IN THE CENTRES OF THE IRON, COAL, MACHINE, AND SHIPPING TRADES.

[COMPILED BY OUR OWN CORRESPONDENT.]

Birmingham Chamber of Commerce and Trade Marks and Government Contracts—Co-operative Society of Brick-makers—Offences against the Factory Act—The Stephenson Monument—Opening of an Iron Church—Three several Boiler Explosions—Fishermen, and the use of the Rocket Apparatus—Discovery of Fire-brick Clay—Discovery of Ironstone—Railway News—Weekly Tickets on the Oxford, Worcester, and Wolverhampton Line—Railway Casualties—Four Men Killed by a Colliery Explosion—Manchester Association for the Prevention of Boiler Explosions—The Imposts upon British Shipping.

THE Birmingham Chamber of Commerce have determined to memorialize the Foreign Secretary upon the imitation of English trade marks by foreign manufacturers. The memorialists pray that steps may be taken to obtain for British subjects, by diplomatic convention, the protection of registration in France; and likewise to secure to their manufactures protection from fraudulent imitation in other countries. ——As hinted in the MECHANICS' MAGAZINE a fortnight since that they would, the master brickmakers of Birmingham and South Staffordshire have determined not to employ any workmen who belong to the Operative Brickmakers' Union. The same manufactories notices have been posted to the effect that the workmen already employed must cease their connection with the union, or at the expiration of a certain notice leave the works. In defence the Unionists have commenced a movement with the view of establishing co-operative societies for the employment of the men belonging to the Union who may be deprived of work in consequence of this decision of the masters. In Rochdale and other towns, similar societies, it is alleged, exist, and are worked with advantage to the operatives and the profit of the shareholders. The men are holding public meetings of their body in Birmingham and South Staffordshire in advocacy of the movement.——At the instance of the sub-inspector of factories for the district, penalties amounting to £179 9s. have been imposed by the Bury magistrates upon Mr. T. B. Crompton, late proprietor of the Prestolee paper mills, for allowing young persons and women to work after 6 o'clock. At the same time three overlookers were fined £3 and costs each, for obstructing the sub-inspector.——The workmen in the employ of Messrs. R. Stephenson and Co., have met, 500 strong, and inaugurated a movement amongst themselves for contributing to the monument to the late George Stephenson, Esq., who was the founder of the works.——The first iron church in Staffordshire was opened on Tuesday last, at Essington, near Wolverhampton. It has been built by voluntary subscription, at a cost of £850 in all, and will accommodate 260 persons. The contractors were Messrs. Hemmingsley, of Bow.——One of three boilers, 36 ft. by 6 ft. 6 in., at the Felling Colliery, Gateshead, has exploded, and killed the fireman, whose body was found at a distance of 100 yards from the original site of the boiler. The cause of the explosion has not yet been ascertained. One of the minor results was the knocking of a locomotive off the neighbouring line of rails.——At the brickworks at Wilnecote, near Tamworth, of Mr. Joseph Arnold, a boiler exploded last week, without, however, injury to anyone, the men having just before removed to a distant part of the yard.——On Saturday, the steam-tug *Gleaner*, of Sunderland, towed a raft of timber to Cambois, Blyth. On leaving there again, and while crossing the bar, her boiler burst, and five men who were on board were scalded, two of them severely. The steamer's anchor was put down, but she soon parted from it, and went ashore upon the rocks to the northward of Cambois.——At their own request, the fishermen of Newbiggen, Blyth, have been exercised in the use of the rocket apparatus for saving life from shipwreck.——The discovery of a seam of fire-brick clay has been made in Commondale, about 12 miles beyond Stokesley, on the North Yorkshire and Cleveland Railway. It is 12 feet in thickness, underlies about 12 acres, is without intervening shale, contains only 1½ per cent. of dileterious substances, is nearly black, and can be drifted out of the hill-side. The discovery must be good news to the shareholders of the railway named.——Not less so to the shareholders of the Oxford, Worcester, and Wolverhampton Railway, that iron-stone had been discovered at Handborough, eight miles from Oxford, where that line has only a little agricultural traffic. After being tested, the stone is found to be of about the same quality as the Northampton ore. It will soon find its way into the extensive South Staffordshire market, where large quantities of Northamptonshire "stuff" is now smelted.——The directors of the Lancashire and Yorkshire and those of the East Lancashire Railways respectively recommend a dividend upon the half-

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year at the rate of 4 per cent. per annum, each carrying surpluses to the reserved fund, the former in addition charging for rails for future use and for past parliamentary expenses no smaller a sum than £23,500.——The Oxford, Worcester, and Wolverhampton directors recommend a dividend of 6 per cent. per annum on the first, and 3 per cent. per annum on the second preference shares.——The Oxford, Worcester, and Wolverhampton Railway commenced on Monday to issue weekly tickets for that portion of their line between Dudley and Wolverhampton.——On Tuesday morning the axle of the guards' van in a train on the Lancashire and Yorkshire broke and threw the carriage off the line as the train was near Dixon Fold. The train was stopped, and a passenger in getting prematurely out of his carriage on the wrong side was killed by a train which was passing at the time on the other line of rails.——On Monday evening, about 7·30, a passenger train on the Great Western Railway was between Shiffnal and Oakengates approaching Wolverhampton when coming into collision with the tail of a train of waggons that seemed to be escaping from a siding, the engine was thrown off the rails and across the line, and the passengers well shaken.——Four lives were sacrificed in the Byeras Colliery, Burslem, on Saturday, by gas being turned out of some old workings into the pit, where men were at work with defective lamps.——The monthly meeting of the committee of management of the Association for the Prevention of Steam Boiler Explosions was held in Manchester on Tuesday last. The report showed that there were 558 mills and other works, and 1,593 boilers under inspection. Out of 668 boilers examined since Dec. 27, 76 had been found defective, 9 dangerously so.——During a conference on Saturday between Mr. Lindsay, M.P., and the Shields Shipowners' Society, that hon. member is understood to have stated that the Government would relieve the shipping from the timber duties, Trinity House charges, passing tolls, and local dues on shipping applied to other than shipping purposes. Mr. Lindsay also stated that a committee would be appointed to inquire into all grievances under which the shipping interest at present labours.

NOTES FROM THE SOUTH WEST.

[FROM OUR OWN CORRESPONDENT.]

The Screw of the "Mersey"—An American Commander on the Great Spithead Review of 1856, and the British Navy—The Royal Albert Bridge—Local Private Bills for the consideration of Parliament — Bristol as an Emigration Port—Cheaper Legislation for Private Objects—Bristol Port Improvements—Women and Watchmaking — Gloucester Trade—Pier at Burnham — The "Nepaul" Steamer—The "Czar"—Mail Communication with the Mauritius—Orders for Machinery—Southampton Inner Dock.

THE screw just received for the *Mersey* frigate is found to be too large, or, at any rate, will involve the enlargement of the space allotted for its accommodation.——Who does not remember, even in this hurrying and forgetful age, the great naval review at Spithead, in the spring of 1856? Commander Walker, of the United States navy, who witnessed the review, has certainly not forgot it, for in a report to his government, recently published, he characterizes that great display of our naval strength as magnificent. The war with Russia, he considers, afforded no indication of the decay which some think may be discerned in the energies of Great Britain; but, on the contrary, after two years, in which Russia was made bankrupt, and France struitened, the strength of England, he thinks, was but roused into full activity. Immense manufacturing energy was revealed, and the Commander thinks there is no reason to believe that had the Government required it, a force of small steamers five times as great could not have been equipped, as one single establishment—that of Penn, of Greenwich—accepted an order for eighty 60-horse engines, to be completed within three months, which they not only fulfilled in the time agreed upon, but put the engines on board the vessels for which they were designed. The Commander notices the fact that there was one type of engine for each class of steamers, and shows that by a judicious distribution of spare parts on board each, no vessel was burdened with a load of machinery, and yet no accident or break-down could occur in a squadron which might not on the spot be repaired. So far as Commander Walker is concerned, Brother Jonathan does full justice to John Bull.——The splendid Royal Albert Bridge, on the Cornwall Railway, is expected to be completed in May. In the construction of this bridge 2,700 tons of wrought iron and 1,200 tons of cast iron have been used; and the fabric comprises, also, upwards of 15,000 cubic yards of masonry and brickwork, and upwards of 15,000 cubic feet of timber. The stone piers at the water's edge are 190 feet high, 29 feet wide, and 17 feet thick; and the length of each arched tube is upwards of 450 feet. The entire length of the bridge exceeds that of the Britannia by 300 feet, so that in some of its details it even transcends that marvel.——Among the private bills which will come before Parliament during the ensuing session, are the following: Bridport Railway; Dartmouth and Torbay Railway, Lymington Railway, Poole and Bournemouth Waterworks, Ringwood, Christchurch, and Bournemouth Railway, Shepton Mallet Waterworks, Somerset Central Railway, Swanage Railway and Pier, Tavistock Markets, Streets, and Improvements, Weston-Super-Mare Improvement and Market, Weymouth and Melcombe Regis Markets and Pier, &c., &c.——It appears that the Bristol Chamber of Commerce presented a memorial to the late colonial secretary, (Mr. Labouchere,) with regard to the capabilities of Bristol as an emigration port. No reply was given to the memorial, but favourable communications have been received from Melbourne and Sydney in answer to petitions presented to the legislative assemblies of Victoria and New South Wales. The question is still not "lost sight of."——An important passage occurs in the voluminous and extremely able annual report just presented to the members of the Bristol Chamber of Commerce. The report calls attention to the bill carried to a second reading last session by Mr. Paull, M.P. for St. Ives, and afterwards withdrawn. The object of Mr. Paull's bill was to enable localities to bring any proposed public improvement in connection with docks, piers, &c., before the board of Admiralty, and after due enquiry, to obtain an act of parliament, as a public act, which would involve much less expense than is incurred under the present system. The chairman of the meeting at which the report was presented (Mr. P. W. S. Miles), made an interesting speech, and a passage or two is subjoined. Mr. Miles observed that it appeared to him that the trading classes of Bristol should not relax their efforts to carry out the objects they had at heart, —viz., the provision of better accommodation for large sailing ships and ocean steamers. He could not help thinking that a report given on the subject by Mr. Walker was not altogether a satisfactory one. Many years ago, he (Mr. Miles) was connected with a scheme known as the Portbury Pier, the principal point being that there should be a large floating pier off Porsit. If Mr. Brunel thought such a pier feasible there, where the run of the tide is stronger than at Kingroad, how was it that a similar scheme was not feasible at the mouth of the river? He had the highest opinion of Mr. Walker, but he should have a very poor opinion of the Board of Admiralty if everything which Mr. Walker said was to be taken for granted. There were, no doubt, other engineers to whom such reports were referred. In regard to other topics, Mr. Miles added that the branch of the South Wales Railway appeared to be progressing satisfactorily. When completed, it would be of great importance to Bristol, for it was as necessary that communication should exist between South Wales and Bristol as that there should be adequate accommodation at the mouth of the river. Another speaker stated that he had heard that there was some thought of an effort for straightening the river. This, he said, would be a good thing, no doubt; but it would not bring a better or a larger class of ships than Bristol had at present. The river was quite good enough for the present trade, but the object should be to attract a different class of vessels, and he hoped the efforts made on the subject would yet be successful. ——Mr. Bennett, who has been lecturing in the metropolis on the desirability of employing women in watchwork, is visiting some of the leading provincial towns for the purpose of developing his views on the subject. Yesterday week Mr. Bennett was at Bristol; and, in addressing a meeting there, he drew a vivid comparison of the poor English sempstress, earning sixpence by eighteen hours of incessant toil, the factory hand, separated from her domestic duties, and the thousands of girls cast, for want of work, upon the streets of the metropolis and large cities of the country, and the mother and daughters of a Swiss family in the midst of the Alps, minding the children, milking the cow, and at the same time obtaining a large sum by making the lighter portions of a watch. On the one hand, grinding penury and dismal vice; on the other, Arcadia, with a useful dash of the commercial element. Mr. Bennett makes no secret of the fact that there is in the trade a powerful combination of men against the employment of women, but states that the very persons who take the most violent part in it are fain to send to Geneva for some portions of watches, which can in no way be made so well as by the delicate touch of the female hand. Mr. Bennett also intimates that he has some intention of establishing a school for the training of women in the business out of his own resources.——It is stated that Messrs. Dent & Co., the eminent glovers, propose to open an establishment in Gloucester, at which 1,000 persons will be employed. The shipping trade of Gloucester shows a satisfactory increase in 1858, as compared with 1857.——At Burnham (at the foot of the Mendip Hills) a pier—referred to as "a great desideratum"—is approaching completion, under the superintendence of Mr. Scott.——The *Nepaul*, new screw steamer, belonging to the Peninsular and Orientrl Steam Navigation Company, has arrived at Southampton from Blackwall, where she was built by the Thames Iron Shipbuilding Company. The *Nepaul* is 1,000 tons burden and 200 horse-power; length between perpendiculars, 320 feet; beam, 30 feet. The machinery is by Messrs. Humphrys and Tennant, and the engines are direct acting; the boilers are Lamb and Summers' patent. The *Nepaul*, which has accommodation for 60 first-class and 20 second-class passengers, averaged 10¼ knots in her voyage from the Thames with a stiff breeze against her. She is destined for the Malta and Marseilles station. In a trial trip in Stokes Bay, on Saturday, she made 12¼ knots.——It was stated last week that the *Ceres* steamer struck on the Lizard Point and foundered. The name was misreported in the original despatches published on the subject, the *Czar* being the lost vessel. The *Czar* was built only a few months since by Messrs. Samuelson & Co., shipbuilders, of Hull, and was one of the largest vessels ever turned out at that port. She was provided with a patent lifting-screw and all the latest improvements. ——The Union Steamship Company have submitted to the Government of the Cape Colony a proposal for the extension of mail communication with the Mauritius by the establishment of branch steamers calling at Port Elizabeth and Natal. The estimated guarantee required is £22,000, one-half to be provided by the Imperial Government.——Messrs Summers and Day have been directed by the Government to proceed with the construction of the machinery of two dredging vessels, in addition to an engine of 800-horse power, for the Royal Mail Steam Packet Company. ——The enlargement of the inner dock, Southampton, is progressing rapidly, and it is expected that the dock will be ready for the reception of ships in April. The west and south walls are within a few feet of the coping level. The north wall, which gave way last summer, has been pulled down, and is now again raised above low-water level; it will be a very substantial work. At the lock the work is progressing favourably. The gates are nearly finished, and will shortly be erected. Bridges for the locks are being made on an improved principle by Messrs. Summers and Day, and four jetties on the west side of the dock are being constructed, two being nearly completed. During the last ten months, upwards of £35,000 has been expended on the works.

NOTES FROM THE EASTERN DISTRICTS.

[FROM OUR OWN CORRESPONDENT.]

The Nene Valley Drainage: Dams at Waldersea and Guyhirn—An odd kind of Bricks—The Reclamation of Marshes at Wells-next-the-sea—Approaching Agricultural Meetings in the Eastern Counties—Grievance of a Gas Company—Compartment-built Ships—The Mayor of Lincoln—The University of Cambridge.

THE dispute with reference to the removal of the dams in the Nene at Waldersea and Guyhirn has come before the Wisbeach magistrates, the town council of that place having preferred an information against the Nene Valley Drainage and Navigation Improvement Commissioners, for causing certain unnecessary obstructions to remain in the river. Mr. F. Jackson, town clerk of Wisbeach, appeared on behalf of the town council; and Mr. Webster, barrister, for the commissioners. The principal witness on behalf of the council was Mr. Thomas Page, C.E., who expressed an opinion that it would be very unadvisable to retain the dams; there had already been very great silting-up in the river, and unless something was done, it would become useless as a port. On the other hand, Mr. Fowler, C.E., was examined on the part of the commissioners, and stated that it would be very inexpedient to remove the dams, in favour of which opinions of eminent engineers have been expressed. The upshot of the application to the magistrates was, that the bench directed that the Waldersea dam should be removed forthwith.——A singular discussion has taken place in the Ipswich town council, Mr. Gowing stating that complaints had been made to him in regard to the bricks used in certain alterations which were being made at the gaol. Mr. Gowing exhibited for the edification of the council a specimen brick, which he crumpled to dust with his fingers. This proceeding elicited loud laughter, and Mr. Gowing was asked whether he had not by mistake got hold of a piece of concrete? A negative reply was returned by Mr. Gowing, who again covered the table with red powder, remarking that the bricks used were of an excessively porous character, because very little clay entered into their composition. He considered that they would decay rapidly, and that the walls of the cell would be damp instead of dry; an animated discussion took place, and the gaol committee were requested to direct their attention to the subject, and deliver a report thereon. ——Reference was made last week to the reclamation of 700 acres of marshes near Wells-next-the-sea, Norfolk. The embankment by which the reclamation is accomplished commences at the foot of the quay, extends in a direct line to the mouth of the harbour, and is 1¼ miles in length; it is 108 feet at base, 17 feet in height, and the footpath at the top is 5 feet wide. A carriage-drive 30 feet wide will be added on the river side, with the view of giving direct communication with the beach, now afforded by a circuitous route by Holkham, where the Earl of Leicester, the prime mover in the matter, has his princely seat.——The three leading agricultural societies of the eastern counties will hold their summer meetings as follows:—Norfolk, at Swaffham, June 16; Suffolk, at Ipswich, June 17; and Essex, at Colchester, July 1.——The Cambridge Gas Company, it will be remembered, applied recently against the poor-rate assessment; and it appears that with a capital expended of £34,000, the amount of their assessment is £2,542; while the expended capital of the Imperial Gas Works, Hackney, is £200,000, and the amount assessed for poor-rate is only £2,000. Several comparisons equally glaring are offered by the Cambridge Company, who consider themselves, and with some reason, deeply aggrieved.——If any doubts were entertained of the greater safety of ships built in compartments, an illustration would be supplied on the subject by a private letter received in Stamford from a midshipman on board the *Feroze*, steam frigate of the Indian Navy, in collision on the 27th of November with the steamer *Pearl*, which conveyed Dr. Livingstone and his gallant comrades to Africa. The midshipman writes that he had just turned in after keeping his watch, and had just gone to sleep, when he was awoke by the noise and "bump" of the collision. The *Pearl*, it was found, had received very serious damage on the port-side, and it was necessary to assist her into the nearest port—Quilon. She was cut seven feet below the water line, and would of course have filled at once and gone to the bottom if she had not been built in compartments ——The Mayor of Lincoln (Mr. Joseph Shuttleworth, of the well-known firm of Clayton, Shuttleworth and Co.,) is about to present to the church of St. Peter-at-Arches in that city an ornamental frame of wrought metal (harmonizing with the other features of the building) for the corporate insignia.——The public have observed with a good deal of pleasure the ready co-operation afforded by the authorities of the University of Cambridge to the movement for rendering the University system more in accordance with the spirit and necessities of the age. It is not at all unnatural that such attention should be given by the Cambridge "heads" to the middle class or "non-gremial" examinations in the leading provincial towns, for as regards the "honour" men, the University has this year barely maintained its position, while the number of candidates for "poll" degrees is very greatly reduced. The number of wranglers, senior optimes, and junior optimes was as follows, this year and at the corresponding period of 1858:—

CLASS.	1859.	1858.
Wranglers	38	42
Senior optimes	47	44
Junior optimes	46	44
Ægrotant	1	4
Total	132	134

As regards the candidates for ordinary or "poll" degrees, the comparison stands thus:—

First class	27	23
Second class	29	54
Third class	31	76
Fourth class	12	20
Ægrotant	3	3
Total	102	176

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As the gentlemen who have now come out matriculated in October, 1855, the war then raging may have possibly had some influence upon the figures of the present year; but, however this may be, it is clear that there is scarcely the same eagerness as formerly to push young men, whatever their talents, into a university life, under the present system. Hence the effort to make the non-gremial examinations a means of recruiting the university. Of the 131 gentlemen who have taken honours, Trinity College contributed 38; St. John's, 31; Pembroke and Magdalene, 1 each; Sidney Sussex, 5; Emmanuel, 7; St. Peter's, Trinity Hall, and Jesus, 3 each; Clare, 6; Caius, 18; Corpus Christi and St. Catherine's, 2 each; Queen's, 4; and Christ's, 10; Downing and King's do not figure in the list.

METAL AND COAL TRADES, &c.

[FROM OUR OWN CORRESPONDENT.]

The Iron Trade Generally of the Past Week: How affected by the War Cloud—The Iron Trade in South Staffordshire—In South Wales—The Coal and Iron Trade in North Wales: of what the Coal-masters there are apprehensive—The Reports from Derbyshire, Yorkshire, and Lancashire—The Coal Trade in Derbyshire—The Sheffield Trades—The Hardware Trades of Birmingham, Wolverhampton, and their Districts—Metals on the Liverpool 'Change—Glasgow Market—Oxfordshire and the Metal and Coal Trades—The Trade of Leeds in Metals and Fabrics—The State of Things in Manchester, Rochdale, Bradford, Halifax, Huddersfield, Leicester, and Nottingham—The Glass-makers' Dispute—The Colliers of South Staffordshire—Total Exports of Coal from Great Britain in 1858.

MUCH cannot be said for the iron trade as the result of the past week's experience. The war cloud, which it was hoped was dispersing, seems now to have become more charged. As ever, so also now, the demon War is the enemy of trade and commerce in nearly all its branches. On account of the apprehensions which the existing very uncertain and extremely unsatisfactory state of things produces, a check has been felt in the past week to the progress which was so observable a month or three weeks ago. The improvement which then set in has not been maintained in the past fortnight; and its subsidence has been particularly observable in the past seven days. Since our last report, very few orders have come to hand for any description of iron. Some of the houses which stand A 1 on the list of firms, do not yet much feel this, as the orders taken at about quarter day will suffice, with the constantly-recurring necessities of established customers, to carry them through the quarter. With the less conspicuous firms, however, the case is different. These have, for some time, been compelled to exist upon the orders obtained from week to week. They, therefore, feel the recently altered state of the trade; and, as a consequence, have their machinery only in partial activity. Prices for malleable iron are easier this week; and the movement in pigs is in the same direction.

South Staffordshire.—The reports of the several iron-masters on 'Change at Wolverhampton, on Wednesday last, showed trade had not progressed in the past week, from the cause already indicated. Little or nothing was done on that day. On every hand there was a manifest apprehension as to the future, which had far otherwise than a cheering influence upon the whole proceedings.

From South Wales our last advices state that the iron and coal trades are still improving in position. Large quantities of steam coal are being shipped at Cardiff, but the trade of Newport is rather depressed. Railway iron is being disposed of freely, and pigs are likewise sought after. The principal demand is for home consumption, at the present moment, but some good orders are received from the continent.

We learn from North Wales that a good trade is being done in iron, stone, and coal. The coal masters, however, are fearing an increase of toll by the Great Western Railway Company, as the result of a bill which that company purpose introducing into Parliament on an early day. Some mines at Ruabon belong to persons connected with that line. In the manufacturing of iron, also, North Wales is tolerably active.

In the reports from Derbyshire, Yorkshire, and Lancashire it is stated the demand for rails is active, owing to the large contracts which are in hand for Australian lines. The inquiry for sheets and plates is also improved. The rates are well maintained, and the makers of first-class brands are full of orders. The pig-iron trade is also in a better state as compared with some weeks ago. The coal trade of those districts is improving, the demand in Derbyshire being largely on the increase. The large pumping engine of the North Derbyshire Mining Company was started on Thursday last for the first time, amid such a display of enthusiasm as is seldom witnessed in a Derbyshire village.

The Sheffield trade is in a better state, since the commencement of the year orders have been given out pretty freely. The orders from America are but small, but the demand from other districts has increased.

Birmingham, Wolverhampton, and their districts are well employed as a whole. The instalments of orders received from travellers out are regarded pretty favourably by the manufacturers.

At Liverpool Exchange on Saturday last the demand for manufactured iron was moderate, and purchasers were cautious in their operations; the prices of common Welsh bars was £6 12s. 6d. to £6 17s. 6d.; Staffordshire, £7 to £7 2s. 6d.; and hoops, £8 7s. 6d. to £9 per ton. In tin plates business was limited, purchasers being unwilling to pay the higher rates generally demanded by holders. Copper continues steady, with a moderate demand; British cake and tile, £112 10s. per ton, and copper sheathing, 1 ¼d per lb. The prices of lead are £21 15s. to £22 per ton for sheet, and £22 15s. to £23 for pig. The pig iron market at Liverpool on Monday was quiet; sellers at 53s. and 53s. 3d. cash, and 54s. three months open; buyers at 52s. 9d. cash, and 53s. 6d. three months open.

From Glasgow we learn that speculation for the moment has closed, and that it shows no signs of being resumed, unless affairs assume a more settled appearance on the Continent.

Oxfordshire (aye, even classical Oxfordshire, gentle reader) is about to furnish material for a paragraph under the heading of "Metal and Coal Trades." A shaft is being sunk on land belonging to his Grace the Duke of Marlborough, in the parish of Northleigh; mining operations are commenced on the estate of Mr. Chamberlain at Adderbury; measurements and levels have been taken for a tramway intended to convey iron ore from Dr. Wilson's estate at Overworton to the Somerton station of the Great Western Railway; while miners in the employ of Messrs. Blackwell and Co., of Dudley, are now procuring from a depth of 35 yards below the surface a quantity of "green stone ore" at Steeple Aston.

From Leeds we learn that the manufacturers of iron in that district are well employed, and for some descriptions of iron are realising a slight advance in price. By an extension of the machinery previously in operation at old works, and by an increase in both works and also machinery, the make of iron in this district is largely increasing. The machine tool trade is manifesting faint signs of awakening from a state of almost torpor. Continental orders are affording considerable employment to the manufacturers of textile machinery. In locomotives there is no great deal doing. The nail-makers are busy.

In textiles, Leeds is an exception to most of the other towns, as well in Lancashire as Yorkshire. Reports from Manchester, Rochdale, Bradford, Halifax, Huddersfield, Leicester, and Nottingham, all show that trade is quieter. The unsettled state of European politics exercises an unfavourable influence. Exports are checked; merchants seem in a state of uncertainty, and operate cautiously.

The glass-makers' dispute is prolonged. A meeting of delegates from the various trades' societies of London was held last Friday in the metropolis to hear the statements of deputations from Birmingham and Stourbridge; and the meeting decided that the glass-makers were worthy of the support of all the trades in London. If they should get it the deputation stated that they could easily resist their employers another six months.

The colliers of South Staffordshire have met and resolved to give their employers notice to-morrow (Saturday) that they must have an advance of sixpence a day upon their present wages, else at the expiration of a fortnight they will cease working and not return to the pits until the advance is accorded. This is a return to half the rate that the men were receiving prior to the last strike in that district.

The total export of coal from Great Britain in the year 1858, as stated in the circular of Messrs. W. and H. Laird and Co., of Liverpool, issued on Friday last, was 6,077,863 tons, showing a decrease as compared with the year 1857 of 148,187 tons. The exports were as follows:—From the Northern ports, 3,592,206 tons; from the Yorkshire ports, 253,649 tons; from Liverpool, 167,478 tons; from the Severn ports, 1,382,277 tons; and from the Scotch ports, 382,262 tons. There was a decrease on the year at all the ports except the Yorkshire ports, where the increase over the year 1857 was 22,785 tons. The total exports for December were 381,077 tons.

Patent for Inventions.

PROVISIONAL PROTECTIONS.

Dated December 10, 1858.

2832. J. Bethell, of Parliament-st., Gentleman. Improvements in machinery and apparatus for the preservation and colouring of wood.

Dated December 31, 1858.

3004. J. H. Sievers, of Rathbone-place, Oxford-st., Gentleman. Apparatus for tightening and releasing the belly bands of riding saddles. A communication from C. Zipp, of Paris.

Dated January 3, 1859.

28. E. Balchin, of Hull, Gun Maker. An improved construction of projectile, applicable to the whale fishery.

Dated January 7, 1859.

52. I. Holden, of St. Denis, near Paris, and A. Holden, of Bradford. Improvements in means or apparatus employed in preparing and combing wool and other fibres.

54. J. J. Florence, of Paris, Merchant. Improvements in reels or spooling-wheels.

56. A. Barclay, of Kilmarnock, Engineer. Improvements in electric and magnetic telegraphs.

58. H. Reynolds, of Denmark-hill, Gentleman. Improvements in refining and decolorizing saccharine substances.

Dated January 8, 1859.

60. H. Harden, of Dundalk, Ireland, Locomotive Superintendent. Improvements in fire bars for steam boiler and other furnaces.

62. D. Friedlaender, of Manchester, Tobacconist. An improved smoking pipe.

64. F. Versmann and A. Oppenheim, of Bury-court, St. Mary Axe, Analytical Chemists. Improvements in the treatment of various substances, by which to render the same uninflammable.

Dated January 10, 1859.

72. R. D. Clegg, of Manchester. Improvements in signalling apparatus.

74. T. J. Claxton, of Montreal, Merchant. Improvements in the manufacture of boots and shoes. A communication from M. Bray, of Montreal.

76. J. S. Margetson, of Cheapside. An improved box or case, suitable for hats, collars, and other useful purposes.

Dated January 11, 1859.

80. C. M. Kernot, of West Cowes, Isle of Wight, Doctor of Medicine. Improvements in purifying and decolorising paraffine, and rendering the same white, hard, and sweet.

82. B. Robbin, of Yarmouth, Nova Scotia, Master Mariner. Improvements in the machinery for working pumps.

84. D. E. Hughes, of New York, Telegraphic Engineer. An improved mode of insulating electrical conducting wires.

86. R. and W. Hawthorn, of Newcastle-on-Tyne, Engineers. Improvements in apparatus for promoting combustion and preventing smoke in coal-burning locomotives and other steam-boiler furnaces.

88. F. Versmann and A. Oppenheim, of Bury-court, St. Mary Axe, Analytical Chemists. Improvements in rendering fabrics and substances non-inflammable.

Dated January 12, 1859.

90. P. Bouché, of Paris, Stays Maker. Improvements in the used means for mechanically raising up the gowns of ladies and young ladies.

91. W. and W. T. G. Bray, of Folkstone, Engineers. Improvements in locomotive and traction engines.

92. W. Oliver, of Shadwell. Improvements in boats, and in the mode of propelling them.

93. J. Thomson, of Dundee, Manufacturer. Improvements in the manufacture of rugs.

94. J. Hands, of Notting-hill, Surgeon. Improvements in preserving or preparing skins intended to be converted into leather, or otherwise manufactured.

95. J. Gibbons, of Oxford-st. Improvements in fixing door and other knobs.

96. S. Canning and H. Clifford, of Leadenhall-st., Engineers. Improvements in machinery for paying out and for recovering or picking up submarine telegraph ropes, cables, or chains.

97. T. Elwell, of Paris, Engineer. Improvements in governors for steam engines and other motive power engines.

98. W. McNaught, of Manchester, and W. McNaught, of Rochdale, Engineers. Improvements in steam engines and in apparatus connected therewith.

99. S. Phillips, of Moseley, Worcester, Gentleman. Improvements in fastenings for securing windows, shutters, and doors, and for other similar uses.

100. R. Mushet, of Coleford, Metallurgist. A new or improved metallic alloy.

101. R. Mushet, of Coleford, Metallurgist. An improvement or improvements in the manufacture of cast steel.

102. C. N. May, of Devizes, Engineer. Improvements in sluice valves.

103. C. Beslay, of Paris, Engineer. Improvements in coating or covering iron or steel with tin, zinc, or lead, or alloys of those metals, by electrical deposit.

Dated January 13, 1859.

104. C. N. May, of Devizes, Engineer. An improved heat indicator.

105. R. A. Lightoller, of Chorley, Cotton Spinner. Certain improvements in machinery or apparatus for spinning cotton or other fibrous materials.

107. W. H. Crispin, of Stratford, Copper Smelter. Improvements in the construction of ships and other sailing and steam vessels.

108. H. Critchley and S. Elston, of Bury, Engineers. Certain improvements in pistons for steam engines or other purposes.

109. G. Scopes, of Needham Market, Suffolk, Bricklayer. Improvements in apparatus for communicating motion to cots, cradles, and other articles for children's use.

110. J. Picksley and R. Sims, of Leigh, Machine Makers. Improvements in lawn mowing machines.

111. W. H. Morrison, of Nottingham, Manufacturer. Improvements in wind musical instruments.

112. D. L. Banks, of Kennington, Engineer. A method of constructing a travelling suspension rail or roadway, applicable, among other uses, as a bridge and lifting agent.

113. J. J. Stevens, of Darlington Works, Southwark, Engineer. Improvements in railway signal apparatuses.

114. F. J. Manceaux, of Paris, Manufacturer, and E. N. Vieillard, of the same place, Gunsmith. Improvements in breech-loading fire-arms and in cartridges.

115. J. Grist, of Beazley-crescent Old Ford, Engineer. Improvements in machinery for cutting and shaping staves and heads for casks, and for the manufacture of casks.

116. W. A. Chadwick, of Wand-sworth-road, Merchant. A musical instrument, chiefly for teaching the intervals of musical scales.

118. T. Herbert and E. Whitaker, of Nottingham. Improvements in the manufacture of warp lace.

119. O. Rowland, of May Fair. Improvements in laying electric telegraph wires in streets.

120. J. Barrans, of Peckham. Improvements in traction and portable steam engines.

121. T. Sampson, of Barcelona, Spain. Improvements in apparatus for feeding steam boilers with water.

Dated January 14, 1859.

122. S. Holt, of Manchester, Silk Manufacturer. A new and improved manufacture of woven silk fabrics.

124. W. Craft, of Hammersmith, and T. Wilson, of Chiswick. Improvements in drawers and napkins so as to render the same waterproof.

125. W. Davis, of Globe-fields, Mile-end. Improvements in sluice valves.

126. J. Danglish, of Tunbridge Wells, M.D. Improvements in obtaining carbonic acid gas.

127. R. Romaine, of Chapel-st., Bedford-row, Gentleman. An improved arrangement of portable railway.

Dated January 15, 1859.

129. W. H. E. McKnight, of Swindon, Wilts. An upright-celled boiler, applicable to all heating purposes by hot-water or other fluid.

131. D. L. Banks, of Kennington, Engineer. Improvements in the method of constructing a travelling suspension rail or roadway, to be used for the cultivation of land.

133. W. Betts, of Wharf-road, City-road, Capsule Maker. Improvements in the manufacture of capsules, and in the apparatus to be employed therein.

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Dated January 17, 1859.

135. W. Morgan, of Grafton-st., Fitzroy-sq., Gentleman. Improvements in printing and stencilling, and in the apparatus or machinery used therein, also for certain applications of such printing and stencilling.

137. J. Montgomery, of New York. Improvements in the construction of the hulls of steam and other vessels, and in the feed-water heaters, boilers, water-gauges, condensers, engines, and propelling machinery appertaining to the former, a portion of which improvements (with the exception of those on the hull), are applicable to analogous useful purposes.

139. P. A. de St. S. Sicard, of Paris, Chemist. An improved process and apparatus for converting cast iron into steel.

141. W. E. Newton, of Chancery-lane. An improvement in sewing machines. A communication from E. Howe, jun., of Brooklyn.

143. R. G. Salter, of Alphington, Devon, Engineer. Improvements in apparatuses for collecting or picking up letters, papers, and other articles requiring to be stamped or printed.

145. R. Mushet, of Coleford, Matallurgist. Improvements in the manufacture of cast steel.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, Feb.* 1*st*, 1859.)

2126. T. B. Hubbell. Petticoats. A communication.
2127. J. Hope. Printing roller.
2129. T. Howe. Smiths' forges.
2140. D. Grant. Colour-printing presses.
2146. H. H. and W. F. Henson. Waterproofing.
2147. R. Bodmer. Preventing explosions in steam boilers. A communication.
2150. G. L. Fuller. Steam engines.
2161. W. Lander. Engraving and printing.
2164. E. Lewthwaite and G. Ambler. Timepieces.
2165. B. Jones. Clod crushers.
2172. G. T. Bousfield. Paper bags. A communication.
2203. L. A. Normandy, jun. Sulphate of copper. A communication.
2206. J. Mills. Roving, slubbing, &c.
2209. W. Menelaus. Straightening rails and bars.
2241. W. A. Munn. Horse-shoes.
2245. J. T. Smith. Electric cables.
2246. E. Birchley. Cartridge.
2270. L. Wray. Insulating telegraph wires.
2271. T. C. Shaw and F. H. Cooper. Motive power.
2287. L. Cowell. Apparel for preserving life at sea.
2289. A. Gordon. Cast iron, steel, and wrought iron. A communication.
2301. W. Bacon. Valves, &c. A communication.
2343. R. Griffiths. Baths.
2351. J. M. Napier. Printing machines.
2382. A. V. Newton. Candles. A communication.
2479. R. E. Pinhey and J. Wood. Ships' compasses.
2613. G. Howe and J. Norton. Boiling water.
2627. A. J. Thorman. Chain cables.
2671. C. E. Amos. Raising ships.
2687. M. Meyers. Parasols.
2746. G. W. Bales. Door sashes, &c.
2836. R. A. Brooman. Cranked axles and shafts. A communication.
2931. J. J. Welch. Neck-ties.
28. E. Balchin. Projectile.
52. I. Holden. Preparing fibres.
53. E. Heywood. Weaving.
56. A. Barclay. Telegraphs.
77. J. White. Purifying air.
93. J. Thompson. Rugs.
94. J. Hands. Preparing skins.
105. R. A. Lightoller. Spinning.
113. J. J. Stevens. Railway signals.
115. J. Grist. Casks.
124. W. Craft and T. Wilson. Drawers and napkins.
126. J. Dauglish. Carbonic acid gas.
127. R. Romaine. Portable railway.
137. J. Montgomery. Steam vessel, &c.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed January 28, 1859.

1714. J. Brierley.
1716. J. F. W. Featherstonhaugh and F. Wise.
1722. J. Watkins.
1723. C. and F. Schiele.
1725. T. Webb and J. Craig.
1726. J. Davey, H. Sims, J. Mayne, W. Hodge, and J. Gerrans.
1729. J. S. Bailey.
1733. G. Ashcroft and H. W. Wood.
1734. G. Davies.
1736. H. Conybeare.
1737. H. Conybeare.
1750. J. L. Norton.
1758. R. Cunningham.
1760. G. Bell.
1763. J. Greenwood.
1768. J. Taylor.
1776. J. Luis.
1859. A. Slate.
1946. W. E. Newton.
1950. J. Ireland.
1978. A. V. Newton.
2046. J. Wright, sen., and J. Wright, jun.
2156. C. Hall.
2310. T. W. G. Treeby.
2317. B. Nickels.
2399. J. W. Mott.
2452. H. Tertian-Moret.
2498. W. Smith.
2606. J. M. Miller.
2652. E. H. Bentall.
2660. A. V. Newton.
2698. R. Alexander.
2721. J. Gresham.
2754. L. MacKirdy.
2755. L. Mac Kirdy.
2767. C. Coates.

Sealed February 1, 1859.

1744. J. W. Schlesinger.
1747. S. Hine.
1766. C. Callebaut.
1779. J. Luis.
1785. R. A. Brooman.
1794. S. Carey.
1795. G. Weston.
1820. R. H. Collyer.
1837. J. Fogg.
1893. F. Preston and W. Macgregor.
1924. J. Macintosh.
2037. A. M. Peters.
2373. W. E. Newton.
2416. W. E. Newton.
2651. A. V. Newton.
2775. R. Pickering.
2821. H. Maudslay.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

222. J. Wormald.
236. D. Foxwell.
254. J. L. Stevens.
255. J. Gretton.
261. H. Tylor.
268. J. B. Anderson.
269. T. Hurst.
287. B. F. Miller.
299. E. S. Robinson.
313. J. Howard.

LIST OF SPECIFICATIONS, &c.

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NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

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BOILERS AND THEIR FURNACES, 1244.
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1220, 1233, 1252, 1258, 1259, 1260, 1264, 1276.
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1218. J. SCHLOSS. *A so-called book-clasp or improved fastening of books, being also applicable to pocket-books, ledgers, blotting cases, and similar articles where locks, bolts, or clasps are employed.* Dated May 29, 1858.

This chiefly consists of a main plate or box containing mechanism for bolting and locking, such as springs, trigger plate with cams, slots, or notches, &c., worked upon by a trigger extending outside of the main plate, and for locking by a key introduced on its outside plate or guard plate; the main plate is made with a hinge plate rivetted or screwed to one side of the book, &c., whilst the opposite side has a similar plate containing a hasp which enters the slot of the bolt when brought near it. *Patent completed.*

1219. J. YOUNG and J. STRANG. *Improvements in the manufacture of starch, gum, or dextrine, and their compounds.* Dated May 31, 1858.

This consists in using whey obtained from milk. *Patent completed.*

1220. J. B. THORNBER. *Improvements in carriages for children, commonly called "perambulators," which improvements are also applicable to invalid and other carriages.* Dated May 31, 1858.

This consists in applying a circular covering or shade. *Patent completed.*

1221. J. B. GIBBD, and P. F. WOHLGEMUTH. *Improvements in ornamental staining, dyeing, and fixing designs, writing, letterpress and type printing and cyphering, and colours, on wood, or any other substances; also extracting, transferring, or discharging colours from the same.* Dated May 31, 1858.

This consists in using for the above purposes metallic salts and oxides. *Patent abandoned.*

1222. G. K. SNOW. *A new and useful machine for affixing postage stamps to letters.* Dated May 31, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

1223. W. PARSONS. *Improvements in steam-engines, for propelling vessels and other purposes, and in bearings for the screw-shafts of steam vessels.* Dated May 31, 1858.

Here two steam cylinders are placed horizontally and opposite each other, with their axes at right angles to the main shaft. In each cylinder there is a piston, and these pistons are connected together. Between the two rods there is a vertical slot, and through this slot a bar passes. At one end of this bar there is a ball carried by a socket bearing on a standard; the other end of this bar fits into a socket on the face of the disc fixed on the end of the main shaft. The cylinders may be applied to act on the bar, half way between its stationary bearing and its bearing in the disc, or at any other point. In some cases he employs oscillating cylinders. To support screw shafts he applies a friction-pulley having its axis at right angles to the shaft. *Patent abandoned.*

1224. H. JAEGER. *Improvements in dyeing wool.* (A communication.) Dated May 31, 1858.

After the wool has been cleansed, it is boiled in a bath of some vegetable acid, such as tartaric or oxalic acid. It is next immersed in a solution of murexide. *Patent abandoned.*

1225. W. E. NEWTON. *Improvements in printing and dyeing textile and other fabrics.* (A communication.) Dated May 31, 1858.

Here the fabric passes between the printing cylinder and the colour roller, sufficient pressure being put upon the former to cause it to press the fabric upon the colour, so that, owing to the elasticity of the fabric, only such portions of it will be presented to the action of the colour roller as correspond to the raised portions of the pattern cylinder. A cloth runs between the fabric and the cylinder, to insure uniformity of action, and another fabric is interposed between the fabric to be printed and the colour roller. There are modifications included. *Patent abandoned.*

1226. J. AUSTIN and J. ARMSTRONG. *An improvement or improvements in the manufacture of coke.* Dated May 31, 1858.

This consists in passing a current of steam through the coke when in a state of strong ignition. *Patent completed.*

1227. C. BINKS. *Improvements in manufacturing soap.* Dated June 1, 1858.

This consists in the use of linseed oil. Also in the use of atmospheric air passing through the materials during saponification. *Patent abandoned.*

1228. A. BARCHOU. *A heel for boots and shoes.* Dated June 1, 1858.

This consists of a hollow leather heel. *Patent completed.*

1229. C. F. VASSEROT. *A kind of tramway to facilitate the locomotion of bedsteads.* (A communication.) Dated June 1, 1858.

The inventor fixes under the castors a sheet-iron band, having a small projecting flange on each side; the two rails are nailed to the floor. *Patent abandoned.*

1230 A. G. GRANT. *A method of preparing paper in order to render it waterproof, and adapted for the reception of photographic pictures.* Dated June 1, 1858.

The inventor impregnates paper with a composition of the following materials:—Asphalte, oil, turpentine, Canada balsam, caoutchouc, gum lac, and white wax, with or without chloroform. It is then placed in an oven wherein the heat is raised to a point just below that at which the material will ignite, where it remains until dry, when it is fit for use. *Patent abandoned.*

1231. A. G. GRANT. *An improved stand or rest for cameras, theodolites, guns, and other articles.* Dated June 1, 1858.

This consists of three or more legs which, when brought together, unite in the form of a cylinder. *Patent abandoned.*

1232. R. W. CHANDLER and T. OLIVER. *Improvements in agricultural apparatuses for ploughing and otherwise operating upon land.* Dated June 1, 1858.

This invention was described and illustrated at page 9 of the MECHANICS' MAGAZINE, No. 1, New Series.

1233. J. LANG. *An improved method of signalling on railways.* Dated June 1, 1858.

The inventor fixes along the line horizontal levers, which vibrate with a slight force; these levers are connected by pulleys and cords with each other, and also with a bell or gong, at the stations along the line; the levers are placed so that a stud fixed upon a chimney or other part of the engine will strike them, cause them to vibrate, and thence, by pulleys, cords, &c., act upon the bell at the station, indicating that the engine has passed a particular point. *Patent abandoned.*

1234. F. J. CANDY. *Improvements in machinery for the manufacture of fishing and other nets.* Dated June 2, 1858.

Upon a bed the inventor fits two socket bars with as many sockets as there are shuttles; one end of these bars is furnished with a rack geared into by a toothed wheel, so that, upon giving motion to the wheel, the bars are moved to and fro. The shuttles for holding the thread, &c., consist of frames, each terminating in a foot which fits into the sockets in the carriers. The thread is wound upon spindles mounted in the frame, and capable of moving to wind and give off the thread; just above the foot in which the frames terminate there is a mortice for the reception of

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fingers. On each side of the machine there is a frame capable of sliding to and fro in a direction at right angles to the socket bars; each frame supports in bearings what the inventor terms a finger bar, with as many projecting arms or fingers as there are sockets. At each side of the machine there are two catch bars carrying wires, which wires are connected to a slide, and hook on, or to set free, the threads. One bar at each side is held upon a cord, the opposite end is passed over a pulley at each end of the machine and attached to balance weights. *Patent abandoned.*

1235. J. MANNHARDT. *An improvement in machinery for the manufacturing of peat fit for fuel, and for the squeezing or forcing of fluids out of the said turf, peat, or similar substances.* Dated June 2, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1236. J. LUIS. *A new farming implement, called the gleaner.* (A communication.) Dated June 2, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1237. J. LUIS. *A new description of plough, with forecarriage applicable to all swing or common ploughs.* (A communication.) Dated June 2, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

1238. D. SERVICE. *Improvements in apparatus for producing printing surfaces.* Dated June 2, 1858.

Here a reciprocating tool above the wooden block, heated by gas, is connected to a similar reciprocating tool, which works into the wooden block from below, so that the two tools act simultaneously, one entering the block downwards as the other enters it upwards. *Patent completed.*

1239. C. WHEATSTONE. *Improvements in electric telegraphs, and in apparatus connected therewith.* Dated June 2, 1858.

This consists of mechanism for transmitting messages, and causing them to be printed at a distant station. Long strips of paper are perforated with apertures grouped to represent the letters of the alphabet and other signs; a strip thus prepared is placed in an instrument associated with a rheomotor (or source of electric power), which, on being set in motion, moves it along, and causes it to act on two pins, so that when one of them is elevated the current is transmitted to the telegraphic circuit in one direction, and when the other is elevated it is transmitted in the opposite direction. The elevations and depressions of the pins are governed by the apertures and intervening intervals. These currents following each other indifferently in two opposite directions act upon a printing instrument at a distant station so as to produce corresponding marks on a ribbon of paper moved by appropriate mechanism. *Patent completed.*

1240. H. BROWN, B. HODGSON, and J. CARTER. *Improvements in machinery for introducing and withdrawing wires when weaving.* Dated June 2, 1858.

Here each of the wires is made with an enlarged head, on one side of which is a vertical groove, so that the instrument which draws the wire out of the fabric, and moves it into a fresh shed in the warp, may for the time act on such head, and readily leave hold thereof. The instrument for drawing the wires out of the fabric, and introducing them into fresh sheds in the warp, consists of a sliding vertical bolt, which moves between V guides, carried by a sliding frame, moving in horizontal V guides in a direction to and from the reed. *Patent completed.*

1241. C. WHEATSTONE. *Improvements in electro-magnetic telegraphs, and apparatus used for transmitting signs or indications to distant places by means of electricity.* Dated June 2, 1858.

This consists of various improvements upon a previous patent granted to the present patentee and Mr. W. F. Cooke, dated 21st January, 1840. For the details, which are very voluminous, the specification must be consulted. *Patent completed.*

1242. R. ROBERTS and W. SHAW. *Certain improvements in looms for weaving.* Dated June 2, 1858.

This consists in machinery for raising and depressing the healds to form the shed; and in a mode of closing the perforations of jacquard cards or chains. These improvements are not described apart from the drawings. *Patent completed.*

1243. J. E. F. LUEDEKE. *Improvements in motive power engines.* Dated June 2, 1858.

This relates to engines which act by the ascent and descent of collapsible air vessels in water, mounted on one axis. The axis is supported on the lower end of a rod depending from an oscillating beam, while the other end of such beam is connected to a crank and flywheel shaft, by which the reciprocating motion is converted into rotary motion. *Patent abandoned.*

1244. J. MEIKLEJOHN. *Improvements in boilers for heating water, and in valves for controlling and regulating the flow or passage of the same.* Dated June 3, 1858.

This boiler consists of four tubular water spaces, united by a web of a cruciform figure; two of the spaces are arranged in one plane, and two above. From each of the lower pipes a thin web or water-way springs in a diagonal direction, and these meet each other above the plane of the pipes; from this point the web diverges, and is bounded by the two upper horizontal pipes. The upper pipes are closed at both ends, but at the front part of the boiler are united by an arch pipe, in which are two sockets to receive the ends of the outlet water pipes. The boiler is set in the brickwork, with the two lower pipes resting upon the inner walls, the diagonal cruciform web extending upwards, its lower face being directly over the fire, and the union pipe of the upper water-ways being directly under the crown of the brickwork. The result is extended heating surface. These boilers are adapted for horticultural purposes. The valves have a vertical valve chamber, which also serves as an expansion box; in this chamber is a ring of metal, the face forming the valve seating. The valve is simply a disc of brass which rests upon the seating, the two faces being ground together. *Patent completed.*

1245. E. OWEN. *Improvements in water closets, night commodes, or similar conveniences, and also in disinfecting processes.* Dated June 3, 1858.

The patentee applies drawers with double perforated bottoms, and causes them to slide under or over the seat. The sliding is produced by the movement of the lid, or by opening the door. Into the drawers he puts Smith and M'Dougall's disinfecting powder, &c., and by the sliding motion the perforations are opened, through which the powder falls. *Patent completed.*

1246. W. CLAYTON and J. GOODFELLOW. *A certain improvement in pistons for pumps.* Dated June 3, 1858.

This consists in extending the depth of the piston packing so that it projects or stands above the piston cover, the upper edge being bevelled inwards to prevent the lodgment of sand, &c. *Patent completed.*

1247. J. BETHELL. *Improvements in the manufacture of alum.* Dated June 3, 1858.

The patentee takes weak sulphuric acid and puts it in a closed tank, and causes the gas from coal, &c., to pass through it until it is saturated with ammonia, and the liquid becomes liquid sulphate of ammonia; he then takes this liquid sulphate of ammonia and adds it to a solution of sulphate of alumina, and proceeds to make alum by evaporation and crystallisation as usual. *Patent completed.*

1248. T. SCHOLEFIELD. *Improvements in gas meters.* Dated June 3, 1858.

These relate particularly to the ordinary consumers' meters, and consist, 1, in the suppression of the division plate, which separates the drum from the rest of the meter; or in having either the regulating valve and bent arm or siphon pipe covered with a bell dipping into the water in the meter, or in causing the gas to arrive at once into the siphon pipe. 2, in a special form given to the outside casing of the meter. 3, keeping the water in the measuring chamber at a constant level by a scoop forming one arm of a bell-crank lever, the short arm of which lever is slotted, and in which slot works the pin of a crank fixed on the drum shaft; by this means the scoop at each revolution of the drum carries up a quantity of water from a reservoir to the measuring chamber, and the parts submitted to friction are constantly working in the water. 4, in giving to the entrance of the pipe by which the water is introduced in the meter a funnel-shaped form, and in a better disposition of the plug for closing the same. 5, in a box with a proper division plate, situated beneath the end of the bent arm or siphon pipe, a tube or arm of which latter dips into the water with which this box is partly filled, which water may partly be drawn off from the outside of the meter. This box receives the overflow water from the reservoir. *Patent completed.*

1249. A. V. NEWTON. *An improved manufacture of woven fabric, applicable chiefly where strength and durability are required.* (A communication.) Dated June 3, 1858.

This consists in the manufacture of stout textile fabrics, in which all the warp threads are interwoven with the filling threads. *Patent completed.*

1250. G. DALTON. *Improvements in furnaces for smelting the ores of iron and other minerals.* Dated June 3, 1858.

This furnace will be smaller than those in general use, and the body oblong, narrow at the base. Above the feeding-doors the furnace may be at once contracted to the dimensions of a flue, such flue having an exhausting fan. The inventor places fires on both sides of the furnace, and forces air into the ash-pit by a fan-blower. Between the fires and the base of the furnace is a crucible to receive the iron and slag. At the back of the fireplace is an air-chamber communicating with the fireplace. This chamber is supplied with air from chambers at the sides of the ash-pit. There are many modifications included. *Patent abandoned.*

1251. J. MITCHELL. *Improvements in purifying paraffine.* Dated June 3, 1858.

This consists in treating paraffine with animal or vegetable charcoal. *Patent completed.*

1252. R. OWEN. *Improvements in the manufacture of railway wheel tyres, and in machinery employed therein.* Dated June 3, 1858.

The patentee casts an ingot of steel in a mould, with a core formed partly of loam, clay, or sand, affixed to a piece of sheet iron. After this ingot leaves the mould it is heated in a fire. It is next hammered, after which the opening left by the core, which has become closed by the hammering, is again opened, and the two halves of the tyre forced outward until they attain the form of a hoop, after which the hoop may be hammered and then rolled. The patentee rolls the tyres for railway wheels to an uniform inside and outside diameter, by the simultaneous action of inside and outside rolls. *Patent completed.*

1253. H. EDWARDS. *An improved pipe-stem or tube.* Dated June 3, 1858.

This consists in forming a pipe stem in the form of a cornucopia, with the end intended to be placed in the mouth flattened into the form of a duck's bill. The improved pipe-stem was mentioned with approbation at p. 74 of our last Number. *Patent completed.*

1254. T. WILSON. *Improvements in the construction of mangles.* Dated June 3, 1853.

This invention is not described apart from the drawings. *Patent completed.*

1255. J. BARON VON LIEBIG. *Improvements in protecting the silvered surface of mirrors and other articles of glass.* Dated June 3, 1858.

This consists in preparing the silvered surface of mirrors, &c., by depositing thereon a coating of copper, gold, or other metal, by electricity, combined with the use of a neutral solution of the double salt tartrate of the oxide of copper, and soda, potash, or ammonia, or an alkaline solution of gold, nickel, &c. *Patent completed.*

1256. W. HARGREAVES and E. HALEY. *Improvements in machinery or apparatus for preparing and combing wool, hair, silk, cotton, flax, and other fibrous substances.* Dated June 4, 1858.

This consists, 1, in taking the noils, shorts, locks, and dirt, from the wool, &c., while in the gills and fallers, by a card or comb passing through the substance projecting from the gills before drawing it. The inventors then draw a clean tuft of wool, &c., from the gills. 2, in working gills or fallers by four or eight chains instead of screws. *Patent abandoned.*

1257. E. M. STOEHR. *Certain improvements in looms for weaving.* (A communication.) Dated June 4, 1858.

This refers to changing the position of the shuttle-box, so as to bring any of the shuttles in a line with the shuttle-race. A pinion on the crank shaft is used to drive a pair of wheels, each of which has a stud for giving motion to a tappet plate which acts on a lever connected to the shuttle-box. To regulate the position of this tappet plate, a chain of perforated and plain links is used. *Patent abandoned.*

1258. J. F. DICKSON. *Improvements in the permanent way of railways.* Dated June 4, 1858.

This relates to railroads in which the sleepers, wings, &c., are laid longitudinally. The patentee forms the sleepers, &c., of one piece of plate iron, about one-third of an inch in thickness, in which is a groove running its entire length, into which he places the vertical limb of a single-headed rail. He uses a new form of iron sleeper, to be used with the rails in ordinary use. He also forms teeth in the ends of the bolts, screws, &c., and places catches on the nuts, &c., so that the catch may fit the teeth and prevent the bolt or screw becoming loose. *Patent completed.*

1259. V. MERIGHI. *Means of preventing dust on railroads.* Dated June 4, 1858.

This consists in providing a train with water, to be distributed over the track to keep the earth moistened. The capacity of the reservoir of the tender may be increased, or a special tender made use of. To cool the air, frames provided with linen, wire-cloth, or felt, may be applied to the train, to allow the water to run down along, and the air to pass through them, causing an evaporation of the water and a cooling of the air. *Patent abandoned.*

1260. V. MERIGHI. *Means for impeding and extinguishing fires in railway trains.* Dated June 4, 1858.

The inventor provides the water-reservoir of the tender with a force-pump, to carry the water by a hose to any part of the train. *Patent abandoned.*

1261. T. and J. T. CRICK. *Improvements in the manufacture of boots, shoes, and slippers.* Dated June 4, 1858.

This consists in making lasts so that, when an upper is fixed thereon, the straining may be performed by expanding the last, and then that the shoe, boot, &c., may be finished on such last in the usual way. *Patent completed.*

1262. R. QUIN. *Improvements in ordnance and fire-arms.* Dated June 24, 1858.

Here the inventor forms a horizontal and rectangular opening through the breech, perpendicular to its axis, for receiving two moveable chambers, formed in one piece. Between the chambers is a space to facilitate the sponging after firing through an opening in the breech end. To facilitate the ramming of the charges into the chambers, a semi-circular trough is fixed on each side of the piece to act as a guide, both to direct the cartridges into the chambers, and also to guide the rammer in its strokes. The rammer is of a hooked form, so that the gunner while using it stands behind the piece. The moveable breech-piece is formed to an arc of a circle, and at its end radial arms are fixed which proceed to a centre under the piece of ordnance. In constructing fire-arms he makes a passage through the breech of the barrel, as already described, but only a single moveable chamber is employed. *Patent abandoned.*

1263. R. A. BROOMAN. *Improvements in preparing the fibrous portions of certain textile plants, and the employment thereof when prepared, either alone or in combination with articles already in use, for the purposes of stuffing.* (A communication.) Dated June 4, 1858.

This consists in preparing the fibrous portions of the "musa," the "alve," the agave," the "corchorus fuscus," the "corchorus junceus," the "corchorus olitorius," the "corchorus capsularis," and the palm leaf, for stuffing mattrasses, sofas, chairs, &c. The fibres are cut into lengths of about one foot to eighteen inches; the inventor then cards such material in a carding engine, and bleaches the fibres by a chlorine bath of 3 deg. to 4 deg. Beaumé, with a small addition of muriatic acid, he then washes them in clear water with a few drops of sulphuric acid. The fibres when dry are again carded or curled similar to horsehair. *Patent abandoned.*

1264. J. H. JOHNSON. *Improvements in railway wheels, and in axle-boxes and bearings for the same.* (A communication.) Dated June 4, 1858.

A complete specification of this invention was filed with the application, and an abridgement of it was published at page 620, No. 1846 of the MECHANICS' MAGAZINE. *Patent completed.*

1265. J. BANKS. *An improved reaping machine.* Dated June 5, 1858.

This consists of two horizontal discs with cutting edges, and secured to the lower ends of parallel vertical driving shafts mounted on the front of a carriage, one of the discs being so placed as to overlap a portion of the edge of the other. The two upright shafts with their discs are caused to revolve in an opposite direction. Motion is imparted to the travelling wheels by endless bands. The propelling power consists of two horses, yoked side by side at the rear of the machine. *Patent abandoned.*

1266. M. PAGE. *A steam or power kneading apparatus.* Dated June 5, 1858.

This consists in introducing in a horizontal cylinder the materials to be mixed, and in imparting a helical motion to blades fixed at the end of the shaft which rotates in this cylinder. The shaft is supported on bearings so that it can also slide lengthways, as it has a reciprocating motion. *Patent abandoned.*

1267. H. CARTER. *Improvements in gas burners.* Dated June 5, 1858.

The inventor makes the burner of two parts, both having jets, the upper one being formed as usual, and the lower one having smaller holes. *Patent abandoned.*

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1268. C. HANCOCK. *Improvements in the manufacture of electric telegraph cables.* Dated June 5, 1858.

This consists in protecting the insulated wire by encircling it in a rope of horse hair. *Patent completed.*

1269. E. COOKE and G. DICKINSON. *Improvements in the manufacture of metallic and other bedsteads, and other articles for sitting, lying, and reclining upon.* Dated June 5, 1858.

The specification of this invention is mainly a description of the drawings. *Patent completed.*

1270. R. ORR. *Improved apparatus to be applied to various machines, and is the manufacture of yarn or thread.* Dated June 5, 1858.

This relates to apparatus for rendering uniform the effect of the drag, by which the yarn, &c., is wound upon the bobbing in throstles and doubling frames. A comparatively slow and duly proportioned motion, or a gradually increasing pressure, is imparted by the machine itself to a bar so connected with the frictional appliance as to gradually increase their resisting action. The apparatus is susceptible of various modifications. *Patent completed.*

1271. A. MANBRE. *An improved method of preparing malt and other grain, and of extracting the saccharine matter therefrom, whether for the purposes of brewing, distilling, or otherwise.* Dated June 5, 1858.

Instead of using the grain bruised, the patentee separates the bran by grinding, and uses only the flour. The patentee places in a vessel water, which is heated gradually from 50 deg. to 100 deg. Fah., flour is poured in, and the heating continued to 185 deg. Fah., stirring being maintained the whole time; then is added a quantity of hops, if beer or ale is to be produced; the whole is allowed to settle when infusion and maceration only are required. There are modifications included. *Patent completed.*

1272. F. H WHITEMAN. *Rendering paper hangings, for decorating the interior of houses, capable of being washed by soap and water without detriment to the colours thereof.* Dated June 5, 1858.

The inventor dissolves an ounce of borax and one ounce of stick lac, or other lac, in water, twelve ounces in weight by heat, and strains the mixture. He applies the mixtare with a brush. *Patent abandoned.*

1273. W. PORTER. *Improvements in artillery ordnance, and some other descriptions of fire-arms.* Dated June 5, 1858.

The inventor fixes a rod within the gun, extending along the centre of its bore from the breach to the muzzle. This rod is fixed to the centre of the breach within the gun, and is angular or oval, or has longitudinal grooves upon its exterior; and he gives to the rod a spiral form, or causes such grooves to be made spirally along the exterior of the rod for imparting rotary motion to a projectile. *Patent abandoned.*

1274. W. HOOPER. *Improvements in the manufacture of projectiles.* Dated June 5, 1858.

This consists in the use of the hard compounds produced by subjecting india-rubber and sulphur to heat, in combination with metallic salts. *Patent abandoned.*

1275. G. HADFIELD. *Improvements in the protection of carboys, or other vessels and packages.* Dated June 5, 1858.

This consists in the use of a partial or complete outer casing for increasing the strength of the vessel, rendering it less liable to injury, and better able to resist internal pressure. It also consists in protecting packages by cases constructed of parts capable of being readily separated. *Patent completed.*

1276. E. SCOTSON and H. CHANLEY. *Improvements in machinery connected with traction and other engines, and in endless railways to be used therewith.* Dated June 7, 1858.

This consists in enabling the direction of the revolution of the locomotive wheels to be reversed without stopping or reversing the engine, and also to cause one wheel to turn in one direction whilst the other wheel turns in the opposite direction, so as to turn the engine in a very small space. It also consists in an arrangement of mechanism, forming an endless railway to be used with such engines. One of the advantages of this arrangement is, that by merely opening one of the links of the chain the whole of the railway apparatus may be removed from the wheel. Reference to the drawings is essential to a lucid description of this invention. *Patent abandoned.*

1277. J. FERRABEE. *Improvements in machinery for cutting, collecting, and spreading grass, and for sweeping.* Dated June 7, 1858.

These relate, 1, to the construction and arrangement of the cutting parts of mowing machines, and in the means of regulating their action. 2, to improvements in revolving brushes and rakes, and the use of the same in the manufacture of hay-making and sweeping machines. The invention is not described apart from the drawings. *Patent completed.*

1278. J. J. ROWLEY. *Improvements in apparatus for applying lime, soot, and other matters to turnips and other crops, and manure to land.* Dated June 7, 1858.

This consists in combining blowing apparatus with apparatus similar to what has heretofore been used for applying manure by drills. *Patent completed.*

1279. J. BOULLENGER and L. J. MARTIN. *An apparatus serving to the decomposing neutral fatty substances into fatty or oily acid and glycerine.* Dated June 7, 1858.

The inventors decompose fatty substances in closed vessels by the sole agency of heat, and in certain cases adds acidulated water to facilitate reaction. The substances are afterwards submitted to pressure in a hot or cold state, and then to distillation at a low temperature. *Patent abandoned.*

1280. J. M. DUNLOP. *Improvements in apparatus for sizing fibrous materials.* Dated June 7, 1858.

This consists in using squeezing rollers in sizing machines, or dressing frames covered with vulcanised india-rubber. *Patent completed.*

1281. H. WIMBALL. *Improvements in machinery or apparatus for destroying the turnip fly and other destructive insects on growing crops.* Dated June 7, 1858.

This consists in the use of a fire, carried by a grating supported in running wheels. The fire is supplied with a blast of air from a fan blower, worked by one of the running wheels of the implement, which blast is directed downwards to blow the smoke on to the leaves of the plants. Sulphur, &c., may be supplied to the burning fuel from a hopper worked by the wheels of the implement. *Patent completed.*

1282. E. VIGERS. *Improvements in the manufacture of bricks and other articles moulded or formed from clays.* Dated June 7, 1858.

This consists in applying for the above purposes a material obtained from a refuse article resulting from the use of the torbane mineral, &c., in the manufacture of carburetted hydrogen gas. This refuse is burnt in heaps in the open air, and the result is white masses or nodules which are reduced to powder, and mixed with various kinds of clays. *Patent completed.*

1283. J. B. A. LOMBARD and X. T. ESQUIRON. *A new or improved method of obtaining saccharine substances from cereal and vegetable matters, and applying the products obtained to various useful purposes.* Dated June 7, 1858.

This invention comprises many different features, for the details of which the specification must be consulted. *Patent completed.*

1284. R. HICKS. *The manufacture of a composition or compositions to be employed as black lead.* Dated June 7, 1858.

This consists in forming a composition of black schist, carburet of iron, combined with "shining" or "shiny" ore, and plumbago of commerce, and with or without soda and lamp black. There are various modifications included. *Patent completed.*

1285. J. M. DUNLOP. *Improvements in bowls or rollers used in machines for printing fibrous materials.* Dated June 8, 1858.

This consists in covering the bowls or rollers with vulcanised india-rubber, &c. *Patent completed.*

1286. R. WAPPENSTEIN. *Improvements in the manufacture of artificial whalebone, applicable to umbrellas, parasols, stays, hats, bonnets, reeds, crinolines, and other similar purposes.* Dated June 8, 1858.

This consists in cutting the horns of animals spirally to any breadth or dimensions. The spiral so cut is then untwisted and flattened by pressure. *Patent completed.*

1287. I. KETCHUM. *An improved self-acting perforated buster.* Dated June 8, 1858.

A vessel, the bottom or sides of which are perforated, is fixed above the joint of meat, &c., and being filled with fat it will pass through the perforations and drop upon the joint of meat, &c. *Patent abandoned.*

1288. J. C. QUINCE. *Improvements in stoppers for bottles and jars.* Dated June 8, 1858.

This stopper is formed in the interior with a groove fitting over the top of the bottle or jar, with a plug fitting into the mouth of the same. A washer of leather, &c., is inserted in the groove, and fills up the space between the substance of the stopper and the top of the bottle or jar. The exterior of the stopper is grooved to receive a wire for attaching it to the neck of the bottle or jar. *Patent completed.*

1289. R. A. BROOMAN. *Improvements in the manufacture of copper pipes and tubes.* (A communication.) Dated June 8, 1858.

This consists in making copper tubes and pipes without joint or weld, and either straight or curved, by depositing copper in a galvanic battery over and upon a core of lead, &c., which can be reduced or removed by heat. *Patent abandoned.*

1290. W. CLARK. *The manufacture or preparation of extract of Peruvian guano.* (A communication.) Dated June 8, 1858.

This consists in submitting the above guano to a series of boilings in certain quantities of water. *Patent completed.*

1291. A. ROBERTSON. *Improvements in stoves or fire-grates.* Dated June 8, 1858.

Here the inner or lower top plate is made in one piece. The lower edges are made to rest on horizontal or curved mouldings at the spring of the arch, or behind the inside check. This inner top plate is hinged at the upper part to the fixed arched top plate, so that it may be thrown up out of the way of the smoke. *Patent completed.*

1 92. J. BUNNETT. *Improvements in the construction of floors, roofs, and arches.* Dated June 8, 1858.

Here earthenware or clay blocks are used with tie rods and wall plates, so that the thrust is brought in each case to act on the tie rods and the wall plates, the several blocks being so formed as to over and underlap each other. The wall plates are made of angle iron, and are tied together by the tie rods at intervals. The tie rods should pass through the blocks, such blocks being made hollow with that view, as well as to obtain lightness. The two sides of each block are each composed of two parallel inclines, each about half the depth of the block, connected by a horizontal, or nearly horizontal plane, and the two inclines on the one side are parallel with those on the opposite side. *Patent completed.*

1293. D. IRONS. *Improvements in the mariners' compass.* Dated June 8, 1858.

This consists in so constructing a compass that its needle shall at all times front due north and south. The card of a compass has three magnates or needles. One needle is of the ordinary kind, and fixed on the card to point north and south; the other two are fixed to the card at right angles to the other needle. The north end or pole of one of the two additional magnets is outwards, and placed to the west of the north end or pole of the first-mentioned magnet or needle. The third magnet has its south pole outwards, and in position it corresponds with the east front on the card. *Patent completed.*

1294. J. RAWLINGS. *Improvements in thrashing machines.* Dated June 8, 1858.

The principal object here is to obtain a mechanism to be worked by hand labour. The thrashing drum and apparatus connected therewith are arranged as in thrashing machines worked by horse or steam power. The axis of the drum receives motion in the following manner:—A shaft turns in bearings at right angles to the axis of the drum. On the outer end of such shaft is applied a crank handle, and on the other end is fixed a bevelled toothed wheel, which takes into and drives a like wheel on an axis parallel with that of the thrashing drum. On this axis is a drum, which gives motion by a strap to the drum on the fly-wheel, on which there is a drum which by a strap gives motion to a drum fixed on the axis of the thrashing drum. A crank handle may be fixed to the axis which is parallel with the axis of the drum. *Patent completed.*

1295. A. RIGG, sen., and A. RIGG, jun. *Improvements in apparatus for tipping or upsetting coals, minerals, or other substances, and in brake machinery.* Dated June 8, 1858.

This apparatus consists of a framing mounted on axles, on which framing the waggon, &c., is held firmly. On the axle there is a brake wheel, surrounded by a band, which is connected to a lever, which moves between fixed guides, on which guides there are ratchet teeth, into which a click on the lever takes, so that the brake can be left in any position on the brake-wheel. There are also teeth into which a click enters, so that, after the coals, &c., have been upset, the moveable parts are prevented from returning until the click is released. The waggon, &c., is placed on the framing, so that the centre of gravity is beyond the axles, so that, when the brake is released, the framing and waggon tilt over, and the speed at which they are allowed to tilt is regulated by the brake. The framing is so weighted that, when all the coal, &c., has been upset, and the click released from the teeth on the brake-wheel, the framing resumes its first position. To the front of the framing is fixed a scoop or screen, which receives and guides the coal, &c., as it slides or falls to the spot required. *Patent completed.*

1296. G. SNARES. *An improvement in fire-arms.* (A communication.) Dated June 9, 1858.

This is for constructing fire-arms, so that they may fire "eighteen or more" shots in succession in an extremely short time, the arrangements admitting of great facility in the handling and loading. They consist of a tube at the top of the barrel for containing the projectiles and conducting them to a chamber, which may be a continuation of the connecting-tube; from this chamber, the charge is placed in the breech of the barrel, and discharged in rapid succession by suitable arrangements for the purpose. *Patent abandoned.*

1297. F. A. GATTY. *Improvements in dyeing cotton and other fibrous materials and fabrics.* Dated June 9, 1858.

This invention consists in applying for dyeing purposes the colouring matter contained in the clearing liquors of dyers and printers (especially those of Turkey red dyers), in which cotton or other fibrous material or fabric previously dyed with any preparation of madder has been washed or cleared. *Patent completed.*

1298. D. MOSELEY. *Improvements in machinery used in the manufacture of vulcanised india-rubber thread.* Dated June 9, 1858.

In manufacturing vulcanised india-rubber thread it is usual to lap a sheet of rubber around a roller, this sheet passing through a trough containing a solution of shellac, which causes the whole to adhere while being cut. In the usual mode of operation the sheet passes under a rod or roller placed in the trough, and the surplus shellac is removed by an instrument called a "doctor." This invention consists in dispensing with this instrument, and in causing the large roller on which the vulcanised india-rubber is lapped to bear on the roller in the trough containing the solution of shellac, and around which the sheet of india-rubber passes before it is lapped on the large roller. When the vulcanised india-rubber is being wound on the large roller the surplus quantity of shellac or other cement is squeezed out by the pressure between the lap and the roller in the trough. *Patent completed.*

PRICES CURRENT OF METALS.

London, 4th Feb., 1859.

		£ s. d.	£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N. of England	pr. ton	6 10 0 to	6 15 0	nett
Welsh Bars, in Wales	,,	6 5 0 ,,	6 10 0	2½
Staf. Bars at the Works	,,	7 0 0 ,,	7 10 0	2½
,, Hoops	,,	8 0 0 ,,	8 10 0	,,
,, Sheets, Singles	,,	8 15 0 ,,	9 0 0	,,
,, Nail Rods	,,	7 0 0 ,,	7 10 0	,,
,, Boiler Plates	,,	8 10 0 ,,	9 0 0	,,
Scotch Pig, M.-Nos. Warrants, at Glasgow	,,	2 13 0 ,,	2 13 6	nett
Do. No. 1, Good Brands	,,	2 13 6 ,,	2 14 6	,,
Scotch Bars	,,	7 5 0 ,,	8 0 0	2½
Swedish Bars, in London	,,	13 10 0 ,,	14 0 0	2½
COPPER, Sheet and Sheathing per lb.		0 1 0½		
Tough Cake and Tile	,, ton	112 10 0		,,
Best Selected	,,	115 10 0		,,
Australian	,,	115 0 0 ,,	117 0 0	,,
South American	,,	105 0 0		,,
Yellow Metal Sheathing	per lb.	0 0 10½		,,
STEEL, Swedish Keg	pr. ton	20 0 0		2½
,, Faggot	,,	20 10 0		,,
TIN, English, Block	pr. cwt.	6 6 0		2½
,, Bar	,,	6 7 0		,,
Foreign, Banca	,,	6 12 0 ,,	6 13 0	nett
,, Straits	,,	6 10 0 ,,	6 11 0	,,
TINPLATES, Charcoal, I.C.	pr. box	1 12 0 ,,	1 13 0	5
Coke, I.C.	,,	1 5 6 ,,	1 6 0	,,
LEAD, Pig, English	pr. ton	22 15 0 ,,	23 5 0	2½
,, Spanish	,,	22 10 0		,,
Sheet	,,	23 5 0	23 15 0	,,
SPELTER, on the spot	pr. ton	22 10 0	23 15 0	nett
for arrival	,,	22 15 0		,,
ZINC, English, Sheet	,,	30 0 0		1½
QUICKSILVER	per lb.	0 2 0		1

REMARKS.—We have no alteration of any moment to report in the price of Metals. The general feeling is improved, and the inquiries with a view to business are greater.

LAWRIE AND HAGGER, Metal Brokers,
33 Lombard-street, E.C.

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, FEBRUARY 11, 1859.

PATENT-LAW REFORM.

BEFORE noticing the petition which the Manchester men resolved last week to send to Parliament, it will be well to mention a consideration or two which but few persons seem to regard, but which have an important bearing upon the subject of Patent-Law Reform.

There is, first, the fact that the proprietors of valid patents are a privileged class—privileged, because they are put into possession of exclusive rights which would not be their's but for the Patent Laws. This fact is by far too often forgotten or suppressed by those who speak and write on the question before us. Even Mr. FAIRBAIRN, in his speech of last week, stigmatizes the fees payable on patents as a "tax" upon the "genius" of the inventor. But they are nothing of the kind. The inventor by his "genius" can produce nothing but ideas, upon which no Government can lay a tax. The fees become payable only when the inventor seeks to acquire an exclusive property for a term of years in some machine or some process the idea of which he has (we will presume) been the first to conceive, but which another man may conceive to-morrow. If this be denied by anyone, let him imagine the Patent Laws abolished, and the "tax on genius" therefore repealed, and then ask himself whether the inventor has benefited by the change. The truth is, that by granting the existing privileges to patentees, the Government confer upon them advantages for which they may very fairly be expected to make some return; and as those advantages are of a pecuniary character, fees are a return of a very suitable kind. It was doubtless in view of these considerations that, when the recent Patent Acts were formed, provision was made for appropriating the £5 payable on the "warrant," and £10 of the £50 payable on the extension of the patent, to a surplus fund which should go to the revenue of the nation, and which has amounted to about £90,000 since 1852.

But while the raising of revenue from patent fees is thus shown to be perfectly equitable, few persons now believe it to be politic. It is very properly thought that the arts, and sciences, and manufactures of the nation would be more rapidly improved if all attempts to draw revenue from this source were abandoned; and we doubt not that the present Commissioners of Patents—including Lord Chancellor CHELMSFORD, Sir FITZROY KELLY, and Sir HUGH CAIRNS, who are enlightened men, and anxiously solicitous, we believe, to promote the best interests of the country—will cheerfully recommend their abandonment, and be willing to reduce the fees on patents, till they are sufficient only to meet the expenses of the Patent Office. If they will do this, they will be enabled to abolish altogether the £100 payments which, otherwise, will shortly become due on patents of the seventh year, and at the same time to reduce or defer the £50 payment on patents of the third year, and some of the earlier fees likewise. We would not, like the Manchester Association, prescribe precise fees to the Government; nor do we think it probable that the scale which the Association has adopted would be found sufficient for all legitimate expenses of the office. They propose—

"That the present stamp duties on patents be reduced to the following scale, namely, £5 on application for protection, £10 for warrant and seal, and £25 at the expiration of five years; and that the stamp duty of £100, now payable at the expiration of the seventh year, be entirely abolished."

They also recommend—

"That the surplus funds, if any, arising from the said scale of charges shall be set apart and considered as a fund appropriated to the carrying out the acts relating to patents for inventions, with the view of promoting the progress of invention and science."

Should these proposals be adopted, the fees on the early stages of a patent would be reduced from £25 to £15, and the whole fees on a patent for fourteen years would be brought down from £175 to £40. We doubt whether reductions to this extent will be found practicable; but whether the Government are able to go the full length of our desires or not, we have great reason to require that a very large diminution of fees shall be made, and with as little delay as possible.

Another reform which we expect the Government to undertake at once is that of providing a suitable building for the Patent Office. Mr. DISRAELI has, we find, adroitly disposed of the long-standing National Gallery difficulty; and why should he not join the Patent Commissioners in settling their's? Inventors, patentees, and men of science everywhere, want to see that splendid Patent Office library disentombed—brought forth from the vaulted passages and dark corners in which it is now heaped, and placed conveniently at their service. The present state of that library is so bad that the place is all but useless to the public, and it had better be shut up altogether than kept as it now is. No man can there enter upon any of those researches for which such libraries are mainly useful, without annoying every one besides himself—indeed, one cannot enter upon any considerable researches whatever in that gloomy and crowded cavern! There is not a library or a reading-room, or a news'-room, or even a boy's schoolroom in the kingdom where there is less accommodation than in the library of the Great Seal Patent Office of England; which should be, and with additional space only would be, the first scientific library in Europe! And as for the Patent Museum, with its original models of WATT'S and SYMINGTON'S earliest engines—its first hydralic press that BRAMAH ever made—its first screw propeller that ever moved a ship of war—its hundreds of examples of modern machinery—and its portrait gallery of men who have made England what it is—this instructive Museum, so valuable for reference, is far away at South Kensington, three or four miles from the library which it illustrates!

It has been rumoured that the Government has proposed, and the Commissioners of Patents agreed to, the erection of a Patent Office in the grounds of Burlington-house, it being at the same time intended to keep the museum where it now is. We cannot credit such a rumour. Everyone knows that Sir RICHARD BETHELL and other eminent lawyers are exerting themselves to get the law courts concentrated, and that the sight coveted for the combined courts is in the neighbourhood of Chancery-lane. It cannot surely be possible that while these efforts are being made, such men as the present law officers can assent to the removal of the Patent Office to Piccadilly, when every individual connected in any way with it must earnestly desire that it may remain near its present position. How are inventors, patent agents, barristers, and others to transact daily business in an office two miles from the City? And we may ask with equal wonder, how are the Lord Chancellor and the Attorney and Solicitor General—whose communications with the Great Seal Patent Office are frequent and often most urgent—to perform their duties in connection with an office thus situated? We can conceive of no satisfactory replies to these questions, and we therefore discredit the rumour. We have confidence in the present Commissioners, and believe that they will take the necessary steps to give us a large commodious edifice, combining museum, library, and business offices, in Chancery-lane or near it. There is a vacant piece of ground on the upper side of Carey-street, which, though small at present, might probably be increased rapidly by purchase, and this would form an admirable and convenient site for such a structure. We would assure the Commissioners of Patents that their action in this matter will be watched with anxiety by many, and we sincerely hope they will be true to the trust which is reposed in them.

In the Manchester petition there are two clauses which we do not fully understand. They are as follows:—

"That additional or special commissioners be appointed possessing scientific attainments as contemplated and provided for by the first section of the Patent Law Amendment Act of 1852, to assist the law officers of the Crown in passing patents.

"That such special commissioners be required to report to your honourable House from time to time on the working of the Patent Law, and to suggest such alterations and amendments as may appear expedient."

If the petitioners intend by these clauses to imply that the law officers pass patents too readily, and do not refuse them sufficiently often, and that, with the aid of special Commissioners, they would pass them less readily, and refuse them oftener, they are advocating a very questionable policy, and one which inventors would not easily brook. Much money is doubtless wasted by infatuated men in patenting old inventions, but it is much better to allow such individuals to squander a few pounds than it would be to subject every man's invention to the mutilating action of a set of Commissioners who are practically irresponsible, as is done in America. This part of the petition at least needs explanation.

With the spirit of the next clause we heartily concur. It is—

"That a special court be appointed to try patent cases and that scientific persons conversant with the subject before the court be summoned as jurors, and paid for their services out of the surplus fund, and that their decision shall be final."

Under the present system of trying patent cases, an immense amount of expense is often incurred by both plaintiff and defendant with no satisfactory or just result. The preceding clause is intended to remove this evil. The only doubt we have is, whether "scientific persons," who are notorious for disagreeing when they appear as witnesses, would be got to agree as jurors. We fear they would often spend supperless nights, and be as often disbanded without accomplishing any result. Still, in a modified form, a special court and special jurors would doubtless dispense readier and more even justice than the courts and juries that now settle patent disputes. We could hardly expect to read then of judges sitting day after day over a single case, as Mr. Justice ERLE has been sitting this week, in the Second Court of Queen's Bench, over "Betts *v.* Menzies."

The two recommendations with which the Manchester petition concludes must meet with the approbation of all honest and economical men. They are—

"That a penalty be imposed on all persons selling goods as patented articles which are not patented.

"That some simple means be devised to secure patents for her Majesty's colonies."

We recommend our fellow Patent-Law re-

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formers to keep their eye steadily on the three points of prime importance to inventors—viz., the reduction of the fees, the provision of a suitable library, and the ready settlement of law cases—and to labour steadily and strenuously for the accomplishment of these objects. They should carefully guard themselves against encumbering these with minor questions, and also against urging them in an ill-digested form, or with too little consideration.

THE CASE OF HENRY CORT, AND HIS INVENTIONS IN THE MANUFACTURE OF BRITISH IRON.

BY

THOMAS WEBSTER, M.A., F.R.S., &c., Barrister-at-Law.

No. II.

THE inventions of HENRY CORT constituted one of the epochs in the history of the manufacture of iron in Great Britain. Before, however, entering on the details of CORT's inventions, it will be necessary to consider the state of the manufacture of iron prior to the middle of the last century, and the various attempts previously made to render Great Britain less dependent on foreign countries for the supply of so important an article of commerce.

The earlier history of the manufacture of iron in Great Britain, and the attempts to prohibit the consumption of wood, and to encourage the substitution of pit-coal for wood or charcoal in the smelting of iron, are matters of curiosity; showing, however, conclusively how severely the scarcity of fuel was felt, and how great was the inducement from the necessary abandonment and suspension of iron-works in Sussex and other parts—then the natural seat of the British iron manufactures—to look to foreign countries for the supply of the deficiency in that material. During the 14th and 15th centuries, iron was imported from Germany, Prussia, Spain, and other parts beyond the seas. In the 16th century, the Germans established works in this country, in the Forest of Dean and near Tintern, introducing at the same time the manufacture of iron-wire; and although the information as to the number of works in this country up to the middle of the 16th century is very scanty, there can be no doubt that the works had materially increased in many parts of the country, particularly in Sussex; and that, but for the alarm as to the scarcity of wood, and the prohibition or restrictions imposed on its use, Great Britain was in a fair way of becoming independent of foreign supply. We learn from LELAND and CAMDEN that the Forest of Dean and Sussex in particular abounded in iron, and mines, and forges, in the early part of the 16th century, but in 1558 an act (1 El. c. 15) was passed, prohibiting the conversion of any timber of certain dimensions growing within fourteen miles of the sea, or any part of the Thames, Severn, or other river, into coal for the making of iron, except Sussex, and certain parts of Kent and Surrey; in 1581 another act (23 El. c. 5) was passed to prevent the destruction of timber and to prohibit the erection of iron-works within a certain distance of London, the Thames, and in certain parts of Sussex, and the conversion within the same limits of wood into coal or other fuel for making iron, which prohibition was extended, by a subsequent act (27 El. c. 19), to the erection of any new iron-works in Surrey, Kent, or Sussex, and the using of any timber of one foot square at the stub as fuel at any iron-works was forbidden. From the operation of these and other causes, the iron-works in many parts of country were either stopped entirely, or their make materially diminished, and the country had to rely more and more on the supply of iron from foreign parts.

The necessity of some other source of supply of iron than that smelted and manufactured by the use of wood or charcoal, turned the inventive minds of the country to the practicability of applying other fuel, as pit-coal and peat, in the smelting or melting of iron, and attempts were made by many persons about the middle of the 16th century with this object, but without, as it would appear, much practical success until nearly the middle of the next century.

The patents, and similar royal grants in connection with this subject, afford instructive illustrations of the legitimate exercise of the royal prerogative for the advancement of manufactures and the reward of the inventor. The express reservation in the Statute of Monopolies (21 Jac. 1) of the letters patent granted (22nd February, 19 Jac. 1) to EDWARD LORD DUDLEY, for the melting of iron ewer (ore) and of making the same into cast works or bars with sea-coals or pit-coals, must also be regarded as a judgment of Parliament in favour of a grant, having such a legitimate and useful object, at a time when, from the abuse of the exercise of the royal prerogative, all grants of monopolies were looked upon with such suspicion that King JAMES, by "a declaration of His Majesty's pleasure," (A.D. 1610), published and declared, out of His Majesty's zeal to law and justice, that monopolies are things against the laws of the realm, and expressly commands that no suitor presume to move the King to grant any of them. The monopolies therein referred to were such as had been obtained from Queen ELIZABETH for twelve years (13 June, 30 El.,) and for 21 years (11 Aug, 40 El.), respectively, of the exclusive privilege of buying playing-cards beyond the seas, and making and selling the same within Her Majesty's dominions; or by EDWARD III. to JOHN PEACHEY, for the sole importation of sweet wines to London, which was declared against the freedom of trade and traffic, and to be illegal and void, in respect both of its nature and duration; but no doubt was ever entertained as to the legality or policy of grants for a limited duration for a new trade or manufacture within the realm which others at the time of making such grant did not use, as was stated in the earliest case on the subject in the following terms:—

"Now, therefore, I will show you how the Judges have heretofore allowed of monopoly patents; which is, that where any man, by his own charge and industry, or by his own wit or invention, doth bring any new trade into the realm, or any engine tending to the furtherance of a trade that never was used before, and that for the good of the realm, that in such cases the King may grant to him a monopoly patent, for some reasonable time, until the subjects may learn the same, in consideration of the good that he doth bring by his invention to the commonwealth, otherwise not."

The earliest grant connected with this subject was for 31 years, by King JAMES in 1612, to SIMON STURTEVANT for the manufacture of iron with pit-coal in all its branches, made subject to the condition of his publishing an account of his discoveries, which condition he complied with by the publication of his "Metallica." It would appear that he failed in his attempts, for he was compelled to surrender his grant in the following year, and we find another grant for the same object to JOHN ROVINSON, also upon the condition of his publishing an account of his discoveries, which condition he also complied with by the publication of his "Metallica," in 1613; but he also with other enterprising men about that time who obtained grants for the same objects, had to resign them, after ineffectual attempts to succeed in the manufacture of iron with pit-coal.

The first patent (granted 19 Jac. 1) to EDWARD LORD DUDLEY for 31 years, would appear to have been cancelled, and another granted in the same year (22nd Feb. 1622, 19 Jac. 1.), which, after reciting as a fact the discovery of "the mystery, art, way, and means of melting of iron ewre (ore), and of making the same into cast works or bars with sea-coals or pit-coals in furnaces with bellows, of as good a condition as hath been heretofore made by charcoal," and further reciting the benefit to result, amongst other things, from the saving of timber and wood wanted for shipping and otherwise, and "holding it agreeable to justice that the authors of so laudable and useful inventions should in some good manner reap the fruits of their studies, labours, and charges," grants the exclusive privilege for fourteen years, within the realm of England and dominion of Wales, to practice the invention of melting iron ore, and of making the same into cast works or bars with sea-coals or pit-coals in furnaces with bellows, and to set up engines for the purpose. This patent was saved by express terms in the Statute of Monopolies. It is somewhat remarkable that this grant should have been only for fourteen years, most of the preceding grants having been for larger terms, as for thirty-one years. It might have been owing to better views as to the most suitable length of the terms of such grants after the declaration made by His Majesty in 1610, or not improbably to the opposition of rival manufacturers, particularly the proprietors of the works engaged in the wooden or charcoal iron trade, who formed a combined and powerful opposition against those engaged in the pit-coal iron manufacture. The following account of the invention, given by DUD DUDLEY, the son of Lord DUDLEY, in the "*Mettallum Martis*," will be read with interest:

"Having former knowledge and delight in iron-works of my father's, when I was but a youth, afterward, at twenty years old, was I fetched from Oxford, then of Baliol College, anno 1619, to look over and manage three iron-works of my father's, one furnace and two forges, in the chase of Pensnet, in Worcestershire; but, wood and charcoal growing very scanty, and pit-coals in great quantities abounding near the furnace, did induce me to alter my furnace, and to attempt, by my new invention, the making of iron with pit-coal, assuring myself, in my invention, the loss to me could not be greater than others, nor so great, although my success should be fruitless; but I found such success at first trial as animated me, for, at my trial or blast, I made iron to profit with pit-coal, and found *facere est adders inventioni*. After I had proved by a second blast and trial the feasibility of making iron with pit-coal and sea-coal, I found, by my new invention, the quality to be good and profitable, but the quantity did not exceed above three tons per week, though I doubted not in future to have advanced my invention to make quantity also.

"Immediately after my second trial I wrote unto my father what I had done, and withal desired him to obtain a patent for it from King James of blessed memory: the answer to which letter I shall insert only to show the forwardness of King James to animate the inventor as he did both Simon Sturtevant, John Rovenson, Dr. Jordanie, and others."

The account of obtaining the patent is described in the following letter:—

"SON DUDLEY,—The King's Majesty being at Newmarket, I sent Parkes thither on Saturday, to some friends of mine, to move the King's Majesty for my patent, which he, coming on Sunday morning, in the afternoon his Majesty sent a warrant to Master Attorney to dispatch my patent, for the which I am infinitely bound unto his Majesty, that it pleased him, of his great grace and favour, to dispatch it so soon. I have been this night with Master Attorney, who will

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make haste for me. God bless you, and commend me unto all my friends.

"Your loving father,

"EDWARD DUDLEY."

Reading the above account of the successful use of pit-coal in the manufacture of iron with our present knowledge, it may be inferred that the cause of the failure of others, and of the success of DUDLEY, was due to an improved blast. However this may have been, it would appear that the production did not at the first amount to more than three tons per week, or about one-half the yield of furnaces using charcoal.

The historian of the "Metallum Martis" goes on to state that the PARKES referred to in the above letter was the author's brother-in-law, and that he did, about one year after the patent was granted, carry from the author much good merchantable iron into the Tower by King JAMES's command, to be tried by artists who did well approve of the iron, and out of which a fowling-gun was made.

Parliamentary Proceedings.

[CONDENSED FOR THE "MECHANICS' MAGAZINE."]

HOUSE OF COMMONS.

FRIDAY, Feb. 4.

SUPERANNUATION FUND.

The CHANCELLOR of the EXCHEQUER gave notice that on Monday he would bring in a bill to amend the law relating to superannuation allowances.

SALE OF POISONS.

Mr. WALPOLE gave notice that on Tuesday he should introduce a bill to regulate the sale of poisons.

GALWAY HARBOUR.

Lord DUNKELLIN asked the First Lord of the Admiralty whether he had any objection to lay on the table of the house a copy of the instructions given to the commissioners appointed last October, by the Irish government, to inspect Galway, and of the report presented by the commissioners, and to state what steps, if any, her Majesty's government had taken, or propose to take, in consequence thereof.

Sir J. PAKINGTON had no objection to laying the report on the table. The inquiry could not exactly be called a commission. An application having been made to the Lord Lieutenant of Ireland, he appointed Captain Washington and Mr. Veitch, who, in conjunction with Mr. Gibbon, an Irish engineer, examined the harbour. The report was greatly in favour of its capabilities in both particulars, and the commissioners think that an expenditure of 100,000*l.* would make the harbour extremely valuable both as a harbour of refuge and for the packet service. No final steps had been taken by the Treasury.

Mr. H. HERBERT asked whether the inquiry had been limited to Galway.

Sir J. PAKINGTON—The inquiry was so limited.

PUBLIC WORKS (INDIA).

Mr. HADFIELD, with reference to that paragraph in the royal speech which related to India, mentioned the alarm felt in this country lest a deficiency should arise in the supply of their staple materials, particularly cotton, of which India could, under proper management, furnish an abundant supply. What India wanted was roads and water for irrigation.

Lord STANLEY, for the present, would only say that he agreed entirely with the hon. member, both as to the necessity of greatly increasing the cotton supply, and of improving the means of transit. It had been estimated that the difference between a good and a scanty supply of cotton for the country was equal to the difference between an income-tax and none, that was to say, that it was equal to the income-tax in time of war. The government was therefore bound to do everything in their power to promote the growth of cotton in India, as well to facilitate the communication between different parts of that country. Even in the present financial position of India, the expense for public works must not be discontinued. It was a mistake to suppose that little or nothing had been done in furtherance of public works in India. For a considerable number of years two millions annually had been appropriated to the purpose. At present they were in this unfavourable position with respect to the money applicable to public works, that the capital for 5,000 miles of railways had been guaranteed, while not more than 500 miles had yet been completed, or were making any return, but he was confident that when the whole had been completed, the traffic would be so enormous as to make an ample return. He should be prepared ten days hence to enter in detail into the question.

Mr. BRIGHT admitted the necessity for establishing railways and roads in India; but, while in Ireland the roads were probably better than in any part of her Majesty's dominions, they had not assisted much in the development of the resources of the land, because the tenure of land in that country remained in an unsatisfactory state. The same grievance existed in India.

Colonel SYKES said there was no difficulty in obtaining cotton in any quantity in India if it was made worth the while of the producer to produce it. At present India sent to Europe 23 millions of its products, and received back not more than 12 or 13 millions of the manufactures of this and other European countries; because the people of India had no use for our woollen manufactures, glass, and hardware. There were three important public works now going on in India—the screw-pile pier at Madras, the water-works at Bombay, and the improvement of the harbour of Kurrachee—from which great benefits would result.

Sir J. ELPHINSTONE observed that the great difficulty was in getting the cotton down to the coast without injury by the existing modes of conveyance. He suggested that the manufacturers and others in this country who wanted cotton from India should appoint agents to go up the country, purchase the cotton, and superintend its conveyance down to the place of shipment.

MONDAY, Feb. 7.

HARBOURS OF REFUGE.

Mr. WILSON asked the First Lord of the Admiralty whether the Royal Commission appointed in pursuance of a vote of this House in the last session, upon the subject of harbours of refuge, had yet made their report, and when the same would be laid upon the table?

Sir J. PAKINGTON said the commissioners had not yet reported.

CIVIL SERVICE SUPERANNUATION.

The CHANCELLOR of the EXCHEQUER, in bringing in a Bill amending the present laws concerning superannuations and other allowances to persons having held civil offices in the public service, said—The measure proposed on this subject is very similar to, or identical with, the Bill of last year.

Mr. WILSON said a great many of the higher class of officers engaged in the dockyards had retired on full salary, but while that had been done many who entered the service at the same time had received superannuation allowances amounting to only one-fourth of their salaries. He knew a case of two men who entered the service on the same day, and who were superannuated on the same day, after having been employed for many years in the same manner, bearing unexceptionable characters, both having received the thanks of the Admiralty. One of these men has been superannuated on an allowance of £740 a-year, and the other of £34 a-year. That arose from the inequality of the law as it now stood. He contended, however, that, as they had abolished the abatements, they could no longer make any distinction between the public servants. He wished to know whether the inequality that now existed was to be maintained, or whether the Bill would be made applicable to all alike.

The CHANCELLOR of the EXCHEQUER said, if the hon. gentleman moved an amendment he should be better able to deal with it than he could now. With regard to the dockyard servants, they were specially provided for by the Admiralty orders, and it was quite unnecessary that they should be included in the Bill.

Mr. KINGLAKE said the Bill of last year gave superannuation allowances to Post-office servants resident in London, but excluded those who lived in the country. The natural result was that much disquiet was caused by the distinction, and he hoped the defect would be remedied in the present measure.

Mr. COLLIER believed the Chancellor of the Exchequer was in error in asserting that the superannuation of dockyard labourers was provided for by certain Admiralty orders.

Sir ERSKINE PERRY concurred in the same view, and recommended that all the servants of the Government should be pensioned upon one uniform scale.

Mr. RICH suggested that it might be well to restore that system of abatements from salaries which was lately abolished.

Sir F. SMITH trusted that the Bill would embody stipulations by which the dockyard labourers would be protected even against the Admiralty, which was sometimes inclined to be niggardly.

The CHANCELLOR of the EXCHEQUER explained that he had referred to the latest copies of the Admiralty orders, which, as they bore a date so recent as October last, had not, perhaps, been seen by hon. gentlemen who had just spoken. [The right hon. gentleman then read from the Admiralty order in question a passage referring to the superannuation allowed to labourers and artificers.] This showed that the labourers in our dockyards were in receipt of regulated rates of pension. Leave was then given to bring in the Bill.

TUESDAY, Feb. 8.

SCHOOL INSPECTORS' REPORTS.

Mr. COWPER gave notice that on Tuesday, the 22nd, he should call the attention of the House to the recent circular of the Committee of Council for Education with reference to the reports of the Inspectors of Schools, when he should move that the efficacy of the inspection of schools depending upon the publicity given to the results, the reports of the inspectors ought to continue to be laid upon the table; and that the tabulated reports of districts ought also to be printed and laid upon the table as heretofore.

THE NATIONAL GALLERY.

Sir H. WILLOUGHBY wished to ask whether a gallery for pictures was being built, and in what locality? Also, what would be the expense of such building, and out of what moneys voted by Parliament the cost would be defrayed?

The CHANCELLOR of the EXCHEQUER in reply, made a statement to the effect that the Government had provided the Royal Academy with part of the ground at Burlington House, and that the Academy was about to erect premises for itself, at its own cost, upon it, giving up the National Gallery entirely. The Vernon Gallery and Turner pictures are ultimately to be placed in the National Gallery, but as the Prince of Wales wants Marlborough House forthwith, they are for the present to be removed to a temporary building about to be erected on the ground rented by the Government from the Royal Commissioners at Kensington Gore. The whole of the arrangements for the final disposal of the various collections of pictures are expected to be completed in about two years.

THE ATLANTIC TELEGRAPH.

Mr. H. BERKELEY asked the Chancellor of the Exchequer if Her Majesty's Government was about to grant a guarantee or subsidy to the Atlantic Telegraph Company; and, if so, upon what conditions.

The CHANCELLOR of the EXCHEQUER said that several applications had been made to the Treasury for a subsidy for the purpose referred to; but no resolution had been come to of the kind mentioned by the hon. gentleman.

SALE OF POISONS.

Mr. WALPOLE brought in, and had read for the first time, a bill for regulating the sale of poisons. Its chief object is not an impossible attempt to prevent murder by poisons, but to prevent accidental injuries resulting from their careless sale. It will control the "keeping" as well as the "sale" of poisonous substances.

SUPPLY.

On the motion of Sir S. NORTHCOTE, the House resolved itself into a Committee of Supply; Mr. Fitzroy in the chair. The paragraph in the Queen's Speech relative to the estimates having been read, a formal resolution was agreed to, "That supply be granted to Her Majesty."

WEDNESDAY, Feb. 9.

SUPPLY.

The report was brought up and agreed to. The committee was ordered to sit on Friday.

On the motion of Sir S. NORTHCOTE, an address to Her Majesty was agreed to, praying that the navy and army estimates for the ensuing year may be laid upon the table.

THE THEORY OF NAVAL ARCHITECTURE.

No. III.

[We hope the following article, which will probably appear repulsive to some of our readers, will not deter them from pursuing the study of this series of papers. They should observe that, although it is highly necessary for us to investigate the nature of the *rules* used by the naval architect, and although the investigation involves processes which persons unskilled in mathematics may deem difficult, yet the rules themselves, and their practical applications, are very simple. As we purpose making our articles as complete as possible, we cannot omit such investigations as the following: at the same time, non-mathematical readers may content themselves with glancing over them, and gathering their general scope and objects, without attempting to follow the arguments throughout. In due time, the humblest reader will find himself led safely and surely through all the theoretical knowledge that it is essentially necessary for a practical designer or builder of ships to acquaint himself with. We may add, for the information of those who are mathematicians, that our investigations of rules are, in the main, original, and conducted without presuming a knowledge of the integral calculus.]

THE next method of approximating to a curvilinear area is, to draw some known curve through the extremities of three consecutive ordinates, and find the area between this curve and the other boundaries of the figure, neglecting, as inappreciable, the very small area between the two curves.

Now a circle, which is a simple curve, may always be drawn through three points, and if the ordinates be not very far apart, the circular arc drawn through the points P_1, P_2, P_3, fig. 8, (p. 57*) for example, would nearly coincide with any given curve; and the area, of which the arc thus drawn is one of the boundaries, would approximate sufficiently near to the required area for all practical purposes. We should then have, as an approximation to the required area, either the two trapeziums, $P_1 P_2 N_2 N_1$, $N_2 P_2 P_3 N_3$, and the two small circular segments, of which $P_1 P_2$ and $P_2 P_3$ are the chords; or the trapezium $P_1 P_3 N_3 N_1$, and the segment of which a line joining $P_1 P_3$ is the chord. It happens, however, that the area of a segment of a circle is found with great difficulty; and

* Throughout the reading of these articles reference must be made to preceding Numbers of the Magazine wherever necessary.

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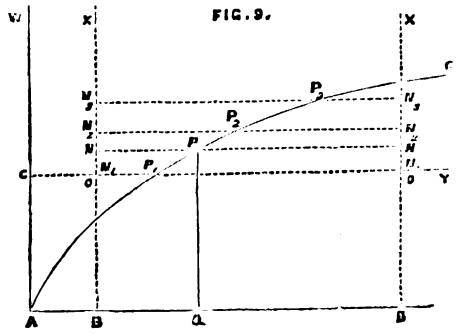
although the circle would be very suitable as an approximating curve, it cannot be made use of in this case, where simple calculations are indispensable.

The common or conic parabola is also a simple curve, but in its usual form it is only capable of being drawn through two points. The common form of the equation to the parabola is $y^2 = lx$, in which the origin of co-ordinates is at the vertex A; and l, which is constant in the same parabola, is called its parameter.*

Let P be any point in the parabola, then, fig. 9, $PQ^2 = l \times AQ$.

FIG. 9.



Instead of taking AW, AB as co-ordinate axes, let the dotted lines OX and OY be taken, their intersection O being the new origin. Let

$PN = Y$, $ON = X$, $OC = a$, $OB = b$.

Then $PN = Y = BQ = AQ - AB = x - a$;

or $x = Y + a$.

And $ON = X = PQ - OB = y - b$;

$\therefore y = b + X$.

Substituting these values for x and y in the common equation, we have $(b + X)^2 = l(Y + a)$. Multiplying out, dividing and transposing,

$$Y = \left(\frac{b^2}{l} - a\right) + \frac{2b}{l}X + \frac{X^2}{l},$$

which may be put in the form—

$$Y = A + BX + CX^2,$$

which is the general equation to the common parabola, whether the point O be within or without the curve; that is, whether the curve be concave or convex to the axis of abscissae, X.

Referring to fig. 8, N_1 is taken as the origin; and since a_1, a_2, and a_3, are the lengths of the ordinates, corresponding to the distances 0, m, and $2m$ from N_1, we have

$$a_1 = A \qquad (1),$$
$$a_2 = A + Bm + Cm^2 \qquad (2),$$
$$a_3 = A + 2Bm + 4Cm^2 \qquad (3).$$

From these equations we find that

$$A = a_1,$$
$$B = \frac{4a_2 - a_3 - 3a_1}{2m},$$
$$C = \frac{a_3 - 2a_2 + a_1}{2m^2},$$

and the equation to the parabolic curve, passing through P_1, P_2, and P_3, where P_1N_1 and N_1N_3 are the axes of Y and X respectively, is

$$Y = a_1 + \frac{4a_2 - a_3 - 3a_1}{2m}X + \frac{a_3 - 2a_2 + a_1}{2m^2}X^2.$$

* In this, as in our previous article, No. II., we necessarily assume that the reader is acquainted with what is called "Analytical Geometry" by some, and "Co-ordinate Geometry" by O'Brien and others. It is a beautiful subject of study, and the young reader who is unacquainted with it should master it without delay. Let him read "A Treatise on Plane Co-ordinate Geometry," Part I., by the Rev. M. O'Brien (Deighton's, Cambridge). Chapter X. of "Hall's Differential and Integral Calculus," on "Equations to Curves," will likewise furnish him with what he requires to know in order that he may understand what we mean when we speak of "the equation to the parabola," &c.

Whence the ordinate at any point in N_1N_3 may be obtained.

Let N_1N_3 be divided into a very large number $(2n)$ of equal parts, each part being equal to $\frac{m}{n}$; and at the points of division imagine ordinates y_0, y_1, y_2, y_3 &c., ... y_{2n} drawn perpendicular to N_1N_3; and their extremities joined by straight lines, thus forming $2n$ small trapeziums. Now it is evident that when n is very large, the very short lines joining the extremities of the ordinates coincide with the curve; and the sum of the small trapeziums thus formed, will be the parabolic curvilinear area required. From the general equation to the parabola

$$y_0 = A;$$
$$y_1 = A + B\frac{m}{n} + C\frac{m^2}{n^2};$$
$$y_3 = A + B\frac{2m}{n} + C\frac{2^2m^2}{n^2};$$
$$y_4 = A + B.\frac{3m}{n} + C.\frac{3^2m^2}{n^2};$$
$$\&c. = \quad \&c.$$
$$y_{2n} = A + B.\frac{\overline{2n-1}\cdot m}{n} + C\frac{\overline{2n-1}^2 \cdot m^2}{n^2}.$$

Area of first trapezium $= \frac{y_0 + y_1}{2} \times \frac{m}{n} = A\frac{m}{n} + \frac{B}{2}\frac{m^2}{n^2} + \frac{C}{2}.\frac{m^3}{n^3};$

„ second „ $= \frac{y_1 + y_3}{2} \times \frac{m}{n} = A\frac{m}{n} + \frac{B}{2}.\frac{3m^2}{n^2} + \frac{C}{2}(1^2 + 2^2)\frac{m^3}{n^3},$

„ third „ $= \frac{y_3 + y_5}{2} \times \frac{m}{n} = A.\frac{m}{n} + \frac{B}{2}.\frac{5m^2}{n^2} + \frac{C}{2}(2^2 + 3^2)\frac{m^3}{n^3};$

$\&c. = \quad \&c.$

„ last, or $2n$th $= \frac{y_{2n-1} + y_{2n}}{2} \times \frac{m}{n} = A\frac{m}{n} + \frac{B}{2}4n\overline{-1}.\frac{m^2}{n^2} + \frac{C}{2}\left\{\overline{2n-1}^2 + 2^2n^2\right\}\frac{m^3}{n^3}$

adding on both sides of the equations we have:—Sum of all the trapeziums =

$$A\left\{\frac{m}{n} + \frac{m}{n} + \frac{m}{n} + \&c.\text{ to } 2n \text{ terms}\right\}$$
$$+\frac{B}{2}\frac{m^2}{n^2}\left\{1 + 3 + 5 + 7 + \&c.\text{ to } 2n \text{ terms}\right\}*$$
$$+ C.\frac{m^3}{n^3}\left\{1^2 + 2^2 + 3^2 + \&c. \ldots\ldots + 2^2n^2\right\}\dagger - \frac{2^2n^2}{2}$$
$$= A \times 2m + 2Bm^2 + \frac{Cm^3}{3}\left(8 + \frac{1}{n^2}\right).$$

This last equation is true whatever n may be, but when n becomes infinitely large, in which case the sum of all the trapeziums gives the exact area of the figure of which the parabolic curve $P_1P_2P_3$ is a boundary; then $\frac{1}{n^2} = \frac{1}{\infty} = 0$. And the approximation to the curvilinear area $= 2Am + 2Bm^2 + \frac{8Cm^3}{3}$. Putting for A, B, and C, their values in terms of a_1 a_2 and a_3, we have

$$\text{area} = 2a_1m + (4a_2 - a_3 - 3a_1)m + \tfrac{4}{3}(a_3 - 2a_2 + a_1)m$$
$$= \frac{m}{3}\left\{6a_1 + 12a_2 - 3a_3 - 9a_1 + 4a_3 - 8a_2 + 4a_1\right\}$$
$$= \frac{m}{3}\left\{a_1 + 4a_2 + a_3\right\}.$$

* The series $1+3+5+7+9+\&c.$ – to $2n$ terms is thus found,

$$1 = 1^2$$
$$1 + 3 = 2^2$$
$$1 + 3 + 5 = 3^2$$
$$1 + 3 + 5 + 7 = 4^2$$
$$\&c. \quad = \&c.$$
$$1 + 3 + 5 + \&c., \text{ to } 2n \text{ terms} = (2n)^2 = 4n^2$$

† The sum of the series $1^2 + 2^2 + 3^2 + \&c. \ldots\ldots + (2n)^2$ may be readily found by the method of Indeterminate Coefficients. *Vide* Wood's "Algebra."

Assume $1^2 + 2^2 + 3^2 + \&c. \ldots\ldots + (2n)^2 = A + B(2n) + C(2n)^2 + D(2n)^3 + \&c.$, where A, B, C, &c., are unknown coefficients independent of $2n$; then writing $2n + 1$ for $2n$ we have

$$1^2 + 2^2 + 3^2 + \&c., + (2n)^2 + (2n+1)^2 = A + B(2n+1) + C(2n+1)^2 + D(2n+1)^3 + \&c.$$

Substracting the first equation from the second

$$(2n+1)^2 = B + C(4n+1) + D(12n^2 + 6n + 1) + 0;$$

all the co-efficients after D being separately equal to zero, since there are no terms on the left-hand side of the equation involving n^3, or the higher powers of n.

Equating like powers of n

$$12D = 4 \qquad \text{or } D = \tfrac{1}{3};$$
$$4C + 6D = 4 \qquad \text{or } C = \tfrac{1}{2};$$
$$B + C + D = 1 \qquad \text{or } B = \tfrac{1}{6};$$
$$\text{also } A = 0.$$

Therefore sum required $= \frac{2n}{6} + \frac{(2n)^2}{2} + \frac{(2n)^3}{3}$

and sum $- \frac{(2n)^2}{2} = \frac{n}{3}(1 + 8n^2) = \frac{n^3}{3}\left\{8 + \frac{1}{n^2}\right\}$

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In the same manner the area between the ordinates P_3N_3 and P_5N_5, writing a_3, a_4, and a_5, for a_1, a_2, and a_3 respectively is $= \frac{m}{3}\left\{a_3+4a_4+a_5\right\}$

area between P_5N_5 and P_7N_7 is

$$\frac{m}{3}\left\{a_5+4a_6+a_7\right\}$$

and so on; until we come to the last set of three ordinates, the area corresponding to which is

$$\frac{m}{3}\left\{a_{2p-1}+4a_{2p}+a_{2p+1}\right\}$$

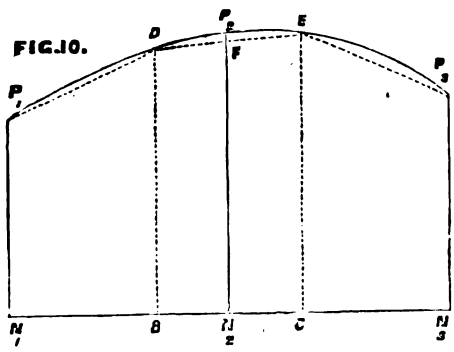
And therefore the whole curvilinear area of which P_1N_1 and $P_{2p+1}N_{2p+1}$ are the first and last ordinates respectively is

$$= \frac{m}{3}\left\{a_1+a_{2p+1}+4\,(a_2+a_4+a_6+\&c....+a_{2p})\ +2\,(a_3+a_5+a_7+\&c....+a_{2p-1})\right\}$$

From this expression we get the following rule to find any curvilinear area, such as is represented in Fig. 8:—

RULE. *Divide the line N_1N_{2p+1} into an even number of equal portions, and through the points of division let the corresponding odd number of ordinates be drawn perpendicular to N_1N_{2p+1} meeting the curve: and, to the sum of the first and last ordinates, add four times the sum of the even ordinates, and twice the sum of all the odd ordinates except the first and last, and multiply this sum by one-third the common distance between the ordinates.*

FIG. 10.



This is commonly called the Rule 2. A proof of this rule is given by M. Poncelet in his "Mécanique Industrielle," and as it is very simple and ingenious we shall give it here, observing that it previously appeared in the MECHANICS' MAGAZINE, No. 1413.

Take $P_1P_3N_3N_1$ (a portion of Fig. 8,) as in Fig. 10, and let a_1 a_2 and a_3 represent the ordinates P_1N_1, P_2N_2, P_3N_3, and m the common distance between them. Divide N_1N_3 into *three* equal portions, and through the points of division B and C, let BD and CE be drawn perpendicular to N_1N_3, meeting the curve in the points D and E. Join P_1D, DE, and EP_3, by straight lines, and let DE cut P_2N_2 in the point F. The common distance between these new ordinates will be $\frac{2}{3}N_1N_2 = \frac{2}{3}m$. Then if $\frac{2}{3}m$ be not very large, an approximation to the curvilinear area will be the sum of the three trapeziums just formed.

Area of trapezium $P_1B = \frac{1}{2}(P_1N_1+BD)\times\frac{2}{3}m$;
" " " $DC = \frac{1}{2}(BD+CE)\times\frac{2}{3}m$;
" " " $EN_3 = \frac{1}{2}(CE+P_3N_3)\times\frac{2}{3}m$;

Therefore approximately the area $P_1N_3 = \frac{m}{3}\left\{P_1N_1+P_3N_3+2\,BD+2\,CE\right\}$.

Now $BD+CE=2N_2F$, and F is very near P_2, since the ordinates are not far apart; therefore $BD+CE=2P_2N_2$ very nearly; and $2\,BD+2\,CE=4a_2$.

Hence approximately the curvilinear area $P_1P_3N_3N_1 = \frac{m}{3}\left\{a_1+a_3+4a_2\right\}$.

Proceeding with the other portions, P_3N_5, P_5N_7, &c., of the figure as has been done above, the rule just stated will be obtained.

The artifice by which the area is thus simply obtained consists in assuming that $BD+CE$ is equal to $2a_2$. The effect of this assumption on the result will be to increase slightly the approximating area above that of the three trapeziums; and since the small segments outside the trapeziums have been neglected, this small increase will tend to make up the deficiency. This, as we have shown above, really amounts to supposing the area to be bounded by a common parabolic curve.

INDIAN ITEMS.

THE works on the Umritsur and Mooltan Railway have been stopped. The reason assigned is that no instructions have been received from home regarding the line, nor any information as to the engagement entered into between the Company and the Home Government. Preliminary works, such as staking-out, the collection of materials, &c., are still proceeding.——The electric telegraph has been completed to Cochin on the Malabar coast, and is now opened to the public.——With regard to the Madras pier, Lord Stanley observes in a despatch, dated Oct. 27, 1858:—"The committee admit the contractors' estimate of the cost of the several additions suggested in the erection of the pier to be reasonable, and they consider that it will be cheaply purchased for £103,616. The offer of the contractors for its construction for that sum has been formally accepted, with the understanding that their original specification is to be modified so as to include the several alterations proposed by the committee; and further, that the whole work shall be completed within 2½ years from the date of commencing operations at Madras."——The Berar and Eastern Coast of Indian Company (Limited), with a capital of £3,000,000, is announced. The line is proposed to run from Coringa, at the mouth of the Godavery, to Nagpore, with a branch to Hyderabad. From Coringa to Nagpore is 400 miles, and the cost of construction is estimated at £8,000 per mile. The promoters urge that the construction of their line would open up an extensive district which would afford this country a large supply of cotton.——The last advices announce the arrival out of 12 vessels, despatched from Liverpool last August by the Oriental Inland Steam Company. ——The electric telegraph has been laid down cheaply in Ceylon. From Colombo to Galle, 72 miles, cost £3,000, and another 72 miles, from Colombo to Kandy, about the same price. ——An English mercantile firm has been established in the Punjaub, at Umritsur and Hurecke, to deal with native merchants for borax, salt, saltpetre, &c., and iron. The latter, which is said to be of excellent quality, is charcoal iron.

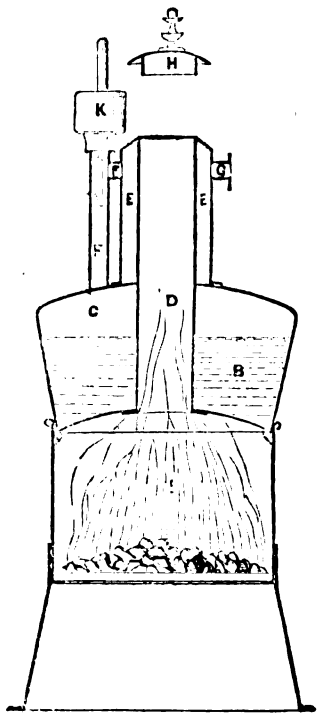
LIGHT-DRAUGHT STEAMERS FOR INDIA.

ON Monday last the light-draught steamer to which we made allusion in a recent Number, and which has been designed and built by Mr. Scott Russell for the Scinde Railway Company, was taken down the river on a trial trip. She is a singular vessel, being 200 feet long, 38 broad, and drawing only 2 feet of water with cargo and passengers on board. She is built of thin iron, and among other strengthening parts, has two longitudinal girders, running nearly throughout her length, and rising 10 feet above the deck, so as to form the bulkheads of a large deck-house containing apartments for passengers, after the fashion of American river steamers She is fitted with Mr. Russell's patent three-cylinder engines, and is driven by ordinary paddle-wheels. The engines worked very smoothly, and ran the vessel along at more than 13 knots per hour, with a draught of 22 inches. The trial was justly pronounced highly satisfactory, and Mr. Russell will proceed forthwith to build several additional vessels of a similar character, for the Indus. The spirited conduct of the Scinde Railway Company in starting vessels of this class upon the rivers of India will doubtless prove the beginning of a new era in the commercial interests of that country. The design of Mr. Scott Russell's vessel was selected from several competing designs, and it would be difficult to devise a better. Unfortunately the length proposed by him has been somewhat curtailed, otherwise a still better result would have been obtained on Monday. The engineer of the Company, Mr. Yarrow, was complimented at the trial by Mr. Russell, for the aid afforded by him in bringing about the accomplished success.

SUPERHEATING STEAM.

MR. TAPLIN, an experienced officer of the Engineering Department of H. M. Dockyard, Woolwich, sends us the following interesting and significant memorandum:—

Gentlemen,—I send the accompanying drawing of a model boiler, designed and brought before public notice by me in 1827, for producing superheated steam, presuming the subject may be of interest to some of the readers of your Magazine.



It will show that neither the practice of producing superheated steam, nor its use as a motive power, is at all a new feature in its application to the steam engine. Though perhaps it may with truth be asserted that it was not generally recognised to be economical and highly advantageous to actuate the steam engine by superheated steam, until Mr. Weathered's recent experiments in America and elsewhere were developed, with his project for using it in a mixed condition.

But as the steam boiler is that apparatus to which the various modes for superheating has to be applied, and boilers being of various forms and descriptions, it may be found expedient to adopt modified devices as may best suit each speciality.

With a view of making known to your readers the plan adopted by myself in 1827 for using superheated steam, unmixed, and more recently with large success on board the *Bremen* steam vessel, I have thought it might be even in the present advanced state of scientific improvements applicable on a still more extended scale, with much benefit to our mercantile marine. The original model and explanatory drawings may be seen in the Museum at Kensington, where they have been deposited. R. TAPLIN.

ARMSTRONG'S GUNS.—It was yesterday stated in Woolwich Arsenal that Mr Armstrong, the inventor of the wrought-iron rifle cannon, has entered into a contract with Her Majesty's Government, and that a considerable number of the guns are to be forthwith supplied for the use of the Artillery.

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DODD AND PHILLIPS'S IMPROVED SLIDE VALVE.

FIG. 1.

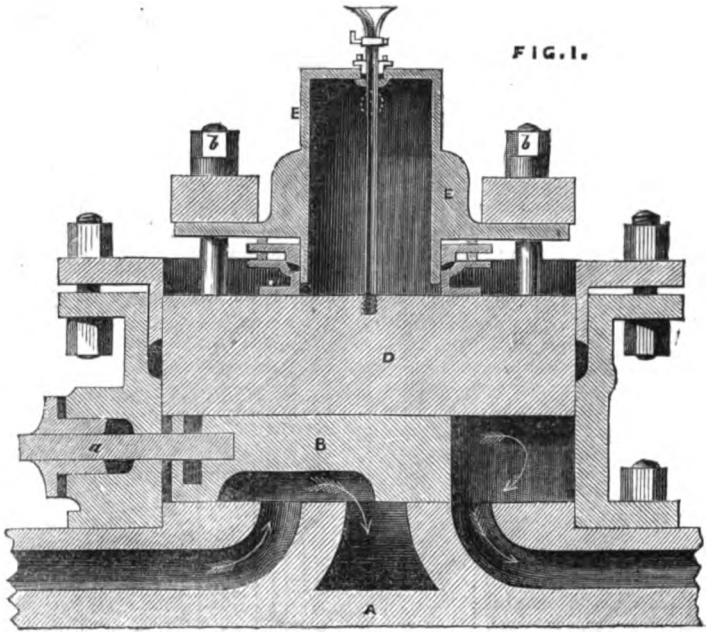
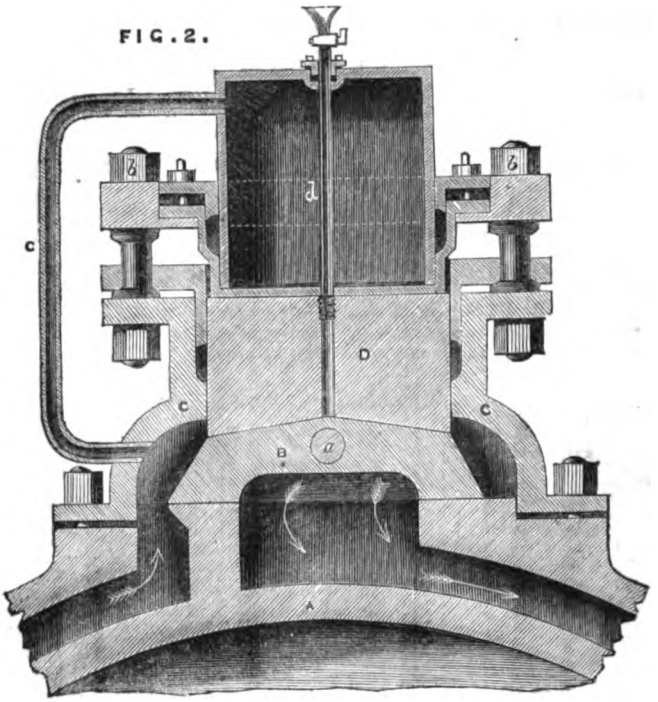


FIG. 2.



DODD AND PHILLIPS'S IMRROVED SLIDE VALVE.

MESSRS. J. DODD AND T. PHILLIPS, of Ruabon, Denbigh, have introduced the method of fitting balanced slide-valves for steam engines represented in the accompanying engravings. Fig. 1 is a longitudinal section, and Fig. 2. a transverse section. *A* is the cylinder, *B* the valve, *C* the valve case, and *D* the valve rod. Upon the top (or in some cases the side) of the valve is placed a block *D*, which is surmounted by a steam chamber *E*, which is fitted with an elastic joint, packed and kept down by bolts, *bb*, as shown in the figures. The steam chamber *E* communicates with the steam space by means of a pipe, *C*. The surfaces of contact of the block *D* and the back of the valve *B* are kept well lubricated by means of oil or other lubricant passed down through the small tube *d*, which extends entirely through the steam chamber, and enters a tube in the block *D* leading to the said surfaces. The dimensions of the chamber, &c., are so regulated as to admit of the desired amount of counterbalancing pressure being exerted upon the valve. The address of the inventors is 1 Lynn Cottages, Forest Row, Dalston.

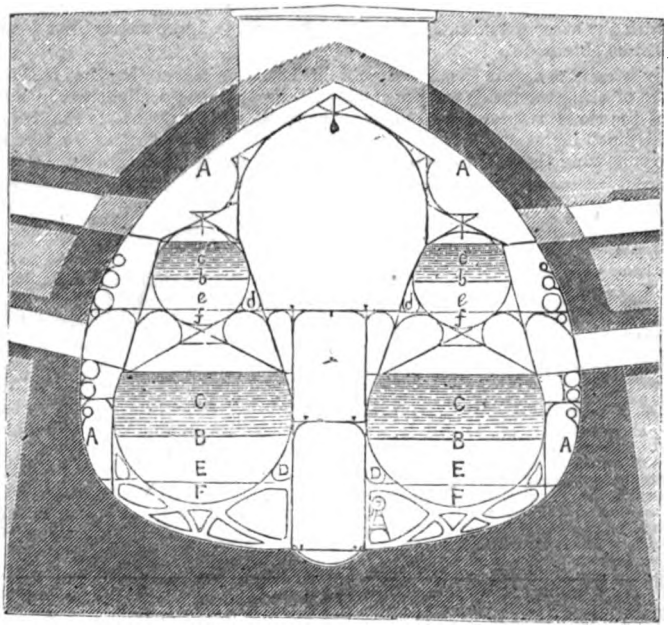
M. HOREAU'S SCHEME OF SEWERAGE.

AT the Hanover-square Rooms M. Hector Horeau, the well-known French architect, has been exhibiting and explaining his plans for the improvement of London. These are sufficiently comprehensive; but the principal points dwelt upon are the sanitary purification of the Thames, and the construction of quays and an esplanade upon its banks. The project of M. Horeau is to construct embankments on both sides of the Thames, having archways leading to the wharves—in front of which also would run canals for loading and unloading barges, wherever the width of the river would allow of the same. Within this embankment would be contained the sewage tunnel, including, besides high-level and low-level rivulets, no less than three railways for transporting manure and machinery, pipes for water and for gas, &c.

M. Horeau dwelt at some length upon the commercial advantage of the proposed wharves, which he affirms would be practicable in a financial point of view by reason of their valuable rental. A new street, to meet all the exigences of the present; or an increased circulation, and a general railway station in the centre of the metropolis, are also among the propositions of M. Horeau.

The following is M. Horeau's account of his "New Purifying Sewers for the Thames:"—

To avoid the difficulties of levels—to avoid expensive engineering—to avoid the formation of an offensive deposit, that no locality would admit of—to avoid the re-flowing of sewage towards the Metropolis—lastly, to economise public expenditure, and develop the riches of nature by natural processes,—such are the objects which the author proposes to obtain.



With this view, the proposed sewers are to consist of a vault, *A A A A*, of sufficient capacity to contain four iron gutters, or rivulets (two large and two small), *B B*, *b b*, supported by iron bearings independent of the construction of the vault; these rivulets are constructed at different heights, in order to facilitate their junction with the present sewers (which are at different levels), and would have a very slight fall, to be divided into as many basins as would be required by fixed sluices, open only at their summits, for the purpose of obtaining deposits, which would not arrest the ordinary current; moveable pipes or gutters being adopted for carrying into the adjoining rivulets the first matters which are not to be received in deposit, either to remove the manure or to allow of repairs. The purified water, *C C*, *c c*, which could be obtained in a short time at the summit of the deposits, might without injury be poured into the Thames, especially should this water be made to pass into channels containing purifying agents—such channels situate at *D D*, *d d*, under the rivulets or deposits. Underneath the purified water would naturally be found the liquid manure, *E E*, *e e*, which may be covered with oil to prevent the escape of its valuable gases. This liquid manure, which would increase in value towards the bottom, could be sent by pumps, pipes, or by casks, to the market gardens surrounding the Metropolis. After the liquid manure is drawn off, the deposit of solid manure, *F F*, *f f*, would be found at the bottom; this should be covered with lime or alum to preserve its quality and facilitate its being put into casks; the casks, to be raised by means of pulleys, could be placed on one of the three railways (with moveable floor), placed above each other between the rivulets. These railways would also serve for removing the manure, and for the transport of engines and other materials; observing that the upper railway could be more especially appropriated to the repairing and replacing those portions of the channels composing the different rivulets. This upper railway may also, in certain cases, communicate directly with the great lines of railway

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at present existing. An extra gutter under the lower railway could receive the waste from the rivulets, pipes, gutters, or junctions, as also the cleaning water and any filtrations which may occur through the vault. Six galleries (three on each side of the vault) would be appropriated to the inspection of the junctions of the old sewers, to the proper disposal of the raw matters to decant into the various rivulets, for the fixing and repairing of the various pipes of water, of gas, and also for their numerous branches of distribution; observing here that electric wires, speaking tubes, and beer conductors (for the different workmen in the sewers) could thus find room on the sides of the vault. Moveable scaffoldings, ladders, syphons, pumps, cranes, and all useful machines, would facilitate the different services in the interior of the sewers, without encumbering the public way, as too often happens under the present system. The sewers in a state of uniform temperature, neither exposed to rain, wind, frost, or heat, would be lighted by jets of gas, establishing a salutary ventilation by means of draft chimneys placed at convenient distances; the workmen should be not only permitted but even induced to smoke. Artificial lighting may be assisted by daylight, by reflectors, or by apertures required for works and for the several workshops established near the course of the proposed sewers. "In the proposed new Purifying Sewers, which, as may be required, can be executed on a greater or smaller scale, which could be doubled, tripled, diminished, and even completely stopped, at the meetings of rivers or canals, or at the entrances of docks, and which could be crossed by existing pipes of water and gas, the intelligent reader will perceive," says M. Horeau, "a series of advantages which collectively would greatly benefit those concerned in purifying the Thames, by the sale of rich manures, by arrangements with water and gas companies, who may avail themselves of the sewers, by obtaining, gratis, on the shore of the Thames, and elsewhere along the course of the sewers, a ground-plot (within the sewer) for manufacturing manure, and, moreover, localities which could be conveniently appropriated for public buildings, as, for example, *Government Offices*. To this project for purifying sewers, enriching agriculture, and rendering salubrious the river and the Metropolis, I will add that a new branch of the Thames from Greenwich-marsh to Barnes would turn the waters to better account for navigation and commerce, and prevent the pollution of the river. But here I stop. These grave questions do not come within the scope of a summary description of sewers. If I have ventured these few ideas, it is that in matters of edility all considerations are bound up together; for London, and especially the City, is of all places in the world the least improving, notwithstanding that its buildings are combustible and of little value; and that the population frequently impedes the circulation required for commercial activity. Is it not time for the capital of the country where the first railways were formed—where the penny postage was established (copied or envied by so many countries)—where the first universal exhibition was formed—where are united telegraphically all the nations of the globe, and where a rare political security is enjoyed—is it not time this capital should arise nobly from its unaccountable lethargy of edility, and combine its different requirements for the purpose of facilitating their execution; and in order that it should become that which it ought to be—the worthy METROPOLIS OF THE COMMERCE OF THE WORLD!"

THE CONSERVATION OF FORCE.

(*Concluded from page* 75.)

THE same method is observable in the author's notice of the steam engine in its connection with the conservation-of-force theory. The above extract is intended to elucidate his view of this particular branch of the subject. In the following the same view, though impertectly, is more fully set forth:—

". . . . In the action of an ordinary steam engine, the heat from the furnace, having expanded the water of the boiler and raised the piston, a mechanical motion is produced; but this cannot be continued without a renewal of the heat or the contraction of the expanded water. This is done by the condenser and the piston descends; but then we have, in fact, transferred the heat from the furnace to the condenser, and in the transfer effected mechanical motion. Whether mechanical motion produced by heat be viewed as the effect of the transfer of heat, or as a conversion of heat into motion, is, perhaps, more a question of terms than of reality. . . . .

". . . . To produce continuous motion, or the up and down strokes of a piston, we must heat and cool, just as with a magnetic machine we must magnetise and demagnetise, in order to produce a continuous or useful mechanical power; and although, from the impossibility of insulating heat, some heat is apparently lost in the process, the result may be said to be effected by the transfer of heat from the hot to the cold body, from the furnace to the condenser. But we may equally well say that the heat has been converted into mechanical force, and the mechanical force back into heat; the effects are always correlative, as are the mechanical effects of an air pump, with which, as we dilate the air on one side, we condense it on the other; and as we cannot dilate without the reciprocal condensation, so we heat without reciprocal cooling, or *vice versâ*.

"Though the expansion of the air, steam, &c., is in itself a mechanical effect; yet to raise a piston we must have an excess of power beyond that which would produce the measure of expansion actually produced, and equal to the mechanical power required. Thus to raise a piston whose resistance is equal to two pounds, would require twice the elastic force of air which would be required to raise to the same height a piston whose resistance equalled one pound.

"In treating of motion we have seen that a certain amount of heat is produced by a certain mechanical action, and that this has been measured for several cases in the experiments of Mr. Joule. I am not aware that the converse proposition, or the amount of mechanical work which is produced by a given quantity of heat, has been directly established by experiment, though some approximative results in particular cases have been given. Theoretically it should be the same—that is to say, if a fall of 772 lbs. through a space of one foot will raise the temperature of 1 lb. of water one degree of Fahrenheit, then the fall in the temperature of 1 lb. of water through one degree Fahrenheit should be equal to raise 772 lbs. through a space of one foot—a result which certainly, at first sight, looks startling. I have endeavoured to give a proof (by showing the anomaly to which the contrary conclusion would lead) that whatever amount of mechanical power is produced by one mode of application of heat should, in theory, be equally produced by any other mode. But in practice the difference is immense; and, therefore, it becomes a question of great interest practically to ascertain what is the most convenient medium on which to apply the heat employed, and the best machinery for economising it."

Mr. Grove enunciates strange dogmas. He tells us that the condenser is an indispensable part of the steam-engine, notwithstanding he cannot be ignorant of the fact, that all locomotive engines work extremely well without its aid. Alternate heating and cooling is by no means absolutely necessary in the application of heat as a motive power. The condenser is used simply on the ground of economy, because it enables the engineer to eliminate, to some extent, the external opposing atmospheric pressure from his machine. Were it not for this external pressure of the atmosphere, the condenser would be of no use whatever, and the condensing engine would be no more economical than the locomotive.

That Mr. Joule or any one else has, by satisfactory experiment, established as a truth that 772 units of work, and the heat requisite to raise 1lb. of water one degree of Fahrenheit are reciprocal equivalents, I do not believe. We are told that Mr. Joule, in the experiments which he made to discover the mechanical equivalent of heat, employed a weight attached to a string to turn a paddle-wheel in a bath of water or of other fluids. The heat generated in the fluid wheel, &c., was, I suppose, equated with the work done by the falling weight. And from this questionable kind of experiment, Mr. Joule concluded that mechanical equivalent of one degree of Fahrenheit added to or abstracted from the temperature of one pound of water is equivalent to 772 units of work. I am not inclined to admit such a deduction from such experiments, unless it be proved that the falling weight has produced no effect besides that of raising the temperature of the fluid, and unless it be proved that the increased temperature of fluid is not coupled with a corresponding diminution of temperature in surrounding bodies. The extreme delicacy of which Mr. Grove says belonged to Mr. Joule's experiments is of little avail for his results if there be, as I think, a radical defect in his logic.

Mr. Grove's theory has a wider application, and therefore is liable to include a still larger amount of error. According to him the amount of heat which will increase the temperature of a pound of water one degree of Fahrenheit, to whatever medium applied, ought always to yield the mechanical equivalent, 772 units of work. What astonishes me is, that he does not seem at all disgusted with his theory, even when he finds that "in practice there is an immense difference." This constancy to a theory in adversity would, I dare say, be very charming to a sentimental mind. The rule I should follow, however, would be to reject every theory requiring uniformity, if practice give "immense" variation. With different media Mr. Grove acknowledges his theory does not hold. Does it hold even for the same medium? In the case of steam, is the duty of the engine always the same even if the same engine, the same boiler are used, if the steam be generated at various pressures? If the same engine and boiler be used, will a bushel of coals produce the same useful effect if applied to generate steam at two atmospheres as if applied to generate it at three atmospheres? The fuel required to transform a cubic foot of water into steam is said to be nearly the same, whatever be the pressure under which the steam is generated. Now, a cubic foot of water turned into steam at a pressure of three atmospheres, will yield a much greater amount of work than the same weight of steam at two atmospheres. And the result in the condenser is also precisely the same, for it requires the same proportion by weight of water to condense the steam, and the whole is left at the same temperature. Hence the mechanical equivalent of heat as used in generating steam varies with the pressure of the steam. The whole doctrine of steam and of the steam engine requires immediate reform if Mr. Grove's interpretation of natural phenomena be well founded; and I recommend it to his notice, and to the notice of those scientific gentlemen who teach the conservation of force and interpret it as he does. According to the common theory of steam it requires the same amount of fuel to heat 29 cubic feet of water from 60° to 100° Fahrenheit, as to evaporate one cubic foot of water into steam under any pressure whatever. And according to the same doctrine 28 cubic feet of water at 60°, if put in communication with the steam obtained by the evaporation of one cubic foot of water, will condense it and form a result of 29 cubic feet of water at 100°, and this will be the result whatever change of expansion, and consequent variation of pressure and temperature, may have taken place in the passage from the boiler to the condenser, provided only that no interchange of heat has happened between the steam and other bodies before it reaches the condenser. If all this be correct it may be readily proved that the result in the condenser is a full equivalent for fuel consumed in the furnace, and that nature does the work of the steam engine into the bargain. If the lowering the temperature of a pound of water one degree of Fahrenheit give a mechanical equivalent of 772 units of work, then the mechanical equivalent of the fuel necessary to raise 29 cubic feet of water from 60° to 100° Fahrenheit is equal to

$$29 \times 40 \times 62{\cdot}5 = 72{,}500 \text{ units of work.}$$

The mechanical equivalent of the heat required to evaporate one cubic foot of water into steam must be exactly the same. Therefore, as none of the heat is lost in the passage through the engine, none of its mechanical power has been consumed. This is a decided proof that either the common theory or Mr. Grove's is in serious error. I am disposed to think that Mr. Grove is wrong. I am quite convinced that the heat which appears on occasions of friction, collision, &c., is not paid for by a disappearance of mechanical motion. For no motion is ever lost in these phenomena. Hence, I do not demand of nature that a development of mechanical action, in which no absolute gain of motion takes place, shall be compensated for by a disappearance of heat. Yours, &c.,

A MECHANIC.

SUFFIELD'S ENGINE-ROOM TELEGRAPH.—An improved marine engine-room telegraph, lately introduced by Messrs. Suffield and Co., engineers, &c., of Bermondsey Wall, and Fenchurch Street, London, has been tried and proved this week, on board H. M. ship *Cressy*, at Sheerness. The trials made with it were very severe, and the success of the instrument surpassed all expectation, giving great satisfaction, we believe, to Captain Halsted, who will report upon it to the Admiralty.

CAPTAIN NORTON'S RIFLE BULLET.—The *Times* of yesterday again notices this bullet, saying, "a favourable report has been made to the authorities of the result of the experiments with the new description of rifle bullets invented by Captain J. Norton." In a previous number of the same paper, a letter from Mr. Busk, the author of a well-known work on the rifle, was published. Mr. Busk speaks strongly in favour of the new bullet, highly eulogizes the inventive skill of the gallant "Peninsular Veteran," and adds that in his case, as in many others, "the labour of a life has been devoted to the service of an ungrateful country, without one word of encouragement, or even a bare token of approval." This applies only to the neglect of the Government departments, the press having continually and warmly urged Captain Norton's many claims. We really hope the Government will now do justice to this old and very able officer.

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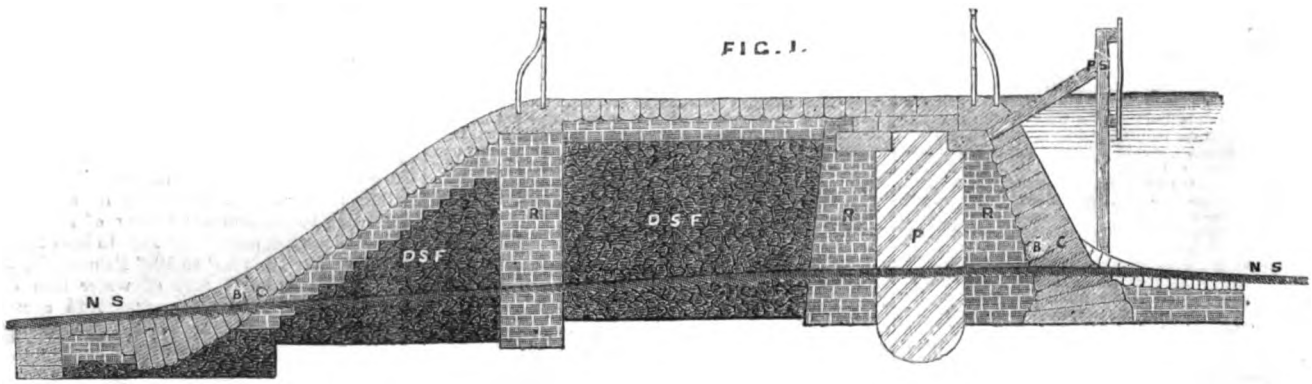
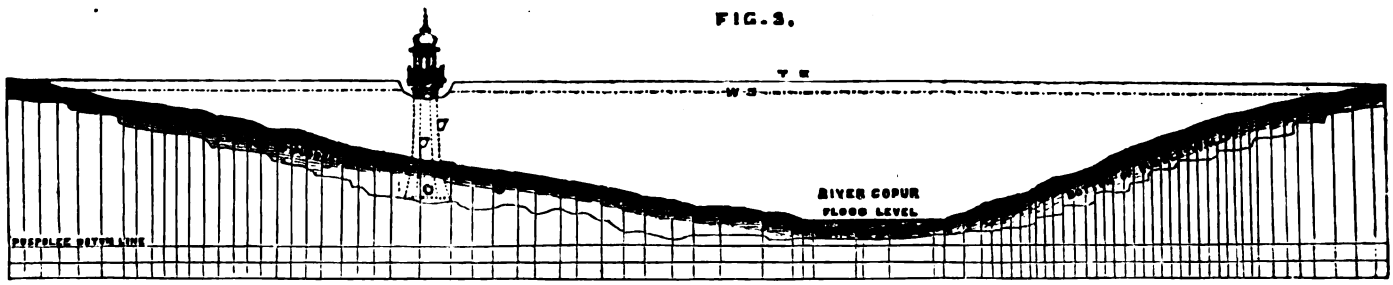
THE BOMBAY WATERWORKS.





THE BOMBAY WATER-WORKS.

THE water-works at Bombay having been deemed of so much importance that they alone of all the public works in India have been proceeded with during the mutiny, and Colonel Sykes having in the House of Commons, on the first business night of the session, alluded to their completion during the present year as a great source of satisfaction, we have made the necessary arrangements for presenting our readers this week with a description of them. In doing this we have been greatly aided by the paper which the able engineer of the works, Mr. Henry Conybeare, C.E., read a few months since at the Institution of Civil Engineers. We shall follow his remarks as nearly as our space will admit.

The geological conditions of Bombay being such as to leave the inhabitants destitute of springs, the population of the place was but a few years since mainly dependent for water during nine months out of the twelve on the rain caught during the monsoon in old quarries, and other shallow excavations, which, being situated in the midst of a peculiarly dense and dirty population, became thoroughly contaminated as the dry season advanced. The annual prevalence of cholera at Bombay at that season, was mainly due to the extreme pollution of the only water the lower classes could then obtain.

The first project for increasing the water supply of Bombay, by means of surface collection in the adjacent high ground (the only practicable plan in the case of Bombay), is due to Colonel Sykes, late Chairman of the Honourable the East India Company, to whom we have already referred. He proposed, nearly thirty years ago, to collect and impound the rain-water falling on the high ground at the south-western extremity of the Island of Bombay. This would now, however, be altogether inadequate. Colonel Sykes' plan was revived by Colonel Jervis in 1845, but without any material alteration. The second feasible scheme was that of the late Mr. Rivett, who proposed to bring the water collected and stored in the high grounds of the adjacent Island of Trombay. In 1846, Major Crawford, of the Bombay Engineers, pointed out the capabilities of the Valley of the River Goper, in the adjoining Island of Salsette. But the Goper scheme lay dormant, with the others, until the water famine of 1851. Lieutenant De Lisle was then instructed to make a preliminary survey of the valley; and soon after, the question was referred to Mr. Conybeare, whose report on "the amount of the existing water supply of Bombay, and the various means which had been proposed, or might be adopted, for increasing it," was published by the Bombay Government. The conclusion arrived at was, that the Valley of the Goper was the only possible source whence an adequate supply could be obtained. It was recommended that detailed contour surveys should be made, with the view of determining the capacity of whatever eligible sites for water storage it afforded; and that plans and estimates should be prepared, to ascertain the cost of rendering a supply from this source available to the population of Bombay. The course thus recommended was adopted by the Government, and Mr. Conybeare was selected as the Engineer, to prepare the surveys and estimates, and to design and execute the works. The rapid rate at which the population was increasing rendered it imperative that the works should be designed with a special view to their future extension, as the population increased.

On referring to a map it will be seen that the high ground, in which the Goper takes its rise, affords five admirable sites for storage reservoirs; two of which, the basins of Vehar and of Poway, are as large as lakes. The most northern of these reservoir sites is in the immediate neighbourhood of the celebrated cave temples of Kenerry, at the head of an adjoining valley; so that it will have to be connected with the Goper series of reservoirs by a short length of syphon main. Of these basins, that of Vehar is the most capacious. Investigation satisfied Mr. Conybeare that the Vehar basin was adequate to the collection and storage of all the water that could be required for some years, and the works for water storage were therefore confined, in the first instance, to the construction of this single artificial lake. It was, however, arranged that while these works were in progress contour surveys of the other reservoir sites should be carried out, so as to determine to what extent, and at what cost, the supply might be at any time increased, by the construction of any one or of all of them.

After numerous calculations and mature reflection, the design of the works was decided upon and prepared by Mr. Conybeare. When filled up to the level of the waste weir the maximum depth of the Vehar lake is 80 feet. It covers an area of 1,394 acres, and stands 180 feet above the general level of Bombay. The water is impounded by three dams. The principal dam contains a little under 300,000 cubic yards. The top width of the principal embankment (which has to carry a road) is 24 feet; that of the two others is 20 feet. The inner slope of all three embankments is 3 horizontal to 1 vertical, and the outer slope 2½ to 1. These embankments were specified to be formed in regular layers of not more than 6 inches in thickness, each properly watered, punned, and consolidated. The puddle-walls of all the embankments are 10 feet wide at the top, and have a regular batter on each side, at the rate of 1 in 8. The trenches for the foundations have been excavated through the surface rock, and past all surface springs, into the solid basalt below. The slopes of all the embankments, and also the top surface, are covered with stone pitching, at least 12 inches in depth, roughly squared by the hammer, and solidly set by hand; an additional thickness of 12 inches of broken stone being laid underneath. The pitching of the top surface and of the external slopes of the dams is necessary to protect the slopes from the effect of the heavy down-pour, to which the hill districts of India are subject during the rainy season; the duration of the intervening dry season being too great to allow of their protection by means of turfing or vegetation.

The waste weir, shown in section in Fig. 1 of the accompanying engravings, is 358 feet in length. It has a horizontal top width of 20 feet; and is faced throughout with chisel-dressed ashlar, set in cement. A breakwater is affixed to the inner margin of the waste weir, to prevent the water being blown over in high winds. *N S* is the natural surface; *D S F* is dry stone filling; *B C* is block in course in cement; *R* is rubble, and *P* puddle.

The water is drawn from the reservoir through a tower, Fig. 2, placed as shown in Fig. 3, which is a longitudinal section through the axis of the embankment. The line *T E* indicates the top of the embankment, and the line *W S* the water surface when filled. The tower is provided with four inlets, fixed at vertical intervals of 16 feet apart. These inlets are 41 inches in diameter, and are provided with conical plug seats, faced with gun metal. The three inlets not in use are kept closed by conical plugs, fitted by grinding. These plugs are suspended exactly over their seats from the balcony above, and are raised or lowered at will by crane-work at the top of the tower. The inlet in use is surmounted by a wrought-iron straining cage, covered with No. 30 gauze copper wire, and fixed to a conical ring, fitting into the inlet orifice, in the same manner as the plugs, and equally cable of being raised and lowered at pleasure. This strainer presents a surface of 54 square feet. The gauze is affixed to the cage so as to admit of its being changed from a boat, when clogged, in ten minutes after the cage has been drawn up to the surface —or a plug may be substituted for the cage, and lowered to its place in the same time. At the bottom of the inlet well, and exactly over the orifice of the supply main, another conical seat is fixed, into which a similar straining cage (but with No. 40 gauze copper wire, and presenting a surface of 90 square feet) is inserted. The water thus passes through two strainers before it starts for Bombay. The primary object of this arrangement was to obtain, in the town distribution, the benefit of the additional head of water—due to the depth of the lake, which would have been lost had the water been strained (as in the more usual arrangement) at the outside foot of the dam. It was also thought advisable to avoid the use of such heavy sluice-valves as would be required for closing inlets 41 inches in diameter, in positions in which it would be difficult to get at them, for the purpose of effecting any necessary repair. Without this arrangement, the utmost head obtainable would have been insufficient for a distribution by gravitation alone.

The gathering grounds are of basalt. The surface, where not covered deeply by the waters of the lake, rises with so steep an acclivity as to have been long since denuded of any soil that could be washed away. The vegetation is all evergreen, and no human habitation is permitted, throughout the entire area of the gathering grounds. Under these conditions, and also taking the great depth and capacity of the lake into account, the author decided that filtration would be altogether superfluous. For the same reason, a sludge-pipe to drain the lowest level of the reservoir was deemed unnecessary. No considerable deposit is anticipated over any portion of the bottom; the little that takes place will probably be confined to the head of the lake, some miles distant from the outlet; and were it otherwise, a single sludge-pipe could have no appreciable effect in keeping down or scouring off the deposit over an area of 1,400 acres.

Mr. Conybeare being of opinion that there is no engineering structure to which an appropriate and æsthetic expression may not be given, with economy and advantage, made the design of the inlet tower at Vehar an attempt in this direction (Fig. 4). It is an example of the application of a style of architecture very little known in England, but which has capabilities peculiarly adapting it to the architectural and structural requirements of a large class of modern constructions, especially for those into which cast-iron and glass enter largely, and the towers of suspension-bridges. But the application of this style is by no means limited to structures of cast-iron, for out of the infinitively varied, and as yet almost untouched magazine of ornamental detail afforded by Indian architecture, much might be culled that would suit any material and harmonise with any style. The upper part of the tower is further illustrated in the plan, Fig. 5, in which *T T* is a quarter plan of the top of the tower, *M N* a quarter plan on line *M N* of Fig. 2, *O P* quarter plan on line *O P*, Fig. 2, *K L* quarter plan on line *K L*, and *G* is the gangway leading from the tower to the embankment. The supply main traversing the dam is 41 inches interior diameter, and the metal is 1¼ inch thick. It is laid in a level trench, excavated in the rock, and filled with concrete.

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THE BOMBAY WATERWORKS.

FIG. 2.

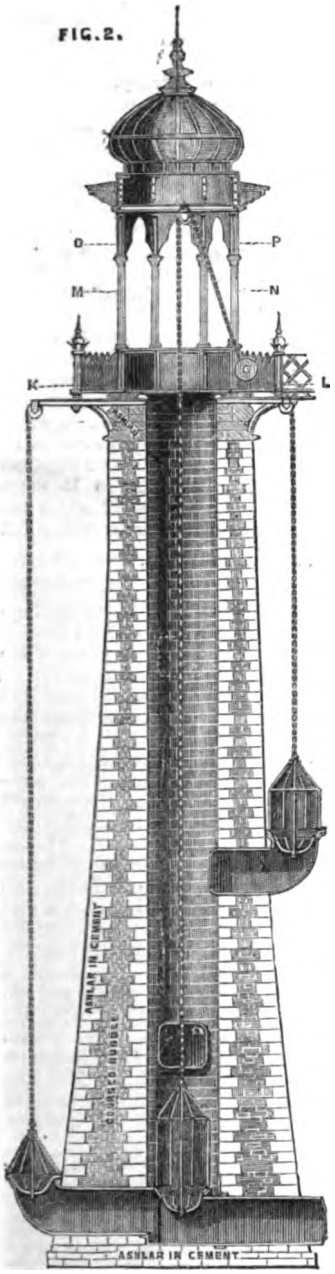


FIG. 4.

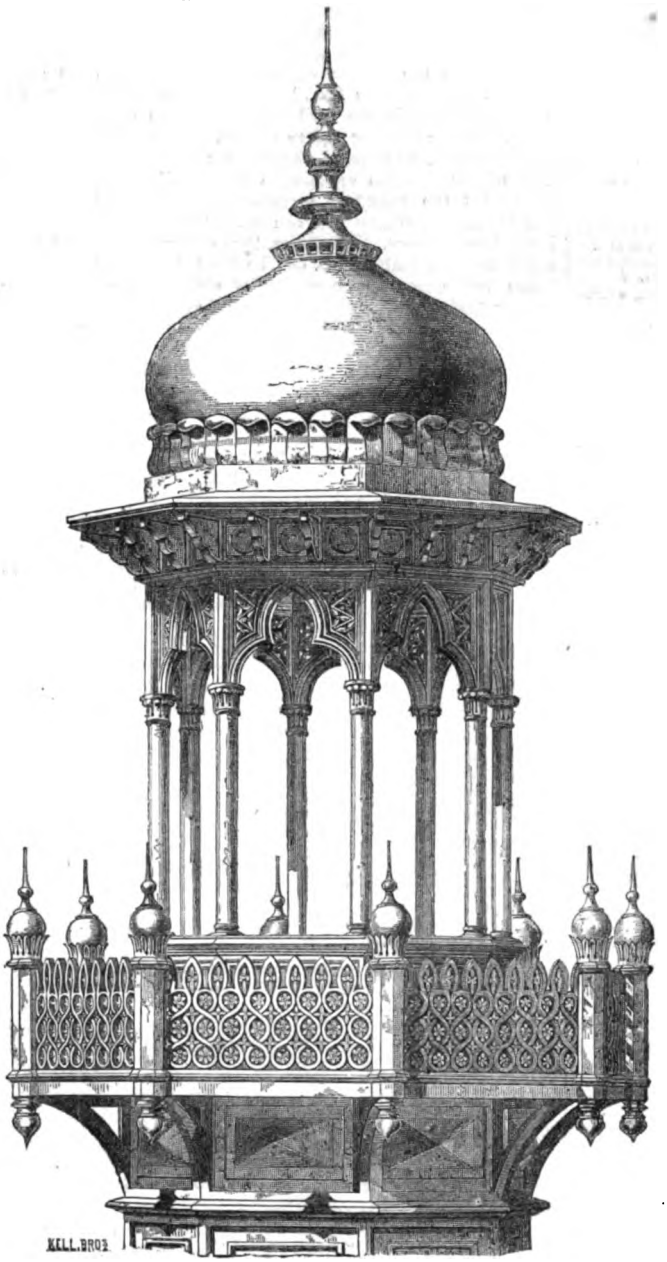


FIG. 5.

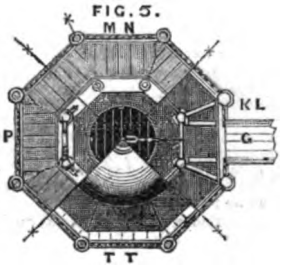


FIG. 7.

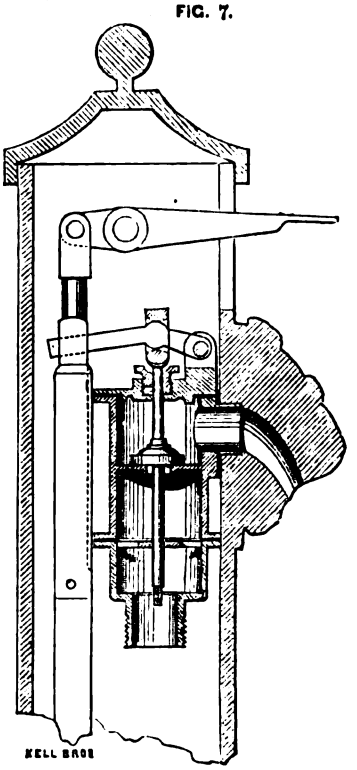
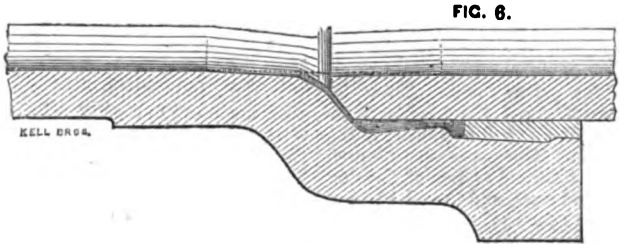


FIG. 6.



The portion traversing the puddle trench is supported on ashlar masonry, set in cement, puddled to a depth of 6 inches, and then arched over with four rings of brick in cement; two teak-wood washers being affixed transversely on the pipes, to prevent any water from passing between the pipes and the puddle.

At the sluice-house, situated at the outside foot of the dam, the large main, 41 inches in diameter, bifurcates into two mains, each 32 inches in diameter, both of which are eventually to be continued into Bombay; only one has been laid, in the first instance, as that suffices for the present requirements of the population. The length of the pipe, of 32 inches diameter, between the Vehar Lake and Bombay is 13 miles 6 furlongs and 160 yards, of which the last 7 miles are laid alongside the Great Indian Peninsula Railway. The mode of joining the pipes is shown in Fig. 6. The supply is distributed through the town and suburbs by means of branch and street mains in the usual manner. The only peculiarity in the distribution is the large proportion of the population supplied gratuitously, by means of self-closing public conduits (Fig. 7). The design of these appliances was, therefore, the subject of much consideration. The pattern finally adopted can be made to close either with or against the water pressure, by simply taking out and reversing the spindle valve; the counter-weights admit of being exactly adjusted to the resistence at the various levels of the town, so as to leave in each case, whether closing with or against the water pressure, just so much preponderence as may be found sufficient to close the valves.

The contracts for the reservoir works in Salsette, and for all the pipe-laying, were let to Messrs. Bray Champney, of Leeds. The pipe contracts were executed by Messrs. D. Y. Stewart and Company, of Glasgow. All the larger sizes of sluice valves, the hydrants, and a portion of the special castings, where manufactured by Messrs. Simpson, of the Belgrave Iron Works, Pimlico. The sluice valves, 32 inches in diameter, are admirable specimens of workmanship. The valve is made in two segments, the smaller one being about one-fourth the area of the larger. By this arrangement, the valves are rendered capable of being closed or opened under the severest pressure, with a very trifling exertion of force. The smaller valves are on Underhay's system, which possesses the advantage of allowing the valve seat, as well as the valve itself, to be removed for the purpose of repair, without disturbing the laying of any portion of the mains. The water is delivered at Bombay under a pressure varying from 165 feet to 169 feet.

The conditions under which the work had to be executed were peculiar. The want of water was so grievously felt at Bombay that the Government and the public were impatient for the immediate completion of the works. But all the pipes and machinery had to be manufactured at a distance of 15,000 miles from Bombay, and it was a difficult matter to provide shipping to a single port for so large an amount of dead weight, within so short an interval. Moreover, it was only during the eight months of the fair season, from the 1st of October to the 1st of June, that work could be carried on to any extent in the interior of Salsette. During October and November, while the ground was drying up after the rains, jungle fever of an extremely malignant type prevailed in that locality, to an extent to create a very serious impediment to the effective prosecution of any large works. In the high country of Salsette the rains are too heavy and continuous to allow of any

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work being carried on while they prevail; and the torrent that often pours down the gorge of the Goper at that season would inevitably sweep away any works for impounding its waters, left in an incomplete state when the rains set in, unless some provisional outlets were provided for its escape in some other direction.

Careful arrangements were made to meet the necessities of the case, and these arrangements have in all essential points been successfully carried out. The dams were just completed to the height required to insure safety, before the setting in of the first monsoon; the rainfall of which first monsoon was thus impounded and stored to the 56-feet contour; and the works will be in a complete state to receive the rains commencing in June next, by which rainfall the lake will be filled to the waste weir, and its surface extended over an area of 1,394 acres.

The only contretemps that has occurred has been occasioned by the difficulty experienced, especially since the commencement of the Indian mutiny, in providing shipping for the pipes with sufficient rapidity, but the effect of this delay will be merely to retard the completion of the detailed distribution in the town to some weeks beyond the specified date, which, as such delay will operate during the rainy season, when water is only too abundant, will be attended by no practical inconvenience.

In the execution of the works great credit is due to Mr. H. Walker, who has ably filled the office of resident engineer, and who carried out Mr. Conybeare's plans to his entire satisfaction. Upon Mr. Conybeare himself, as a professional man, the entire undertaking, from first to last, reflects great honour, and places him among the foremost engineers of the time.

Literature.

Miscellaneous Papers on Mechanical Subjects. By JOSEPH WHITWORTH, F.R.S. London: Longman, Brown, Green, Longmans, and Roberts. Manchester: J. and J. Thomson. 1858.

THE volume which Mr. Whitworth here presents to us has a peculiar value. It records the thoughts and observations of one of the most refined mechanical minds of the age, and at the same time shows the practical influences which those thoughts and observations have exerted. The contents of the volume have for the most part been published before, in the proceedings of various societies, and elsewhere; but they will be heartily welcomed in a collected form; the more so as they are associated with an original paper on rifled fire-arms, which all mechanical, and many naval and military men will seek with interest. There is something exceedingly pleasant and impressive in Mr. Whitworth's professional career. That faculty of the mind by which man corrects, refines, and perfects his instruments, and which is more than ordinarily strong in Mr. Whitworth, he has employed with the happiest results. Exercising his early powers, if we mistake not, in conjunction with Mr. Babbage, in the construction of the famous calculating machines, he soon learnt to acquire nicety of touch and mechanical delicacy. On coming out into the broad sphere of engineering operations these qualities led him to observe the rudeness and imperfection of many of the mechanical processes of that period; and this resulted in the production of the first paper in the volume before us, on "plane metallic surfaces," read at the British Association in Glasgow, 1840. We hardly need say that the system of "scraping," then recommended by Mr. Whitworth in place of "grinding," has now come into general if not universal use, and with immense reduction in the wear and tear of steam engine slide valves, &c. The next of the papers before us was on "A Uniform System of Screw Threads," and was read at the Institution of Civil Engineers in the following year (1841). This paper was followed by the abandonment of the old system of forming screws of all forms and sizes, and the adoption of uniform sets of screws for engineering works—a highly economical change. The next paper is the address delivered by Mr. Whitworth to the Institution of Civil Engineers at Glasgow, in 1856; and this is followed by the paper on "Standard Decimal Measures of Length," addressed to the same Institution at Manchester in 1857. These are deeply interesting papers, detailing the means by which the minutest lengths, sensible only to the touch, are measured. The perfection of measurement seems to be here attained. The decimal system is advocated with irresistible cogency. The last paper in the book is Mr. Whitworth's report on the New York Industrial Exhibition, in 1853, which is still sought after. But before it, comes the paper on "Rifled Fire-arms." And here we must state, that from the first we have looked anxiously for the success of Mr. Whitworth's proposed system of construction, and have never heard of, or announced, its failure in any instance without regret. There seems to be a fitness and suitability in the system which the "grooving" does not possess. We fear, however, the success of the polygonal-bore arms has hitherto been but small. In the chapter before us, Mr. Whitworth early remarks, we observe, that "the angular corners of the hexagon are always rounded." We considered the rounding a recent improvement, and think Mr. Whitworth can hardly intend to imply the contrary. He states, that either cylindrical or hexagonal bullets can be fired from his guns; but urges the necessity of employing a powder that ignites quickly with the cylindrical bullet, in order to expand it effectually into the angles of the bore. Knowing the difficulty with which marksmen judge of distances, he gives his bullets a small diameter, so that they fly fast, and move in a low trajectory, whereby the aim is made more sure than usual. For some purposes, such as firing through iron plates, through water, &c., he employs a long flat-fronted projectile, which is found to be scarcely inferior in any respect to a pointed one, and has many advantages. For firing through elastic materials, he uses hollow projectiles, which take out a core, leaving a hole that does not close up. These also penetrate masonry very efficiently. He gives a very quick turn to the rifling of his small arms—one turn in 20 inches for a military barrel—and objects to a varying turn, as "obviously injurious," "for besides altering the shape of the bullet it causes increased resistance at the muzzle—the very place where relief is wanted." This paper on fire-arms is very meagre—a fact which the author explains by saying that it has been drawn up rather with the view of offering some reply to many inquiries than with the intention of giving a detailed account of what has been done, or of presenting a complete treatise on the subject. It ought, however, to have contained some explanation of the failure of the cannon. There is a note at the end of the paper which may, we think, have had much to do with the publication of the volume, and which, in justice to the author, we with pleasure transcribe. It runs as follows:—

"It is right to state that from the time I first undertook, at the solicitation [!] of the Government, to render what assistance I could in the improvement of rifled fire-arms, I have always devoted my time and attention to them, without any remuneration whatever, even for personal expenses. The sums required have been advanced by myself; periodical accounts are sent in to the Government, and the advances have been repaid at its convenience."

We earnestly recommend this book to young engineers. It will refine and exalt their professional ideas, and otherwise greatly help them.

Remarks upon the Practicability and Advantage of Railway Communication in European and Asiatic Turkey. By Sir MACDONALD STEPHENSON. With Maps. London: John Weale, 59 High Holborn. 1859.

THIS publication has probably been put forth more with the view of eliciting articles in the press than with the desire to circulate the book itself extensively; but, as it comes to us as a literary production, we prefer treating *it* rather than its subject. The author is well known as an able and zealous promoter of railways in the East. In compliance with a requisition of the directors of the Ottoman Railway from Smyrna to Aidin, he has visited Smyrna and Constantinople, and finds that the first section, extending 40 miles from Smyrna, will be probably opened by September next. The second and third sections will be completed earlier than was anticipated, and the prospect of merchandize and passengers is very encouraging. After quoting some interesting documents, and noticing the trade of Smyrna, he proceeds to state that at Constantinople he urged upon the ministers of the Porte several reforms in connection with railway undertakings in Turkey. The ministers expressed themselves willing, and even anxious, to do what they could, and approved of his suggestion, that all parties concerned in those railways should co-operate in order to remove existing evils. Sir Macdonald next repeats the arguments made use of by him many years since in favour of railways in India, applies them to Turkish railways, and quotes from Mr. Alison's report on the commercial interests of Turkey. He subsequently enters upon a discussion respecting the extension of railways in that country, and urges the construction of a great trunk line, as direct as may be found practicable, connecting the European network of railways with the Turkish port or ports nearest to the East. The whole of Europe, Turkey, and Asia would be thus brought into close connection, "conferring mutual benefit," as he contends, "in the interests both of civilization and peace." That political objections to such a railway system will be devised by some we do not doubt; but, for our part, we look with great confidence for the progress of international communication, and anticipate nothing but good from it. We therefore cordially recommend our readers to study the pamphlet before us, in which the proposed extension is advocated with much ability, and which is accompanied by two excellent illustrative maps. They will find in it much valuable information on a subject of which the best of our untravelled countrymen know but little.

ASSOCIATION OF FOREMEN ENGINEERS.

AT a meeting of the Associated Foremen Engineers held on Saturday last, Mr. Joseph Newton was unanimously elected president in place of the late lamented Mr. Sheaves. Mr. Newton, in returning thanks for the honour spontaneously conferred upon him, took occasion to remark upon the sudden and untimely manner in which his predecessor had been removed from among them, and to eulogise his disinterested character. The president elect also invited those among the members of the Association who had not hitherto contributed papers, to prepare some forthwith. "It was not creditable," he said, "that there should be any among a body so practically valuable to the community as foremen engineers, and united as they were for common benefit—it was not creditable that there should be any who were mere listeners. They need not be particular as to the niceties of composition: it was information sound and substantial that was wanted—the results of experience gained and experiments made." Mr. Newton promised an inaugural address on the "Influences of Mechanical Science and Mechanical Men upon the Age in which we Live," for the first Saturday in the ensuing month, and, thanking his audience, again resumed his seat.

The distressing condition in which Mrs. Sheaves with an infant family of four children—sons—is left, occupied, at a later period, the attention of the meeting, and it was resolved to make the painful fact known to the mechanical public of the kingdom, in the hope of thus aiding a small stream of private benevolence which has fortunately set in towards the widow and orphans. It was hoped that the scientific press would not be averse to saying that Henry Grissell, Esq., of the Regent's Canal Iron Works, City Road London, would be happy to receive subscriptions in aid of the helpless family, or to answer any enquiries respecting them. The MECHANICS' MAGAZINE and the *Engineer* were especially mentioned, and *we* have pleasure in responding to the call. There must be, throughout the United Kingdom, hundreds situated as poor Mr. Sheaves was—foremen of factories—unable to make future provision for their families; though in the enjoyment of enough for the hour. Sudden calamity dashes to the ground in an instant the hopes and the determination of the most prudent—and death seals them in gloom. If a presentation to a charitable institution could be obtained for one of the children, that would be of immense service.

The meeting of Associated Foremen Engineers stands adjourned to the first Saturday in March, at 8 P.M. The Bay Tree Assembly Room, St. Swithen's Lane, City, is the meeting place.

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NOTICES.

Several articles and letters stand over until next week.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 6d. per line for any number of insertions less than 13; for 13 insertions, 5d. per line; and for 52 insertions, 4d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 6 o'clock on Thursday evening each week. None can be received after 9 o'clock on Friday morning for the ensuing number.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

Quarterly Meeting, Jan. 25, 1859.—W. FAIRBAIRN, F.R.S., &c., *President, in the Chair.*

Augustus de Morgan, V.P.R.A.S., &c., Professor of Mathematics in University College, London, and Arthur Cayley, Esq., F.R.S., &c., were elected honorary members of the Society.

M. Auguste le Jolis was elected a corresponding member.

The following gentlemen were elected ordinary members of the Society:—Mr. Thomas Carrick, Mr. James G. Lynde, the Rev. W. N. Molesworth, M.A., Mr. Henry Wilde, Mr. Richard Eadson, Mr. Thomas Sowler, Mr. James Dorrington, Mr. Henry Alexander Hurst, Mr. John Slagg, jun., Mr. George Mosley, Mr. William J. Rideout, Mr. James Thompson, Mr. Thomas Brittain, Mr. John William Mc Clure, Mr. M. L. Tait, Mr. Edward Coward, and Mr. John Watson.

Mr. Joseph Baxendell, F.R.A.S., was elected a member of the council, in place of the late Rev. H. H. Jones.

The president congratulated the meeting on the prosperous condition of the library, paying a high tribute to the zeal and industry of the honorary librarian, Mr. F. Ekman. The efforts which had been made to obtain an exchange of published transactions with learned institutions, at home and abroad, had been attended with great success, so that at present the most important of the scientific periodicals were in the possession of the Society.

IMPROVEMENTS IN SHIPBUILDING.

Mr. W. H. CRISPIN, of Stratford, London, sends us the following statement respecting his patent "improvements in the construction of ships and other sailing and steam vessels." The hull of the ship or other vessel, is constructed of iron, which may be considerably thinner than that usually employed in iron ships; the same being covered externally and internally with wooden planking, bolted completely through the iron and wood, and so arranged as to break joint, and thus add to the strength of the vessel. The external and internal wood-work should be caulked, in order effectually to prevent leakage. In some cases, it may be desirable to place the external planking in the ordinary horizontal manner, and to arrange the internal planking diagonally; and where great strength is required (as in ships of war) the series of wood, iron and wood, may be duplicated or tripled. The hull thus constructed admits of being sheathed with copper or other sheathing metal, and thus obviating one of the great objections to iron ships; while in the case of ships of war, the arrangement of wood and iron, in accordance with this invention, will prevent the disastrous consequences occasioned by the fragments of iron, when ships, built entirely of that material, are struck by shot, at the same time much greater facility being afforded for repairing the shot-holes. The deck of the ship or vessel may be constructed upon the same principles as the hull, in which case it may be desirable to place the lower or under planking transversely or across the ship.

THE WEDGWOOD STATUE.

A NUMBER of gentlemen assembled at Stoke-upon-Trent on Monday, January 24th, 1859, John Ridgway, Esq., in the chair; when it was resolved:—1. That the lapse of more than sixty years since the death of Josiah Wedgwood, F.R.S., has applied the test of time to his works, and shown that they possess that lasting power of pleasing, not dependent on having been suited to the fashion of his day; which, combined with the permanent and general usefulness of his labours, seem to point him out as a fit subject for a public monument. 2. That a statue be erected to his honour, by public subscription, the character and locality to be left to the decision of the subscribers.

Subscriptions to the Wedgwood Statue Fund will be received by the treasurer, E. J. Ridgway, Esq., Bank House, Hanley; or by the following banking houses:—Liverpool, Manchester, and the Potteries—the Manchester and Liverpool District Banking Company; Stone—William Moore, Esq.; London—Smith, Payne, and Smiths, and Coutts and Co.

GEOLOGISTS' ASSOCIATION.

ON Tuesday evening an address was delivered by Mr. Hyde Clarke, V. P., on the organization of a Continuous Geological Society, in aid of the Government Survey, by local sections or committees of the members contributing yearly reports on the progress of geology in their districts, which would embrace:—additions to the surveys and maps; discoveries of new minerals and fossils, particularly of building substances, as stones, slates, marbles, clays, cements, sands; accounts of mines, quarries, cuttings, wells, tunnels, &c.; observations on wells, springs, and water strata; the result of special inquiries into the building stones of the neighbourhood, or researches for economical substances. A discussion followed, in which the Rev. T. Wiltshire, V. P., and P. L. Simmonds, Bollaert, Mackie, Byerley, and Beaumont took part.

THE DRUID CLOAK.

IMPORTANT DECISION UNDER THE REGISTRATION OF DESIGNS ACT.

THE proceedings at Marlborough-street, and the decision arrived at, will have the effect of restoring confidence to that portion of the inventive public, who have hitherto sought the protection of the Act for the Registration of Designs. The article—a cloak that has become exceedingly fashionable, and called "The Druid"—had been extensively pirated, and two of the Oxford-street mantle warehousemen, who had not taken heed of previous printed notices, were summoned under the Act before Mr. Bingham, on Friday last. Mr. Orridge, the Barrister, briefly explained the complaint of the proprietor of "The Druid" Cloak, and the original cloak and the piratical copies being compared, the magistrate at once declared that it was in his power to visit this offence with a fine of at least £5 for every cloak sold. However, upon the interposition of the proprietors of "The Druid" Cloak (the Messrs. Jay) through their counsel, a nominal fine only was recorded, and the expenses, amounting to £8, were divided between the two defendants. The court was crowded during the hearing of the case with the members of the trade, and the feeling amongst the auditory was evidently that the little inventive talent which occasionally shows itself amongst the English caterers of fashion, ought to have every protection thrown around it. The result was consequently one of gratification, with an unqualified expression of regret that the representative of the wholesale house or houses by whom this piratical system is mainly supported, did not stand at the bar of the police court instead of the implicated retailers.

CURRENT EVENTS

IN THE CENTRES OF THE IRON, COAL, MACHINE, AND SHIPPING TRADES.

[COMPILED BY OUR OWN CORRESPONDENT.]

Armstrong's Gun—New Lines of Railway Projected: Forest of Dean to South Staffordshire—Prosperity of the Stockton and Darlington Railway—Engineer to the Merthyr Tydfil Local Board—"Wynne v. the Shropshire Union Railway" again—Shipwrecks in January—The Pit Explosion at Burslem, Astounding Heedlessness of Danger—Colliery Proprietors Fined—Infringements of the Factory Act—Steam-Engine for the Turnpike Road; The Marquis of Stafford upon it—Commencement of the Stratford-upon-Avon Railway—"Who built Wearmouth Bridge?" Was it Tom Payne? No!

MR. ARMSTRONG'S gun is noticed by the London correspondent of the *Manchester Guardian*, who says:—The projectile, like Mr. Whitworth's, is a bolt, not a round shot; but Mr. Armstrong's bolt is coated with lead, by means of which it adapts itself perfectly to the grooved gun. Besides getting rid of all windage and waste of propelling power Mr. Armstrong has devised machinery for training the gun with unerring accuracy; and by slots on which the gun traverses in its recoil, the piece once laid retains its elevation, however often fired. Mr. Armstrong has, moreover, invented a most ingenious time-fuse, to be used with shells discharged from his gun, of which the burning time can be altered for each discharge, if necessary, without unscrewing and fresh boring the fuse, as is now necessary whenever the range is changed. (This fuse was described and illustrated at p. 394 of the last volume of the MECHANICS' MAGAZINE.) A prick in a dial-plate attached to Armstrong's fuse, and which each captain of a gun makes in accordance with the word passed along the ship, will fix the time of the fuse's burning to a second, so that not an instant need be lost in altering fuses.——A line of railway connecting the mineral district of the Forest of Dean with the great manufacturing districts of East Worcester and South Staffordshire is contemplated. It is a line to run out of the Monmouth and Pontypool Railway, to pass through the iron and coal district of the Dean Forest, down to the Hereford, Ross, and Gloucester line, at Mitcheldean-road station, and from thence proceed by Aston Tryham, near Newent, again on by Dymock and Ledbury, where it would converge into the Worcester and Hereford Railway, now in course of construction, and then *viâ* Worcester, along the Oxford, Worcester, and Wolverhampton and Severn Valley Railways into the eastern portion of Worcestershire and South Staffordshire. There appears but little doubt that a railway so commenced would afford great accommodation, and be a speedy means of transit for all kinds of traffic. The other project talked of is a line of railway from Witney to Evesham, to be worked by a joint committee of the company originating it, and the Oxford, Worcester, and Wolverhampton Company, the former paying to the latter 50 per cent. of the receipts.——The directors of the Stockton and Darlington Railway announce that the traffic receipts of the past half-year have so far improved, as to justify them in recommending the payment of a dividend of 9½ per cent. per annum. Last half-year's dividend was 8½.——Mr. Alfred Taylor has been elected engineer to the Merthyr Tydfil Board of Health, from among fifty-three candidates.——Mr. Serjeant Shee has determined to re-open the arbitration case "Wynne *v.* The Shropshire Union Railway," his former award of damages to that gentleman, who is the Government Mining Inspector for North Staffordshire, for personal injuries sustained on the defendants' line, having been appealed against as excessive. Mr. Wynne is to be examined by three medical gentlemen on either side.——A published return shows that the number of wrecks in the month of January was 177.——At the coroner's inquiry into the circumstances attending the death of the four men at the Bycus Colliery last week in North Staffordshire, noticed last week, the jury returned a verdict of "Accidental Death," but severely censured the butty of the pit, who did his work so loosely that not only were the safety lamps of the pit out of order, but they were also all unlocked—it being the practice of the men to open them in the pit to light their pipes!——Mr. Eli Walsh, the proprietor of the Hayfold Colliery, has been convicted by the magistrates of Over Darwen, of neglecting to provide sufficient ventilation for his pits, and fined £2. The complaint was laid by Mr. Dickinson.——Messrs. Wm. Thompson and Sons, manufacturers, Whalley, have been convicted at the Blackburn County Petty Sessions, and fined £52 17s. 6d., for breaches of the Factory Act, in employing women and young persons in their mills after 6 o'clock on the 26th ult.——The Marquis of Stafford may now be seen travelling on the turnpike road, on a steam-engine which he has had constructed for the purpose in Buckingham. In front there is an ample seat, capable of accommodating four persons, and is guided by a handle in front. It weighs about twenty-two cwt., and is of two-horse power; it will travel at the rate of fourteen miles an hour.——The line of railway by which the world-renowned Stratford-upon-Avon is to be opened to the world, was commenced on Tuesday last amidst every allowable manifestation of rejoicing on the part of the people and the authorities.——"Who built Wearmouth bridge?" has been raised by a proposition of Mr. Summers, one of the Wearmouth bridge committee, to place upon the structure the following inscription:—"*Nil desperandum auspice Deo:* this bridge was invented and built by Rowland Burdon, Esq., M.P., A.D. 1796; strengthened and improved by Robert Stephenson, Esq., M.P., A.D. 1859." Ald. Ranson opposed the proposition on the ground that he believed that Mr. Burdon was not the inventor of the bridge, but that the honour of it properly belonged to Tom Payne; the matter having been postponed for further consideration, a minute of the commissioners of the bridge, dated Aug. 26, 1796, was produced in which Rowland Burdon, Esq., is thanked "for his liberality to the public in constructing the bridge upon principles for which he as inventor has a

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patent, without accepting any pecuniary consideration for the patent right." Also there is read a letter from Mr. Burdon, of Castle Eden, the inventor's son, dated the 26th ult., in which that gentleman says: "I am in possession of the patent taken out by my father for the invention of Wearmouth bridge, and of documents, *e. g.*, letters from Mr. Wilson, &c., proving incontestably his right to it." Mr. Thomas Wilson, of Bishopwearmouth, referred to in the above letter, was the engineer of the bridge, under Mr. Burdon. A deputation of the committee waited upon Mr. Burdon last week, who produced the patent and other documents, and satisfied them that his father was the inventor of the bridge; so that it is now probable that the inscription proposed by Mr. Summers will be placed on the bridge.

NOTES FROM THE SOUTH WEST.

[FROM OUR OWN CORRESPONDENT.]

Cornwall Railway—Steamer for the Truro River—The Omeo (s.s.)—Mr. Brunel in Egypt—Gloucester and Cheltenham Tramway—A French Company near Cardiff—Somerset Central Railway: Wells Extension—Falmouth v. Southampton—Great Western and South Western Railway—Drinking Fountains at Plymouth—Water Supply of Plymouth—Naval Matters—St. Ives Harbour: Dawlish.

THE locomotive has at last penetrated to Truro, *via* the Cornwall Railway, and in a few days it is stated that an engine will be able to run from Truro up to the viaduct at St. Germains. This viaduct at present "stops the way." It is expected also that an engine will shortly cross the Royal Albert Bridge from the South Devon line. Between Plymouth and Saltash the works are "assuming quite an appearance of finish."——A new iron screw steamer has been launched at Bristol for the navigation of the Truro river. The vessel will leave Bristol as soon as possible, and is to commence running immediately between Truro and Falmouth. She is rather a small affair—about 70 feet long and 50 tons burden, drawing 4½ feet. Her engines are 18-horse power.——*Omeo*, (s. s.) for Melbourne, is lying in Plymouth Great Western docks, for new boilers.——A western paper states that Mr. Brunel, C.E., now in Egypt, will probably visit Suez, as the Viceroy is desirous of having his opinion on a projected transfer of the port of Suez to the Bay of Ataka, 10 miles south of the present landing place.——A "Gloucester and Cheltenham Tramway Abandonment Bill" is now before Parliament.——A large piece of land belonging to the Marquis of Bute, near Cardiff, has been taken by a French company for the manufacture of patent fuel by steam power.——The Wells Extension of the Somerset Central Railway has been examined by the Government inspector, but the period for opening for traffic has not yet been finally decided on.——The statements made at the late meeting in favour of docks, &c., at Falmouth, have, so far as they tend to the depreciation of Southampton, naturally excited a good deal of attention in the latter town. The great speech at the Falmouth meeting was made by a gentleman named Tilly, who is reported to have said that a Falmouth gentleman was told by Mr. B. M. Willcox, of the Peninsular and Oriental Company,—"We know very well that we shall have to land the mails and passengers at Falmouth, but we perfectly make up our minds that we shall take up our cargo at Southampton." This statement Mr. Willcox, supported by the Falmouth gentleman, has denied. Complaint is also made of the assertions made by Mr. Tilly with regard to the accommodation afforded by the Southampton docks. "For example," says a local paper, "he says the entrance to our (Southampton) inner dock is only 40 feet wide, when in reality it is 56 feet. They propose to make the tidal dock at Falmouth 80 feet wide at the entrance, whereas ours is 150 feet in width. . . The width of the entrance to our tidal dock, as before stated, is 150 feet, and to the close or inner dock, 56 feet. The tidal dock is 18 feet deep at low water springs, and the close dock will have a depth of 25 feet. The dimensions of our dry docks are as follows:—

	Eastern.	Middle.	Western.
Length from gates to head ...	538 ...	282 ...	346 feet.
,, on blocks	425 ...	233 ...	343 ,,
Width of gates	80 ...	51 ...	66 ,,
Depth of water over blocks at ordinary springs	25 ...	14 ...	20 ,,
Ditto neaps	21 ...	10 ...	16 ,,

With this accommodation for shipping already in existence, and with a large new dock in process of construction, we have not much fear of Falmouth competition."——Lord Lovaine, one of the Lords of the Admiralty, Admiral Sir George Seymour, and several engineer officers attached to the Portsmouth Dockyard, witnessed, at Haslar Creek, on Saturday, the operation of lowering one of the screw gun-boats from under the shed by machinery. The boat was afloat in 27 minutes from the commencement of the operation, which was pronounced to be completely successful. At this rate a fleet of gun-boats could be floated and got ready for action in two or three days.——The rolling stock of the Great Western Railway is returned as follows (broad and narrow gauge):—passenger engines, 204; goods engines, 194; royal saloon carriages, 2; first-class, 216; composite, 100; second-class, 273; third-class, 157; passenger luggage vans and brake, parcel and mail vans, 82; carriage trucks, 227; horse boxes, 121; open goods waggons and cattle trucks, 1,104; covered goods waggons, 1,946; coal, coke, and ballast trucks, 4,097; timber trucks, 184; goods brake vans, 55; and furniture vans, 18. The mileage worked is returned at 466, and the earnings of the past half-year were £852,947 against £847,452 in the corresponding period of 1857. The total net balance was £524,246 in past half-year, and £508,188 in the corresponding period of 1857, a reduction of nearly £11,000 having been effected in the working expenses. The expenditure on capital account has now reached a total of £23,237,554.——The London and South Western Company's report states that the net revenue for the half-year, after deducting interest on loans and all other preferential charges, is £202,480; and this sum enables the directors to declare a dividend at the rate of 5½ per cent. per annum. Considerable progress is stated to have been made in providing the additional stock necessary for working new lines about to be completed. Before the close of 1859 the Company will be working, including the Portsmouth line already opened, 120 miles of additional railway. With regard to the permanent way, a further portion of the main line has been renewed at an expense of £10,553 charged against revenue. The increased mileage run and the additional trains required in connection with the new lines is expected to create a considerable increase in the wear and tear on the old line. The doubling of the Southampton and Dorchester line for the 36 miles from Southampton to Wimbourne is completed, and the contractor is proceeding rapidly with the works on the Exeter extension. The station works at Salisbury at the junction with the Salisbury and Yeovil have been somewhat delayed; but the first portion of that line to Gillingham will be ready for opening in the spring. The new line from Wimbledon to Epsom which the Company have agreed to work will be opened—at least the board are so informed by the engineer—on the 1st of March. The parliamentary campaign, so far as this Company is concerned, threatens to be a serious one—the great railway evil.——The offer of Mr. W. Bryant to present to Plymouth six drinking fountains and three drinking troughs has been gratefully accepted by the town council.——The supply of water to Plymouth has been discussed at considerable length by the town council. It was estimated by the late surveyor, Mr. Bampton, that the quantity of water supplied by the corporation for domestic consumption and for trade and manufacturing purposes conjointly, amounted on an average to about 2,000,000 gallons *per diem*; and he considered that domestic supplies consumed one-third, while the remaining third represented the consumption in trade and manufactories. In the opinion of the present surveyor the estimate of this latter quantity is not exaggerated. The rental for the present year gives £4,093 as the sum paid by domestic consumers, and only £517 for trade and manufacturing purposes. The council have expressed their approval of a system of equalising the charges as between the manufacturers, recommending the water committee at the same time to confer with a deputation of manufacturers as to the scale of rates which should be fixed.——The *James Watt*, 91, screw, has been ordered to be brought forward and fitted for the first division of the steam ordinary. The Admiralty have ordered the *Supply* store-ship to be fitted with Cunningham's patent topsail; this is the second ship in the navy to which the invention has been applied. The *Atlas*, 91, one of the new screw steamers of the line ordered to be built at Chatham, will be launched during the present year, and will be attached to the Channel squadron. A large stone dock constructed at Chatham is now ready for the reception of any line-of-battle ship requiring to be fitted. The channel at the entrance to the basin has been considerably deepened, and the largest ship in the service could now be floated in for fitting or repairs.——It is reported that the Government have resolved to expend a considerable sum for the purpose of making St. Ives a harbour of refuge; but seeing that the commissioners appointed to consider the whole subject have not yet made their report, the statement appears premature. It is stated that something is also to be done at Dawlish.

NOTES FROM THE EASTERN DISTRICTS.

[FROM OUR OWN CORRESPONDENT.]

Water Supply of Chelmsford—Lincoln Mechanics' Institution and "Franklin Monument"—Oxford Middle Class Examinations—Boiler Explosion near Stamford—The Dams in the Nene: Odd Proceedings—Railway Materials for New South Wales.

THERE has been some more talking at Chelmsford anent the water supply of that pleasant little town. At a meeting of the Local Board of Health, a day or two since, the surveyor (Mr. Chancellor) stated that he was still collecting information on the subject. With respect to one proposed source of supply, the railway lake, Mr. Bruff, C.E., had intimated to him his belief that there were not any very powerful springs there; but he would push the inquiry to the contractors for the line. Mr. Bruff had also informed him that at Colchester some deep borings were made into chalk with little success, and it was proposed to leave off; but by his advice the parties went on, and after another 50 feet came to a spring from which an abundant supply of water was obtained. In another case, a person had bored 1,100 feet without obtaining water. One member of the local board observed that he thought the present water supply was not properly economised. The expense of the proposed works was roughly stated at £5,000 for a population of some 8,000. Eventually the whole subject was referred to the sanitary committee of the board, who were directed to make further inquiries.——At Lincoln a movement has been a long time on hand with a view to the establishment of a museum in honour of the late Sir John Franklin; and a considerable sum has been subscribed for the object. It has just been determined that the amount shall be applied conjointly with certain funds contributed for the establishment of a Lincoln and Lincolnshire Mechanics' Institute in Lincoln, so that one good building may be erected and used for the two institutions, which are to be called the "Lincoln and Lincolnshire Mechanics' Institute and Franklin Monument." A handsome building is to be erected in a convenient part of Lincoln.——Ipswich has been selected by the University of Oxford as the centre for the eastern district of the Local Middle-Class Examinations, which will commence in several of the provincial towns about the middle of June. A complaint was expressed at a recent meeting on the subject that the examination papers were not more closely connected with agriculture and the useful arts, the most important matters to which the middle-classes can devote their attention.——There has been a bad boiler explosion at Ryhall, near Stamford, two persons being killed and several others injured. The explosion took place at the works of Mr. R. Downes, plough maker. The jury at the inquest attributed the deaths to accident. Mr. Morley, an owner of portable agricultural engines, was among the witnesses examined, and stated that he had looked over the wreck of the engine, boiler, &c. The flue and chimney were blown away, and in his opinion the engine had been worked at too high a pressure, as he found the spring balance standing at 49, when, in his judgment, it should not have been more than 25. At the latter pressure the engine did its work well. He could not form any opinion as to the supply of water at the time of the accident. The boiler when in use ought to have been cleaned out at least once a month. Water had of late been muddy, and more might have accumulated during the last fortnight than for six weeks previously. The plates of the boiler were defective. He had repeatedly cautioned Mr. Downes against working the engine at too high a pressure—the last time, 23 hours before the accident.——It was intimated under this head last week that the Wisbeach magistrates had directed the dam placed in the River Nene at Waldersea to be removed (at the instance of the Wisbeach Town Council). Some odd proceedings have since taken place. An hour had scarcely elapsed from the time the magistrates signed the order, when a party provided with suitable tools proceeded to Waldersea to demolish the dam, although they were not acting with the official sanction of the Wisbeach Council, who were restrained by an injunction from the Court of Chancery. The posse was not less than 120 strong, and an impression was soon made upon the dam, which stood upon more than 100 very strong piles, braced together by massive cross beams, &c. Before the work of demolition was completed, the Mayor of Wisbeach, accompanied by the town clerk, went down to the spot and informed the men that they were acting upon their own responsibility and without the sanction of the council. This had the effect of stopping matters for a time; but the men afterwards returned to the dam, and the work of destruction was pushed on. An attack was subsequently made upon the other dam in the river at Guyburn.——A Lincolnshire firm has recently sent out some railway materials for use in New South Wales.

METAL AND COAL TRADES, &c.

[FROM OUR OWN CORRESPONDENT.]

General Condition of the Iron Trade: How Affected by the Emperor's Speech—The South Staffordshire Iron and Coal Trade: The Colliers' Movement—The Progress of the Trade in the North—Glasgow Pig Iron—The South Wales Trade—The Iron and Coal Trades of Yorkshire, Derbyshire, and Lancashire—Birmingham and Wolverhampton Trades—Sheffield Trade—Metals—Iron Ship-Building Trade—Glass Makers' Dispute—The Supply of Wool.

THE iron trade has not experienced any improvement upon its conditions at the date of our last report. Scarcely sufficient time has elapsed since the 7th of February in Paris to show what effect the undignified compound of egotism and mystification to which the world was treated on that day, will have upon the trade. By the ironmasters generally the expectations are but faint of the speech doing them much service—a want of confidence in the transparent truthfulness of the speaker being all but universal.

The different mills and forges in South Staffordshire are in fair operation, and those manufacturing first-class iron are in many instances producing more finished iron than usual. There is not much doing in pig iron, owing to the large contracts which were entered into about six weeks ago. A considerable number of blast furnaces are being prepared to be blown in. The coal trade is not quite so brisk as it was, but prices are well supported. A few of the colliers west of Dudley gave notice a week ago for a rise of wages, but have since withdrawn it. The colliers on the east side of Dudley are still agitating the question of an advance, but it is not likely to be successful in the present position of the trade. Certain of them, however, gave notice for a rise of 6d. a day last Saturday evening.

The iron trade of the north is in an active state; an excellent trade being done in rails in particular. This district is being fast developed. Mr. Richard Hoyle, of Newcastle-upon-Tyne, says:—"The number of furnaces available for smelting the ore of this district, comprising those of Cleveland, Durham, and Northumberland, are 87, the majority of which have been erected within the last eight years. Of these 73 are now in blast, and 14 out. Five more furnaces are in course of construction, and will, it is expected, be in operation shortly. The average number of furnaces in blast throughout the year has not exceeded 58; and at a minimum production of 170 tons of pig-iron per week from each furnace, the total produce of the year may be estimated at 512,720 tons. Much of this make is consumed in the district, and a considerable portion is sent into Yorkshire and Lanchshire. In Newcastle, local iron has partly displaced the Scotch, but in the other districts the excess of consumption has absorbed a large part of the Cleveland iron; whilst it has also maintained the consumption of Scotch and other pigs at about the usual rate. There are likewise large and increasing exportations to the continent, and the South of England affords another market in which Cleveland successfully competes with Scotch and other iron."

In Glasgow pigs continue to recede. On Tuesday the market was nothing doing. Shipments this week, 6,585 tons; corresponding week last year, 8,689.

In the iron and coal trades of Monmouthshire and South Wales there is an increased firmness, several good orders have been received for home and for foreign consumption. Railway iron continues to be in steady demand, and French commissions are now in hand at several works. There is no doubt that the present large demand for South Wales coal will be even increased, as there is now a manifest preference for it in the Government navy, as is evinced by the invitations for tenders from South Wales masters noticed in the list of open contracts in another column of this number of the MECHANICS' MAGAZINE.

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The position of the iron trade in Yorkshire, Derby-hire, and Lanca-hire has been such as to indicate a general improvement. All the makers of the better description of malleable iron are fully employed. The coal trade is very good, a large number of orders have been given out for the London market. Rates are firm.

In Birmingham, where, contrary to expectation, the trade was getting duller, the speech of Napoleon III. has done and is expected to do but little in the way of improvement, until it shall be seen that actual preparations for war have ceased to be made by the French Government.

The Wolverhampton trades follow suit with Birmingham. The lock trade is tolerably good, with reasonable prospects of a further improvement. The workmen employed in the plate lock branch have issued a notice to their masters that they will not work at present prices after the 5th of March.

In reference to the trade of Sheffield, we learn there are some good foreign orders in the town. For cutlery, there is a fair demand. The file trade is slowly improving. Some houses in the steel trade continue slack, but many are pretty well employed. The rolling mills are nearly all at full work. The general trade is not in a flourishing condition; but there are evidences of a gradual change for the b tter. Compared with the state of affairs a year ago, there is a very marked improvement. Metals, copper, and tin, remain unaltered in price.

We learn from the circular of Messrs. Alfred Brett and Co., that the first month in 1859 has terminated with improved inquiries for steam ship property, both for purchase and hire. During a protracted period the coasting trade alone offered the most obtainable employment for steam vessels; and now, whilst the demand is increa-ing, it also begins to extend to foreign stations. Of the largest class of screw steamers, however, many are being laid up for want of remunerative freights, in addition to those already on the look-out for charters. A few shipbuilders have entered into contracts for new steamers; but the majority of building establishments are not desirous of immediate engagements. Several sales of moderate-sized screw steamers were effected in January, and the tone of the market for this description of property is more hopeful than it has been.

The glass-makers' dispute has assumed another phase. The Association of Flint-Glass Manufacturers have met in Birmingham, and passed the following resolutions—"That the Associated Manufacturers, earnestly desirous to terminate the present disputes, will receive a deputation of twelve workmen, on the 15th inst., at 12 o'clock, at the Crewe Arms Hotel, Crewe: but, if all obnoxious interference with their just rights as employers be not there or then withdrawn, they hereby adjourn to Tuesday, the 3rd of May."

The Bradford Chamber of Commerce has resolved to direct its attention to the encouragement of the growth of long and combing wool, and that a separate fund be contributed to carry the object into operation. The Wool Supply Association may now be considered as fairly launched.

NOTES FROM SCOTLAND.

[FROM OUR OWN CORRESPONDENT.]

New Screw Steamer for the Bengal Pilot Service—Glasgow Import Dues—Customs Receipts at Glasgow, Greenock, and Port Glasgow—Steam Navigation from Leith—Miners' Hours of Labour—The Pig Iron Trade: Prices and Shipments—The Coal Trade: Prices—The Western Bank of Scotland—The Vacant Situation of Engineer to the Clyde Navigation Trust—Scottish Railway Traffic.

MESSRS. WILLIAM DENNY and Brothers have contracted with the Government to build a screw steamer for the Bengal Pilot service, the machinery to be constructed by Messrs. Tullock and Denny.——A respectably signed memorial has been addressed to the trustees of the Clyde Navigation, urging that the existing import dues on direct foreign produce at the harbour of Glasgow are proving too excessive for the welfare of the port.——The Customs' revenue collected at Glasgow, Greenock, and Port Glasgow during the past month of January contrasts favourably with the amount received in the corresponding period of 1858. At Glasgow there was an increase of £2,720; at Greenock an increase of £6,085; and at Port Glasgow an increase of £457.——Steam communication has been resumed between Rotterdam and Leith, from which port steamers also run to Hamburg.——The miners of the Fifeshire collieries are making an effort to reduce their hours of labour to eight daily, or as near eight as possible. A conference is to be held next week at Glasgow.——The pig iron trade has been rather flat, but a fair business has been done at slightly reduced prices.——Coals have been rather dull of late, but prices have remained without change.——A lengthy report has been published by the liquidators of that disastrous undertaking, the Western Bank of Scotland. It seems that the total obligations of the bank at the date of its suspension, Nov. 9, 1857, amounted to £8,911,942; on the 1st of February, 1858, when the liquidation commenced, to £6,351,000; and at the present time to £1,770,000. There are at the credit of the liquidator's funds to the amount of £474,000, leaving a balance of £1,296,000 still to be provided for from unrealised assets and arrears of calls. From the prompt manner in which the two calls of £25 and £100 per share were met, and the improved position of the company's affairs, it is not expected that any further calls will require to be made.——Some time since Mr. Ure, engineer to the River Clyde Navigation Trust, resigned his appointment, proceeding to a similar situation on the Tyne. Thirty-two applications have been made for the vacant office, and of these five have been selected for the decision of the trustees. The five gentlemen thus selected are Mr. Charles Owen, Mr. T. Ormiston, Mr. A. Duncan, Mr. D. M'Call, and Mr. T. C. Gregory. The election is to take place on the 15th inst.——The traffic receipts of the twelve principal railway lines in Scotland, extending over 1,087 miles, were last week £13,267, or £2,209 more than the receipts of the corresponding week of last year. The only case in which a decrease occurred was the Dundee and Arbroath. As the state of railway traffic is now regarded as some indication of the condition of trade, the figures just quoted are satisfactory.

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated November 2, 1858.

2438. M. A. F. Mennons, of Paris. An improved system of railway brakes. A communication from C. Arnoux, of Paris.

Dated December 1, 1858.

2740. R. Laming, of Hayward's-heath. Improvements in purifying gas, and in turning sulphuretted hydrogen, carbonic acid and ammonia, or their compounds, to profitable account.

Dated December 27, 1858.

2962. F. W. Turner, of Swansea, Mechanical Engineer. Improvements in steam-engines, condensers, and steam-boilers, and in promoting combustion in the furnaces of the same.

Dated December 28, 1858.

2968. A. Lyons, of Finsbury. Improvements in travelling bags.

Dated January 1, 1859.

8. J. Walkland, of Sheffield, Silver-piercer. An apparatus for lighting cigars and tobacco.

18. I. Wood, of Charing Cross. Improvements in cutting and finishing corks, and in machinery used for such purposes. A communication from H. F. Cox and A. Miller, of New York.

Dated January 13, 1859.

106. W. Bennetts, of Tuckingmill, Cornwall, Workman. Improvements in mechanism used for preventing accidents when raising or lowering skips, baskets, or apparatus, particularly applicable to mines.

117. W. Wilson, of Newcastle-on-Tyne, Hat Manufacturer. Improvements in machinery for felting bodies of hats and bonnets. A communication from J. S. Taylor.

Dated January 15, 1859.

123. J. Eccles, of Blackburn, Cotton Manufacturer. Improvements in the manufacture of articles from clay earths for building purposes, as substitutes for such articles as are usually formed of stone and other materials.

130. P. A. Viette, of Faubourg de Schaerbeck, near Brussels. Certain inks applicable for engraving and lithographic purposes.

132. R. Mushet, of Coleford, Metallurgist. Improvements in the manufacture of cast steel.

134. R. Mushet, of Coleford, Metallurgist. An improvement or improvements in the manufacture of cast steel.

Dated January 17, 1859.

136. T. Edwards, of Liverpool, Gas Engineer. Improvements applicable to letter-boxes and other like receptacles.

138. E. T. Hughes, of Chancery-lane. Improvements in machinery or apparatus for sowing seed. A communication from C. Beure and E. Barret.

140. S. T. Cooper, of Upper Clapton, Gentleman. Improvements in the use and application of artificial light.

142. E. Brooks, of Edward-st, Dorset-sq., Locksmith. Improvements in locks.

144. G. and J. Collier, of Halifax. Improvements in means or apparatus for washing and drying wool and other fibres, part of which improvements is also applicable for other purposes, where steam, hot water, or other fluids are required to be conveyed under pressure through movable connections.

Dated January 18, 1859.

146. J. Luis, of Welbeck-st. A new machine for putting on, equalizing, and drying the colours on paper for hangings, bookbinding, boarding, and fancy paper of every description. A communication from J. P. Faure, of Paris.

147. W. Newman, of Aston, near Birmingham, Brass-founder. New or improved furniture for window and other blinds.

148. J. Foster, of Lancaster, Corn Merchant. Certain improvements in machinery or apparatus called "spinning frames" and "roving frames" employed for spinning and roving flax, tow, hemp, jute, and other fibrous substances.

149. G. Hamilton, of Liverpool, Professor of Chemistry. Improvements in treating resin and resinous substances to obtain products therefrom, and in treating the products obtained from resin and resinous substances.

150. H. Gallon, J. H. Bean, and S. Lumb, of Leeds, Machine Makers. Improvements in machinery for slotting, morticeing, tennoning, and cutting wood, iron, and other substances.

151. C. D. Archibald, of Rusland Hall, Lancaster, Esquire. Generating force. A communication from H. M. Paine, of Worcester, Mass.

152. R. A. Brooman, of 166 Fleet-st., Patent Agent. An improved silk thread, and a new fabric made entirely or partially from the same. A communication from C. Depouilly, sen., of Paris.

153. R. Garrett, jun., of Saxmundham, and J. Kerridge, Foreman to Garrett and Sons. An improved arrangement of combined thrashing and dressing machines.

154. J. Fawcett, of Kingston-upon-Hull, Merchant. An improved preparation of food for cattle and horses.

155. R. Bradley and W. Craven, of Wakefield, Engineers. Improvements in machinery or apparatus for manufacturing bricks, tiles, and other similar articles.

156. W. Trotter, of South Acomb, Northumberland, Farmer. Improvements in reaping machines.

157. J. H. Johnson, of Lincoln's-inn-fields. Improvements in air pistols and guns. A communication from J. L. L. Daimé, of Paris.

Dated January 19, 1859.

159. W. A. F. Powell, of Bristol, Potter. Improvements in stopping or closing jars and bottles.

161. T. Clarke, of Derby, Moulder. Improvements in the manufacture of core barrels for pipes or columns used either for railway pipes or columns, or for water pipes or sewerage pipes.

162. E. T. Hughes, of Chancery-lane. Improvements in machinery or apparatus for measuring and sorting silk and other textile materials. A communication from J. Veyrin, of Lyons.

163. J. Whitehead, of Halifax, Wire Maker. Improvements in the means or machinery for the manufacture of "purled" wire.

164. E. Stevens, of Patriot-row, Cambridge-road. An improved cooking utensil.

165. T. A. Evans, of Bayswater, and W. J. H. Rodd, of Islington, Artist. A new method of advertising.

166. W. Poupard, of Blackfriars-road, Engineer. An improved wheel-skid or shoe.

167. J. H. Johnson, of Lincoln's-inn-fields. Certain improvements in the manufacture or production of lasts, boot-trees, and clogs, and in the machinery and apparatus employed in the production of such articles. A communication from J. Mathieu, of Paris.

Dated January 20, 1859.

170. J. C. Reid, of Liverpool, Master Mariner, and W. Milner, of the same place, Manufacturer. Certain improvements in the construction of ships and vessels.

171. H. Hilliard and T. Chapman, of Glasgow. Improvements in table-knives, and in table-knife sharpeners.

172. A. Lindo, of Batignolles, France, Chemist. Improvements in manufacturing soap.

173. W. Woofe, of Gloucester, Agriculturalist. Improvements in implements for ploughing, tilling, and paring land.

174. E. T. Hughes, of Chancery-lane. Improvements for preventing incrustation in steam boilers or other vessels. A communication from Von Langen of Berlin.

176. S. Phillips, of Moseley, Worcester, Gentleman. Improvements in sliding sashes, shutters, or doors.

177. W. E. Newton, of Chancery-lane. Improved apparatus for measuring water and other liquids. A communication from A. Nobel, of Paris.

178. T. Greenwood, J. Batley, and J. Dockray, of Leeds, Machinists. Improved machinery for converting hemp and flax fibres into yarn, twine, ropes, and cordage.

179. J. Bent, of Birmingham, Military Ornament Maker. Certain improvements in clasps or fastenings, applicable for belts, garters, and other purposes.

180. J. Shanks, of Arbroath, Machinist. Improvements in mowing machines.

181. J. L. Clark, of Haverstock-hill, and J. Muirhead, of Gloucester-road, Regent's-park. Improvements in electric telegraphs, and in the apparatus used in working the same.

182. H. Sagar, of Broughton, near Manchester, Bleacher, and A. Schultz, of Paris, Chemist. Improvements in producing pink shades on cotton fabrics or yarns.

Dated January 21, 1859.

183. T. Richardson, of Newcastle-on-Tyne. Improvements in the manufacture of manure.

184. S. Osler, of Great Yarmouth, and J. B. Balcombe, of Brixton, Gentleman. Improvements in apparatus for treating fish, so as to adapt it for manure, and in using the same alone or in combination with super-phosphate of lime or other phosphates.

185. L. Le Prince, of Regent-st., Bootmaker. The improvement of ladies' boots and shoes, called the cameleon boot and the cameleon shoe.

186. G. B. Harkes, of Southwark. An improved machine for washing, wringing, and mangling.

187. G. Ellis, of Pentonville, Merchant. The improvement of muffs, to be called the patent reticule muff.

188. J. Hick and W. Hargreaves, of Bolton-le-Moors, Engineers. Improvements in the construction of steam boilers.

189. R. Howell, of Smethwick, Stafford, Gas Fitter, and R. J. Willder, of Birmingham, Hatter. An improvement or improvements in taps or stop cocks.

191. W. Wells, of Greetland, near Halifax, Cotton Spinner. Improvements in machinery or apparatus employed in spinning and twisting cotton, and other fibrous substances.

192. A. Davenport, of Birmingham, Gas Purifier Maker. An improved regulating burner for gas. A communication from H. Woodward, of New York.

193. J. Childs, of Putney. An improvement in applying heat in the manufacture of artificial gums and teeth, and other articles composed of India rubber, or gutta percha, combined with sulphur.

194. J. H. Hume, of Broughty Ferry, Forfar, Baker. Improvements in warming apparatus for the feet.

195. A. J. A. Gautier, J. G. Dumay and J. T. Persin, of Paris, Gentlemen. An improved manure.

197. J. Newman, of Birmingham. Improvements in the manufacture of chains.

198. B. Lauth, of Surrey-st., Westminster, Mechanician. An improved mode of, and improved machinery for, rolling plates, bars, rods, and shafts.

199. J. Edwards, of Aldermanbury. Improvements in the manufacture of buckles.

Dated January 24, 1859.

201. D. Moseley, of Ardwick, Manchester, Manufacturer. Improvements in the manufacture of india rubber thread.

203. E. Dorsett, of Old Broad-st., Tar Distiller, and J. B. Blythe, of Neweross, Merchant. Improvements in the distillation of oil from coal tar, and in apparatus for preserving timber therewith.

205. W. E. Newton, of Chancery-lane. Improved machinery for cutting files. A communication from M. D. Whipple.

207. C. Sharps, of Philadelphia, Manufacturer. Improvements in breech-loading repeating fire-arms.

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NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, Feb.* 8, 1859.)

2169. J. Manning and T. Paul. Dressing mill-stones.
2173. T. Britt. Propelling steam-boats.
2174. J. Wright. Furnaces.
2189. Sir E. Belcher. Telegraph cables.
2192. J. Rogers. Telegraph cables.
2194. W. Brierley, sen. Looms.
2197. H. G. Collins. Blocks for printing.
2211. J. H. Brown. Projectiles.
2216. M. Jacoby and F. R. Ensor. Twist lace machines.
2219. G. Collier. Winding machines.
2243. C. W. Lancaster. A metal or metallic alloy.
2249. C. E. Bull. Preserving articles in shipwreck.
2275. J. A. Gasse. Railway breaks.
2277. M. Sautter. Air engines. A communication.
2279. H. Parker. Apparatus for cultivating land.
2298. W. E. Newton. Improved cabin. A communication.
2308. L. Marcus. Reaping machine.
2363. R. Waller. Obtaining motive power.
2398. T. Almond. Furnaces.
2412. P. Brunon. Cocks.
2553. M. L. J. Lavater. Mats, &c.
2592. R. A. Brooman. Lace and net. A communication.
2674. R. Bodmer. Valves. A communication.
2734. J. Coulson. Thrashing and dressing machines.
2762. T. Bailey. Loading fire-arms.
2966. J. Sinclair. Pistons.
74. T. J. Claxton. Boots and shoes.
117. W. Wilson. Felting. A communication.
155. R. Bradley and W. Craven. Bricks, tiles, &c.
161. T. Clarke. Core barrels.
170. J. C. Reid and W. Milner. Ships and vessels.
171. H. Hilliard and T. Chapman. Table knives and sharpeners.
172. A. Lindo. Soap.
178. T. Greenwood, J. Batley, and J. Dockray. Yarn, twine, &c.
188. J. Hick and W. Hargreaves. Steam boilers.
194. J. H. Hume. Warming apparatus.
205. W. E. Newton. Cutting files. A communication.
207. C. Sharps. Breech loading fire-arms.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed February 4, 1859.

1781. E. Leigh.
1788. A. V. Newton.
1791. G. H. Bovill.
1797. J. Walker.
1804. J. Walker.
1818. A. Barchou.
1821. F. Haeck.
1835. J. H. M. Maissiat.
1864. L. A. Forot.
1958. E. Massey.
2195. H. Monier.

Sealed February 8, 1859.

1812. T. G. Messenger.
1839. A. J. Paterson.
1847. F. J. Manceaux.
1931. J. H. Johnson.
1947. W. Kempe.
1969. J. H. Johnson.
1973. M. A. F. Mennons.
2003. A. Guye.
2057. W. E. Newton.
2187. M. Hipp.
2411. W. Hall & A. Wells.
2653. T. Spencer.
2757. W. Robertson and J. G. Orchar.
2905. J. Soutter.
2953. M. A. F. Mennons.
2957. J. Shaw.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

273. E. Schischkar.
279. A. Lamb and J. Ronalds.
310. M. L. Parnell.
327. J. E. Duyck.
343. J. Elce and S. F Cottam.
354. W. H. Harfield.
358. G. T. Bousfield.
416. S. F. Cox.
419. C. S. Jackson.

LIST OF SPECIFICATIONS, &c.

Published during the week ending February 4, 1859.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s d		s d		s d		s d		s d		s d
1460	0 4	1470	0 3	1477	0 8	1483	0 3	1489	1 4	1521	0 3
1463	1 11	1473	0 10	1478	0 3	1484	0 3	1490	0 6	1525	0 3
1464	1 5	1475	0 3	1479	0 10	1485	0 10	1491	0 5	1527	0 3
1465	0 3	1476	0 9	1480	0 9	1486	1 5	1492	0 6	1661	0 7
1468	0 3	1478	0 3	1481	0 9	1487	0 9	1501	0 3	2068	0 7
1469	1 9	1479	1	1482	0 7	1488	0 6	1511	1 4		

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINES, &c., 1319, 1333, 1335, 1358.

BOILERS AND THEIR FURNACES, 1301, 1329, 1334, 1337, 1351.

ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1302, 1310, 1346.

SHIPS AND BOATS, including their fittings, 1331, 1352, 1359.

CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 1300, 1305, 1315, 1316.

FOOD AND BEVERAGES, including apparatus for preparing food for men and animals. *None.*

FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1313, 1323, 1326, 1331, 1336, 1338, 1345, 1349, 1350, 1360.

BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c. *None.*

LIGHTING, HEATING, AND VENTILATING, 1308, 1309, 1311, 1324, 1328, 1344, 1347, 1348.

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1312, 1327, 1340, 1344.

METALS, including apparatus for their manufacture, 1343, 1346, 1354.

CHEMISTRY AND PHOTOGRAPHY, 1322.

ELECTRICAL APPARATUS, *None.*

WARFARE, 1306, 1321, 1361.

LETTER PRESS PRINTING &c., 1341.

MISCELLANEOUS, 1299, 1303, 1304, 1305, 1307, 1314, 1317, 1318, 1320, 1325, 1330, 1332, 1334, 1338, 1339, 1342, 1353, 1355, 1356, 1357, 1358.

1299. S. LEES. *Improvements in the manufacture of tan or tanning, and in tanning hides to make leather.* Dated June 9, 1858.

This invention consists in treating the oils obtained by the distillation of coals or other bituminous, earthy, oily substances with strong sulphuric acid, until a black carbonaceous pitchy substance is formed. The process is facilitated by steam passing through pipes placed within the vat containing the oil and acid, which are agitated until the carbonaceous pitchy substance is obtained; and any undecomposed oil found upon the surface must be taken therefrom and may be used for lubricating machinery. The steam is then shut off, and the inventor adds by degrees strong nitric acid, stirring the whole until it boils and becomes a dark brown pitchy substance. He then adds liquid ammonia or gas tar-water, or other alkali, until it takes up the remaining acids. During this process steam must be applied to keep the pitchy substance in a liquid state, care being taken not to add too much alkali, so as not to dissolve the said substance, which he calls mineral tar. This is then dissolved in common soda, potash, or alkaline lyes of any specific gravity, according to the quality or thickness of the skins to be tanned. These skins are first prepared in lime as usual, and then steeped in a solution of the mineral tar above described. When they have sufficiently imbibed the tanning, they are taken out and put into a solution of alum or other metallic salts, until the tanning becomes fixed, and the hides or skins converted into leather. *Patent abandoned.*

1300. E. T. HUGHES. *Improvements in machinery or apparatus for sowing grain.* Dated June 9, 1858.

This specification is mainly a description of drawings. *Patent completed*

1301. E. C. GRIMSHAW. *Improvements in furnaces and steam boilers.* Dated June 9, 1858.

These improvements consist in combining stoves used in hat-finishing, or for similar purposes, with boilers, so as to make the furnace capable of heating irons, and converting water into steam. These arrangements may be used for a variety of purposes with much economy of fuel. *Patent completed.*

1302. W. A. GILBEE. *Improvements in the construction of railway wheels.* (A communication.) Dated June 9, 1858.

This invention relates to solid railway wheels, and its object is to reduce the iron, time, and labour expended in their construction. 1, the inventor makes the felloe and nave separately, and employs stamped wrought iron plates placed against each other to strengthen the same. When the parts are put together, the whole are heated and welded (by a hammer or otherwise,) between dies. 2, in some cases, before the parts are united, the nave is forged in a die, and the plates are placed against annular shoulders made on both sides of the nave, and then all the parts are placed between dies. The projecting parts of the nave are afterwards brought down. The usual tyre is placed over the felloe. The plates mentioned may be curved, and attached to the nave and felloe, and be united by bolts or rivets. *Patent abandoned.*

1303. C. F. VANSEROT. *An apparatus for measuring and registering the flow of liquids.* (A communication.) Dated June 9, 1858.

Here two cylinders are placed side by side, and two connected balance-beams are placed one above and one below them. A pipe open at both ends ascends to a certain height in the centre of the cylinders. The liquid is admitted to the cylinders alternately, until it flows over and down the pipe into a cup below it, resting on the lower balance beam. A counterpoise above the other cylinder is thus raised, and the balance beams are forced down. This movement raises the rod of a valve at the bottom of the cylinder, and the liquid which it contained, as well as that in the cup, is then discharged. On one end of the axle of the upper balance beam is a crank, the rod of which moves wheelwork outside of the apparatus, thus actuating the hands of indexes indicating the number of the strokes—at each of which a given weight (and therefore quantity) of water is passed through the apparatus. *Patent abandoned.*

1304. J. EASTERBROOK. *An improvement in ratchet braces.* Dated June 9, 1858.

This invention consists in letting into the bow in which the rachet lever is made to terminate, a toothed spherical-sided wheel which is acted upon by a spring or other paul let into the lever. The wheel is retained in the bow by a collar secured by screws. The brace thus formed, while it possesses all the advantages of an ordinary ratchet brace, can be used in positions where a brace with a straight-sided ratchet wheel would be wholly inapplicable. *Patent completed.*

1305. P. DUMONT. *Improved implements for distributing or applying powder.* Dated June 9, 1858.

These implements are principally for destroying vermin, but may be used for many other purposes. They consist of self-distending india-rubber balls (with or without handles), having each a small tube or jet, which may be removed when the powder is to be introduced. By compressing the ball smartly the powder may be blown out through the tube upon plants, &c. *Patent completed.*

1306. T. W. G. TREEBY. *Improvements in revolving fire-arms and cannon and cartridges.* Dated June 9, 1858.

This invention relates to a former patent, dated 10th January, 1856. According to the present improvements the chains are hinged to the chambers by the side of the chambers (and not in the centre), and the endless chain revolves over two pulleys or drums (instead of one), and is made tight by them. The inventor also makes the main barrel send the charge home in the chamber by a screw and nut with lever, or lever and cam; thus doing away with the ramrod. The cartridge is as usual, but, in the end where the powder is put, he places a metal ring on the end of a mandril hollowed out to receive it. The end of the cartridge is then turned into the ring, and a percussion cap driven in with the hollow part towards the outside, thus completely securing the cap in the centre and fastening the end of the cartridge. The cartridge is charged with powder and ball in the usual way. The strikers or plungers are attached to each chamber fastened in the breech end, and revolve with the chain of chambers, and at the end of the iron frame he places a hammer, attached to the lock by a pin and a cam slotted in the lock. When the hammer is pulled, it strikes the plunger and explodes the cap, the ring and cap passing out with the charge. The plunger is therefore not injured by continual firing. *Patent abandoned.*

1307. H. ROLLINSON. *An artificial fuel.* Dated June 9, 1858.

This invention consists in using combinations of coal, pitch, breese, with or without ashes, broken or crushed coke, or sawdust, to which may be added Stockholm pitch, resin, or other substances capable of burning. These are heated, moulded into blocks, and pressed if required. *Patent completed.*

1308. T. ROBINSON and H. OGDEN. *Improvements in safety lamps, and in apparatus connected therewith.* Dated June 9, 1858.

In attaching the gauge to the lamp so that it cannot be removed by any apparatus which the miner usually has at his disposal, the inventor employs, first, two or more fastenings which must be held simultaneously to allow the gauze to be removed; secondly, keys acting by screw threads for unlocking, whether one or more fastenings be employed; thirdly, an apparatus for unlocking, whereby two or more keys are made to act simultaneously. Enamelled metal reflectors for safety lamps are also used by him. *Patent completed.*

1309. J. ROBERTS. *An improved construction of reflector or cover for gas burners.* Dated June 9, 1858.

The chief object of this invention is to prevent the accumulation of heat in apartments arising from the combustion of gas. For this purpose the inventor applies to the metallic reflectors used with gas burners, or to the covers for intercepting the smoke of the gas flame, a water chamber, which, being close to the flame, will take up a great portion of the heat generated, and by transmitting it to the water, give off an aqueous vapour that will keep down the temperature. Standing up over the central hole in the reflector is a tube with a closed end. Surrounding this tube is a larger and longer one. These tubes are securely brazed to the upper side of the metallic disc reflector, and form an annular water chamber, over the inner periphery of which the heated gases play, thereby evaporating the water. In cases where a reflector is not required, the suspended cover for collecting the smoke may be made with an annular water chamber. *Patent abandoned.*

1310. C. CAMMELL. *Improvements in railway buffers.* Dated June 9, 1858.

The inventor so arranges the parts of buffers that the springs shall not be liable to be damaged by undue compression when suddenly collapsed. To this end the helical spring of the buffer head is enclosed in a cylindrical case, which is attached either to the end framing, or to the buffer head, and is long enough to prevent the spring collapsing to such an extent as to drive the coils against each other. By so constructing the spring case the edge of the latter will, when the buffer is collapsed, be driven against the solid end frame, or against the buffer head, and will thereby prevent the coils of the spring from being driven against each other. The same object may be effected by placing a strong rod, or cylinder, within the coiled spring, and causing it to work up and down within the spring, or the spring to work thereon. This rod may be attached either to the end framing, or the buffer head. Sometimes the inventor proposes to place between the metallic coils of the spring rings of a yielding material, to prevent the coils from being brought into contact. A cushion may also be used to receive the pressure of the cylindrical case. *Patent completed.*

1311. J. ROBERTS. *An improved construction of stove.* Dated June 9, 1858.

The object here is to construct a stove in which the fuel may burn for a considerable time, giving off an equable

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heat without requiring attention. To this end is employed a combination of well-known parts, slightly modified in construction, whereby the fuel is burnt from the top downwards. This combination is not described by the inventor apart from his drawings. *Patent completed.*

1312. G. CASTLE. *Ventilating women's stays by means of perforation.* Dated June 10, 1858.

This invention consists in perforating stays to afford escape to the heat and moisture of the wearer's body. *Patent completed.*

1313. T. W. MELLOR and W. JAMIESON. *Certain improvements in looms for weaving figured fabrics.* Dated June 0, 1858.

This invention consists in certain alterations and additions to looms for weaving figured fabrics, which are mounted either with treddles or harness, and are operated upon in one direction by springs or weights. The improvements relate to that part of the apparatus by which the treddles or harness are acted upon in the contrary direction to the springs or weights, in order to form the *sheed* for the passage of the shuttle. These improvements are not described by the inventor apart from his drawings. *Patent completed.*

1314. J. LUIS. *An alembic wine examiner.* (A communication.) Dated June 10, 1858.

This specification is mainly a description of drawings. *Patent abandoned.*

1315. J. LUIS. *An improved thrashing machine.* (A communication.) Dated June 10, 1858.

This specification consists mainly of a description of drawings. *Patent completed.*

1316. J. LUIS. *An improved balance-beam thrashing machine.* (A communication.) Dated June 10, 1858.

This specification is mainly a description of drawings. *Patent abandoned.*

1317. J. LUIS. *An improved nose-bag for giving horses their oats, &c.* (A communication.) Dated June 10, 1858.

This bag is made of coarse thread canvas, the threads of which are close enough to prevent the oats from falling out, and open enough to permit the horse to breathe easily. The old mode of suspension is not altered. *Patent abandoned.*

1318. T. CHATWIN and C. TAYLOR. *Improvements in screw stocks.* Dated June 10, 1858.

The improved screw stocks contain three dies, one ordinarily stationary, and the other two capable of moving towards it when the screw is being cut, or when bolts of different diameters have to be screw-threaded. The patentees claim, 1, causing the moveable dies of a screw stock to advance, either by the advance of a screw-box upon the screwed handle of the stock, or the advance of a screw in the body of the stock. 2, causing the several dies of a screw stock to advance simultaneously by the use of a ring encircling the dies, the inclined inner face of the ring urging the dies forward when the ring is made to advance by a screwing motion into the body of the stock. *Patent completed.*

1319. J. S. CROSLAND. *Certain improvements in steam engines.* Dated June 10, 1858.

These consist, 1, in an improved combination of a high-pressure vibrating or oscillating engine as auxiliary or pusher, or to compound any other condensing steam engine whether marine or stationary. 2, in the application of a high-pressure double cylinder (horizontal) engine, "as auxiliary, &c.," as in first claim. 3, in an improved combination of a high-pressure single cylinder (horizontal) engine, "as auxiliary, &c.," as before. 4, in passing the supply and exhaust steam with concentric pipes through a single trunnion of a vibrating or oscillating cylinder, instead of through separate trunnions as heretofore. *Patent completed.*

1320. W. DAVIS. *Certain improvements in the tangs of awls, also in the mode of manufacturing awl-blades or similar articles, and likewise in the stocks or pads for holding the same.* Dated June 10, 1858.

1. Here improved tangs are formed of a uniform size, and may therefore be applied readily to any handle; they also make the awls, &c., stronger. 2, a new mode of giving form to the blades of awls is used. 3, the stocks or pads are connected to the handles by improved means, which are also applicable to surgical instruments, cork screws, &c. The inventor's drawings are referred to throughout the descriptive part of this specification. *Patent completed.*

1321. G. HALL. *Certain improvements in cartridges.* Dated June 10, 1858.

In order to load the gun by means of a cartridge, and yet arrange the powder, &c., in the barrel as if they had been poured from flasks, the inventor places his charge within a case so formed that it may be inserted in or fixed on the muzzle, and then the charge be rammed down by the ramrod, and the case afterwards removed, either to be re-charged or thrown away, according to its value. *Patent completed.*

1322. H. REYNOLDS. *An improved method of separating glycerine from saline and other substances.* Dated June 10, 1858.

This invention consists in blowing on or through spent soap lees a current of dry steam, at a temperature of about 408° Fahrenheit. The fluid may be first reduced by evaporation, and raised nearly to the boiling point by being passed through a heated still-like vessel, or by being heated in any other vessel. It is then passed into another vessel where it is met by a jet or jets of superheated steam, which raises it to the boiling point, and evaporates the glycerine, carrying the vapour upwards with it, and leaving the salts to deposit themselves in the vessel. Greater purity can be obtained by repeating the process. *Patent completed.*

1323. W. WILKINSON. *Certain new textile and other combined fabrics, and means of ornamenting fabrics and skins.* Dated June 10, 1858.

These fabrics are made by uniting by india-rubber solution, or other adhesive substance, two pieces of cloth, or cloth and silk, or two textile fabrics (ornamented on both sides, or not), and subsequently ornamented or not by embossing or otherwise, and with or without a central strengthening or foundation piece, or other textile fabric. The inventor also forms a new combined fabric by cementing a cut pile or other fabric to the back of leather, kid, and other skins, and making the solution used to unite the fabric to the skin porous by forming holes therein, that the finished fabric may be porous. He forms elastic stockings and bandages by uniting thicknesses of cotton, silk, or other web by india-rubber solution pierced with holes before being allowed to dry; or he causes a piece of india-rubber cloth pierced with numerous holes to adhere to webs of stocking fabric. The object is to produce elastic stockings and bandages porous throughout. The means of ornamenting fabrics, leather, and skins consist in the application thereon by adhesive matters of patterns and devices produced in similar materials, or in different materials to those upon which the ornament is to be applied, and in the same or different colours. The ornament may be ground flocks, or lace, or flowers produced in silk or cloth to imitate embroidery and otherwise. *Patent abandoned.*

1324. W. C. WILKINS. *Improvements in lighthouses.* Dated June 10, 1858.

Heretofore, when dioptric apparatus has been used in lighthouses, such apparatus has been combined with metallic reflectors. These improvements consist in combining spherical glass reflectors with dioptric apparatus. *Patent abandoned.*

1325. J. GEMMELL. *Improvements in the manufacture of starch.* Dated June 11, 1858.

In these improvements the material is steeped in water, and otherwise treated as usual. The coarser particles are then separated from the rest, and the strained product poured on to a runner, hitherto used for separating the starch from the "shines." The water is thus run off, and the whole of the amylaceous product precipitated upon the face of the "runner." The starch is now removed to be dried; thus the whole process is effected in one apparatus. The inclined planes or runners may be modified to suit the object in view, and may be arranged in series, so as to carry out the process continuously. By these means the yield of starch is made uniform, the ordinary waste being avoided, and time, labour, and plant economised. *Patent completed.*

1326. L. A. BIGELOW. *Improvements in sewing machines.* (A communication.) Dated June 11, 1858.

This invention was described at p. 620, of No. 1846 of the MECHANICS' MAGAZINE, for Dec. 25, 1858, a complete specification having been filed with the application. *Patent completed.*

1327. L. A. BIGELOW. *A new and improved machine for sweeping carpeted and other floors.* (A communication.) Dated June 11, 1858.

This invention consists of a box open at the bottom, in which are the brushes and machinery. It is drawn along the room by a handle, and the dust collected in two suitably placed dust-pans. The chief novelty is, that the brush is put in motion by a cogged or toothed wheel, on the axis of the wheel on which the apparatus rests. *Patent abandoned.*

1328. G. BARTHOLOMEW. *Improvements in that description of gas meters commonly called wet meters.* Dated June 11, 1858.

The object here is to secure uniformity in the measurement of gas, by keeping the surface of the water in the measuring compartments at the same level, although, by evaporation or otherwise, the water becomes diminished or increased in the case. The inventor claims the arranging wet or water gas meters so that the drum or measuring chambers acting on suitable index apparatus are made to float in the water or other fluid contained in a case or reservoir, whereby such drum or measuring chambers, whilst such meters are in action, are sustained at a uniform and determined line of immersion in such water or other fluid, whatever may be the height of the water or other fluid in such case or reservoir and unvarying measurement thereby obtained. *Patent completed.*

1329. W. E. NEWTON. *An improved apparatus for supplying boilers with water.* (A communication.) Dated June 11, 1858.

The objects here are, 1, to regulate the pumps to the requirements of the boiler. 2, to sound an alarum should the pumps cease to act. The only part which the patentee describes apart from his drawings is a combination of a feed apparatus controlled by expansion and contraction, with an expansion tell-tale placed below the lowest safe water level. *Patent completed.*

1330. S. CHEAVIN. *An improved preparation or combination of mineral substances, applicable for use as a pigment, cement, or mastic, or to be used either alone or in combination with other well-known materials for washing, scouring, cleansing, or bleaching purposes.* Dated June 11, 1858.

The substances here used are red ore, or hematite iron ore, in combination with the slag or scale left from the working of iron in iron works. These materials are pulverized and intimately mixed, and then are either combined with oil or turpentine, &c., to form a pigment, or are mixed with water to form a cement or mastic. The slag, &c., may also be combined with soap, &c., and employed for scouring, washing, or bleaching. *Patent completed.*

1331. L. F. LENIERE. *Improvements in treating hemp or tow for the caulking of ships and vessels, parts of which improvements are applicable to washing and cleansing textile articles or fabrics impregnated with greasy or oily matters, and in the apparatus connected therewith.* Dated June 11, 1858.

This invention consists, 1, in obtaining good oakum or a substitute superior to oakum, by submitting new hemp or tow to a bath of tar, in an apparatus suitably heated. 2, in the application of the composition and apparatus, slightly altered, to the cleansing of textile fabrics and substances impregnated with oily or fatty matters. *Patent completed.*

1332. G. W. HART. *Improvements in the manufacture of locks.* Dated June 11, 1858.

Here the bolt of the lock is made with a fixed stump on it, and two slots through it. There is one set of tumblers acted on by the key, and a detached tumbler by a cam put in motion by the key, or by the key itself. The bolt has at its upper edge a projection the back edge of which is inclined, corresponding with an incline on the front edge of a projection on the upper edge of the tumbler which is actuated by the cam. The tumbler, which is worked by the cam, has also a slot through it in which the stump on the bolt moves as the bolt is slid back, and such slot at its lowest part is longer than at its upper part. The back part of the tumbler which is worked by the cam has a projection at its upper edge, which rests against a fixed stop on the case of the lock, so that should it be attempted to push back the bolt it would by its upper projection come against the projection at the fore end of the detached tumbler and be resisted by it, and that by a fixed stump on the case. The tumblers actuated by the key move on an axis at their back ends, and the fore end of each is formed into a toothed sector, which takes into a pinion, on the axis of a disc having formed on its circumference a number of false notches and true notches or holes. The false notches are less deep than the true, and the tumbler which is worked by the cam has a tooth which, when the discs are turned correctly into position by the corresponding tumblers moved by the key, will fall into the true notches of all the tumblers. The discs have fixed guards around them, except opposite the place where the true notch is to be brought when the proper key is used. By these arrangements it will be seen that the key used must not only act correctly on the key tumblers, but by the cam it must also act correctly on the cam tumblers, consequently no tampering or prejudicial action can take place in respect to the bolt by pressing it back, as the bolt would be resisted going back unless the tumblers are first properly acted on. In some cases the inventor makes locks with rotating tumblers, *i.e.*, a series of discs with a number of false notches in the peripheries, true notches in each. Each disc is made with a hole for the key and a number of steps, one only being the true one for the key. The discs are surrounded by a ring having a projection for the key to act upon, and on this ring there is a pin which works in a slot in the sliding bolt. This ring is kept in position by the case of the lock, which is circular, and in the ring there is a sliding piece which is projected outwards by a spring, there being a recess in the case to receive the sliding piece. When the key turns the ring, an incline on the case acts on the sliding piece, and forces it into the true notches of the discs (which have been turned into position by the key,) and allows the key to be turned, and the bolt to be withdrawn; but if the discs have not been brought into such a position that the sliding piece enters the true notches, the sliding piece is prevented from being forced in, and in consequence the ring is prevented from being turned and the bolt from being shot. In some cases he applies two stumps to the bolt, one of which has teeth on its back surface, which, if the bolt be pushed when the tumblers are not properly placed, take into notches or teeth formed on the fore end of the tumblers. The tumblers, when properly placed by the key, allow the two stumps to pass through a longitudinal slit, there being also transverse slits to receive the stumps when the bolt is thrown or withdrawn *Patent completed.*

1333. G. T. BOUSFIELD. *Improvements in marine steam engines.* (A communication.) Dated June 11, 1858.

This invention was described at page 620, of No. 1846 of the MECHANICS' MAGAZINE for Dec. 25, 1858, a complete specification having been filed with the application. *Patent completed.*

1334. G. T. STIELER. *Improvements in the means for generating steam and economising fuel.* Dated June 12, 1858.

These improvements consist in the arrangement of one or more water spaces, bridges, or transverse tubes in the fire-boxes of locomotive or other tubular boilers, whereby the inventor is enabled to use a series of fire tiles of suitable form through which the products of combustion are conducted; and he also introduces a number of hollow stays into different parts of the fire-box, and through these a supply of atmospheric air is conveyed to the products of combustion. *Patent abandoned.*

1335. J. HALL. *An improvement in the slide valves of steam engines.* Dated June 12, 1858.

This invention consists of an alternate expansion valve, arranged to afford facility for cutting off the steam at any required part of the stroke. Being connected to a governor, so as to vary with the speed of the engine, it dispenses entirely with the necessity for a throttle valve. The slide valve is of the ordinary construction, with the addition of a steam port at each end. The ports are covered by flap valves lying on the top, and mounted upon levers vibrating upon a central fulcrum attached to the back of the valve. These flap valves are each furnished with a pin or friction roller, acted on by a fixed cam placed at each end of the throw of the slide valve. As the flap valves are raised by the cams, they are held by retaining levers (and acted upon by a spring) until the return of the slide valve brings these levers alternately against one or other of the two stop pins attached to slides. The flap valves are thus alternately raised and released, and falling by their own gravity shut off the steam. This can be done at any part of the stroke, as the slides which carry the stop pins are moveable, and so connected by a pinion and racks that as the speed of the engine varies, the stop pins are moved nearer to or farther from each other, and thus the amount of steam allowed to enter the cylinder is regulated. These slides move so easily that the governor acts upon them instantly, and consequently regulates the speed of the engine very quickly when the load is increased or decreased. *Patent completed.*

1336. W. CLARK. *Improvements in machinery for combing cotton and other fibrous materials.* (A communication.) Dated June 12, 1858.

The inventor claims nippers of any kind, for holding fibrous materials, of which one part at least turns on its axis, is of cylindrical form, and has a jerking or intermittent motion. He also claims certain new arrangements of gear for imparting motion to the nippers for combing

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fibrous materials. He claims, too, the application of this machinery to the combing of all fibrous materials. The inventor refers to drawings throughout his description of the improvements. *Patent completed.*

1337. A GIBSON, J. POLLOCK, and J. MARTIN. *Improvements in the construction of steam-engine boilers and furnaces for effecting the prevention of smoke.* Dated June 12, 1858.

This relates to the introduction of air into furnaces by a peculiar application of an air-pump or pumps, or by atmospheric pressure through tubes. *Patent abandoned.*

1338. W. CLARK. *A new treatment or preparation of a vegetable product, and its application as a fibrous or textile material.* (A communication.) Dated June 12, 1858.

According to this invention the "nettle" is substituted for animal wool and silks either by using it alone, or in combination with animal silk or wool, and it is also dyed in all kinds of colours, which it takes perfectly. The method of preparation, after having boiled and removed the ligneous part from it, is the following:—1. For softening the plant, and completely bruising or breaking the ligneous parts which may still adhere to it, it is passed under an edge runner rolling on a horizontal stone, or is acted on by any similar means. 2. The inventor proceeds with the operations for obtaining the silk or wool, which differ according as it is wished to obtain one or other of these substances. If both are to be obtained, the plant is divided into two parts, and for the silk the fibres found in the core or heart are selected as being the finest and brightest. The remaining part of the vegetable is to be treated in the following manner, to produce the vegetable wool:—1. The substance should be combed like hemp. 2. After being well combed it is mixed, if required, with animal wool, cut to the same length as if by an instrument with teeth which tears the plant. 3. In this condition it is submitted to the action of a caustic lye, composed of salts of soda, about 15 lbs. to every 375 lbs. of vegetable, and 5 lbs. of a solution of lime, or one-third of the salt employed (or any other analogous chemical agent), which solution of lime is decanted and poured into the boiler containing the vegetable and lye. The latter should mark two degrees of the lye meter of Beaumé. It should boil two hours, then be withdrawn, and perfectly washed with running water, if possible. For drying it promptly, it is, by preference, poured into a dydro-extractor, and then spread in the open air, but any other system of drying may be employed. 4. When dry, the vegetable is placed in a vat of wood lined with lead, and in which several hours before has been placed a solution of chloride of lime, which should mark 1½ or 2 degrees of Beaume's concentrated acid matter. The bleaching is effected in two hours, after which the vegetable is withdrawn, washed till the last water used remains clear, placed into the drying apparatus, and afterwards spread in the open air till dry. 5. To give it, when bleached, all the suppleness it can acquire, it is passed into a bath of soap, then carefully washed and dried in the air. 6. The vegetable is now ready to be manufactured into wool or silk. For well separating it, it is passed through a devilling machine, and then into a spiked gig-mill if necessary. All the methods ordinarily employed for the manufacture of silk and wool may be used for that of this vegetable. *Patent completed.*

1339. A. V. NEWTON. *Improved machinery for cutting veneers.* (A communication.) Dated June 12, 1858.

This invention consists mainly in the use of two knives made to cut the veneer from opposite sides of the block of wood, each knife cutting one half the veneer, and making its cut in the same plane with the other knife, and parallel with the run of the grain. The veneer is thus little liable to be roughed or broken. To cut veneers from such woods as are commonly used, it should first be steamed, or softened by steam and hot water combined, but this is not required if the wood be soft or green. *Patent completed.*

1340. W. CLARK. *Improvements in curtain poles or rods.* (A communication.) Dated June 14, 1858.

This relates to the employment of grooved curtain poles, in the spiral grooves of which the curtain rings lie, being traversed ordinarily along the grooves, to or fro, as the pole is turned by cords passing over pulleys on them; and the invention comprises an improved means of arranging the curtains, by which the cords and pulleys are dispensed with. *Patent abandoned.*

1341. J. H. YOUNG. *Improvements in setting up, composing, and distributing types.* Dated June 14, 1858.

These improvements in setting up types relate chiefly to the composing machine patented by the inventor in 1840, in which an inclined plane is used for collecting the different types as they are required at one point; but they are also applicable to the machines in which moveable belts are used as a collecting medium. The inventor now claims:—1. The application of apparatus for obtaining a regulated alternate movement and stoppage to the step-wheel. 2. The application of apparatus for obtaining a regulated alternate movement and stoppage of the types upon the inclined plane, in order to insure their being properly taken off. 3. Making the steps of the step-wheel moveable. 4. The raising of the types at the termination of the inclined plane of the same, and the regulated action of the pusher so that it may not strike at an improper movement. 5. The application of electro-magnetism for regulating the taking off the types off the inclined plane, and their delivery into the receiver. 6. The application of a small auxiliary composing machine, which may be fixed to, or detached from, a larger or other composing machine. 7. The partial covering of the channels down which the types slide on the inclined plane. 8. The application of a groove for small bodied type in the bed of the channel of the inclined plane used for a larger bodied type. 9. The application of a pusher through the aperture or apertures so constructed in the incline plane to allow of superfluous types falling off the same. 10. The application of moveable blades to effect the distribution of types by means of their nicks as described. *Patent completed.*

1342. H. J. DANIELL. *A process by which the stamp on bankers' cheques is cancelled, and the cheque indelibly and simultaneously crossed.* Dated June 14, 1858.

This inventor claims the sole right to cross bankers' cheques, and cancel the stamp thereof by excision or perforation. *Patent completed.*

1343. H. N. S. SHRAPNEL. *An improvement in preparing iron and other metals or mixtures of metals for, and in casting the same in moulds.* Dated June 14, 1858.

Here the metals to be cast are, whilst in the furnace, subjected to a mechanical stirring; then run into the mould, and the stirring kept up until the metal solidifies. *Patent abandoned.*

1344. G. NEALL. *Improvements in gas stoves for warming, cooking, and other purposes; as also in the saucepans, kettles, or other utensils to be used with the same.* Dated June 14, 1858.

This specification is mainly a description of drawings. *Patent completed.*

1345. J. HETHERINGTON. *Improvements in guides or clearers used in machines for winding, reeling, and clearing threads of cotton, silk, and other fibrous materials.* Dated June 14, 1858.

This invention is for making guides or clearers from a solid piece of steel or other suitable material. The space for the thread to pass through is made wide at the top and tapering downwards, thus rendering it suitable to every count of thread between the coarsest and finest. An adjustable rod or bar is used for regulating the depth to which the thread is to be entered in the slit. These guides or clearers are fixed in the transverse rod or bar, or mounted on a spring in the same manner as ordinary guides. *Patent abandoned.*

1346. J. H. JOHNSON. *Improvements in machinery or apparatus for breaking or crushing stones for road metal, and other purposes; and for crushing ores and other hard and brittle substances.* Dated June 14, 1858.

This invention was described at p. 30, of No. 2, under the heading "Crushing Apparatus." *Patent completed.*

1347. J. C. HENDERSON. *Improvements in stoves.* Dated June 14, 1858.

This invention consists of a combustion chamber above the fire, and within a radiating chamber, whereby the smoke and gases are confined and submitted to perfect combustion. They then pass into the radiating chamber, from which the heat is communicated to the surrounding atmosphere, or to the substance to be heated. *Patent completed.*

1348. C. C. J. GUITTROY. *A new smoke-consuming apparatus, and also a new method of introducing the coal or fuel into it.* Dated June 15, 1858.

This invention was described at p. 620 of No. 1846 of the MECHANICS' MAGAZINE for Dec. 25, 1858. *Patent completed.*

1349. L. C. S. MASSON and F. DE LA MORINIERE. *Improvements in the manufacture of woven fabrics with coloured patterns.* Dated June 15, 1858.

The invention consists in so printing the threads which are to serve as weft for weaving fabrics as that by weaving by any of the ordinary methods tissues may be produced with a coloured pattern corresponding to any given design. *Patent completed.*

1350. B. PITT. *Improvements in the construction of knobs and roses used with locks, latches, and such like fastenings as are constructed with spindles.* Dated June 15, 1858.

Here the under rose consists of two parts—a metal plate screwed on the door, and having a neck with an external worm; and a collar fixed within the outer ornamental rose, and having in its interior a worm which screws on to the worm of the neck. The knob is jointed thereto by a nut, to allow it to revolve without affecting the ornamental rose, which is fixed by a small pin. Sometimes the under rose is attached to the lock instead of the door. *Patent completed.*

1351. G. ADSHEAD. *Improvements in steam boilers.* Dated June 15, 1858.

The inventor applies to boilers upon the tubular, flue, or other principle, a bridge or bridges constituting a water chamber or chambers; and in such arrangement he claims particularly the adaptation of springs at the lower and upper parts of the chambers communicating with the main part of the boiler. *Patent completed.*

1352. BARON F. J. VON WEDEL-JARLSBERG. *An improved self-registering compass, or control compass.* Dated June 15, 1858.

This specification is mainly a description of drawings. *Patent completed.*

1353. W. P. WILKINS. *Improvements in the arrangements and construction of refrigerating apparatus.* Dated June 15, 1858.

This invention refers principally to refrigerators used for cooling wort. The small tubes within the outer casing which contains the cooling liquor or water are held in the tube plates; but instead of fixing them rigidly thereto, the inventor simply slides them through holes formed to receive them. These tubes are arranged by preference in a circle within a cylindrical outer casing. In India-rubber discs of the diameter of the outer casing, he cuts holes corresponding with the positions of the several tubes, and places the discs on the ends of the tubes, which all project through the tube plates for the purpose. He then places washers or plates similarly formed with holes against the discs of India-rubber, and by screw studs and nuts compresses the India-rubber, thus rendering the joints tight, and at the same time admitting of expansion and contraction. The inventor also arranges channels or passages for the water in connection with suitable cocks, or valves, &c., whereby the water can be diverted from its ordinary course, and passed through the wort tubes in the opposite direction to that of the wort, whereby those tubes are readily cleaned out. The passage of the wort is then of course suspended. A third part of the invention refers to the introduction of a perforated metal disc in the outer chamber to sustain the tubes in the middle of their length (if long). This disc is similar to the washer used for compressing the India-rubber, but it has apertures for the passage of the water. *Patent completed.*

1354. SIR F. C. KNOWLES. *Improvements in the fabrication or manufacture of steel.* Dated June 15, 1858.

These improvements are as follows.—As soon as the metal is withdrawn from the converting furnace in whatever shape it may be (as bars, rods, sheets, plates, &c.), the inventor puts it into retorts without carbonaceous matter, and carefully excludes all atmospheric air. The retorts are then heated like gas retorts for a longer or shorter time, according to the size of the bars, &c., until the temper or cementation shall have become even throughout the mass and the steel itself almost homogeneous. The bars, &c., must then be drawn out and immediately covered up from the air with sittings of coke, and allowed to cool gradually in the heap. The inventor treats ingots of steel in the same manner to render them more homogeneous, and to destroy any crystallization, or state of strain in the mass among its molecules. If bars, rods, plates, &c., of steel after conversion (above all, if the iron from which they are made be itself clean and after this subsequent process in retorts be submitted to what is called "washing," heat, and then hammered, or rolled "shear" steel, or steel analogous to it, may be made without any welding process, highly homogeneous and solid, and less liable to crack under the hammer. *Patent completed.*

1355. H. S. WARNER. *Improvements in the manufacture of decolourizing and purifying charcoal.* Dated June 15, 1858.

This invention was described at p. 31 of No. 2 for Jan. 7, 1859.

1356. A. DEMBINSKY and A. C. ENGERT. *An improved fire-proof composition or wash.* Dated June 15, 1858.

This composition or wash is composed of sulphuret of potassium, silica, ground quartz or flint, soda or commerce, powdered charcoal, and pyroxalic acid. The whole of these ingredients are mixed and reduced to a flux under heat. The flux is afterwards diluted with boiling water down to the consistency required for use. Any equivalent ingredients may be substituted for any of the above-named. Many acids may be substituted for the acid mentioned, but pyroxalic acid produces the best effect. *Patent abandoned.*

1357. J. RUBERY and T. WARWICK. *Improvements in machinery and tools for making portions of umbrellas and parasols and lingoes.* Dated June 15, 1858.

In carrying out this invention steel wire is placed on a swift or reel at intervals, and a sufficient portion is drawn in to make a stretcher for an umbrella or parasol. The wire is then cut off to the length, and another pair of tools split the other end of the piece. The split wire is then by the machine carried laterally to two sets of tools which flatten the ends of it, and is then again carried laterally to two other sets of tools—one set to punch one end, and the other set to open and shape the split end. The stretcher thus formed is (still by the machine) moved laterally and delivered. The sets of tools mentioned are such as have been before employed. In making lingoes, the combination above described is somewhat varied, as the ends of these articles do not require splitting. In fixing the middle piece or joint of brass of the usual V shape to the steel ribs of umbrellas and parasols, the tools are so formed and worked as to fix the piece at one operation. The bed, die, or tool (whether made of one piece or more) has a slot through it, and a groove in the top, in which the rib is received and supported. Across the slot is a shaping tool, which corresponds in width with the brass piece which is to be fixed to a rib. On the edge of this tool is a recess corresponding with the form of the edge of the middle piece when finished. A split or double tool, the prongs of which are elastic, descends through the slot in the bed tool, and on either side of the brass or middle piece, by which the edges of the grooves formed in the edge of the brass or middle piece are gathered over the rib, and are then pressed on and finished simultaneously with the shaping of the other edge of the middle piece in the hollow tool across the slot in the bed tool, the parts of the spring tool being caused in its descent to come somewhat nearer together than the prongs are when they are free. *Patent completed.*

1358. B. PREDAVALLE. *Improvements in the mode of obtaining motive power.* Dated June 16, 1858.

This invention consists in working pistons, say on board ship, by means of "the decanter syphon," the short arm of which is immersed in the water, rising at the bow as the ship moves, and the long arm descending towards the water at the stern, the action of this syphon being "combined with the action alternately intercepted and restored of the vertical pressure of the water in the syphon upon the upper and lower parts of a piston or pistons" for giving motive power. A similar combination is used wherever water can be so employed as to act similarly—*i.e.*, in conjunction with a syphon. *Patent abandoned.*

1359. G. T. BOUSFIELD. *Improvements in apparatus to be used in the construction of small boats.* (A communication.) Dated June 16, 1858.

This invention consists of a certain apparatus for sustaining and confining the parts of the frames of small boats in the same relative positions as they occupy in the finished boat, and in certain accessories to such apparatus; the object of which is to cheapen the building by reducing the work in their construction. The patentee does not describe his invention apart from his drawings. *Patent completed.*

1360. B. ATWATER. *An improved sewing machine.* Dated June 16, 1858.

This invention was described at page 620 of the MECHANICS' MAGAZINE for Dec. 25, 1858, No. 1846; a complete specification having been filed with the application for a patent. *Patent completed.*

1361. C. W. LANCASTER. *An instrument or apparatus for charging cartridges for breech-loading arms.* Dated June 16, 1858.

This invention was described and illustrated at p. 361 of the MECHANICS' MAGAZINE for Oct. 16, 1858, No. 1838. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, FEBRUARY 18, 1859.

OUR STEAM NAVY.

A FLOOD of light is now pouring upon the navy of England. The discussion which was commenced in the middle of December last, stimulated by Her Majesty's announcement of an increase of expenditure "for the re-construction of the British navy," has brought down upon the public a deluge of information which it had but small reason to anticipate. In swift succession we have had the paper read at the Society of Arts on the ships of the navy, Sir HOWARD DOUGLAS'S *Naval Warfare with Steam*, and statistical leading articles and correspondence in the *Times*; and now, to-day, in our own supplement, we have those Admiralty tables which have been coveted, and sighed for, and begged, and stolen, and quarrelled over for months and even years past. And these are not all, for Sir CHARLES WOOD—touched with reasonable indignation at the ungenerous slight implied in the words of the Royal Speech, and determined to show that the navy was not neglected while under his care—has moved in Parliament for a return which will set forth in detail the vast work of "re-construction" which has already taken place.

A singular and fortunate conjuncture of things is observable in these facts. Sir CHARLES WOOD'S return was unquestionably moved for, less with the view of benefiting the public, than with that of justifying himself. Men of science might have asked him in vain, during his term of office, for the information which he has now elicited. But as soon as his personal reputation becomes shadowed, even by that very transparent cloud of words which Her Majesty was made to utter, forth come all the facts!

Singularly enough, we are in no position just now to urge this consideration against our Admiralties, because, before Sir CHARLES took action in the matter, the very valuable information which constitutes our Supplement was in our hands, and with it the Board of Admiralty's permission to publish it.

While giving that body of facts to the world, we would commend a word or two to the consideration of intelligent readers. The reluctance of official men to make bare the details of operations conducted in their departments will never be without excuse all the time those details are publicly discussed with injustice, animosity, or rancour. But few men are so heedless or so stoical as to bear unmerited aspersion and contumely if they can avoid them. And yet how often are persons in office subjected to both without cause! To fair discussion, however severe, we have not a word to oppose; but that ill-favoured spirit which is prone to attack, and cunning to impute bad faith everywhere, we abhor. For these reasons we hope that those of our readers who may hereafter examine and discuss the official papers of which we are to-day the channel, will do so with candour and right feeling. Let no gentleman mount a hobby-horse of any kind, and then attempt to traverse the expanse of facts and figures which we have spread out before him. On the other hand, all intelligent inquiry, all honest investigation, and all pure discussion we shall gladly hail.

THE NAVY ESTIMATES FOR 1859-60.

THE Navy estimates for the ensuing financial year 1859-60 were published this week. The grand total sum which the Legislature will be required to vote amounts to £9,813,181, being a net increase of £951,810 on the estimates of 1858-59, which amounted to £8,851,371. The principal increase occurs in the item No. 10, "naval stores, &c., for building and repairing ships," and in item No. 8, "wages to artificers employed at home;" these items together figure for an increase of nearly a million, or £985,707; the increase being asked "to meet the extraordinary charges to be incurred during the year in consequence of the additional work to be undertaken for the building and conversion of ships of war for the steam navy, and providing machinery for the same." Under item No. 10,—"Naval stores for the building, &c. of the fleet,"—£687,000 (the actual amount of the proposed increase) will be spent as follows,—viz., £82,000 for the purchase of timber, masts, and deals; £17,200 for other stores; £335,000 for the purchase of steam machinery and the repair of the same; and £252,000 for ships to be built by contract. Under item No. 8 the sum of £298,707 (the actual amount of the increase) is required to meet the extraordinary charges for dockyard labour. In the item for victualling, there is a decrease of £31,710; and in the item of "new works, improvements, and repairs in the yards," a decrease of £12,364.

The following is a list of the principal items of expenditure in the estimates for the ensuing year, viz:—Wages to seamen and Marines, £2,487,062; victuals for the same, £995,647; the Admiralty Office, £142,957; the Coastguard service and Royal Naval Coast Volunteers, £186,057; the scientific branch, £61.358; the establishments of Her Majesty at home, £153,089; and those abroad, £28,083; wages to artificers hired at home, £989,323 + £298,707 (the increase already explained); wages to artificers employed abroad, £54.330; naval stores, &c., for the building and repairs of ships, £1.484,240 + £687,000 (the increase already explained); new works, improvements, and repairs in the yards, £573,498; medicines and medical stores, £50,000; and miscellaneous services, £67,948. These items constitute the estimate of the effective branch of the service, and they amount altogether to £8,259,299. Under the head of the non-effective service, there are items of £706,509 for half-pay, reserved half-pay, and retirement to naval officers and Royal Marines; £483 957 for military pensions and allowances; and £163,416 for civil pensions and allowances. The item of the Army and Ordnance Departments (conveyance of troops) figures for £200,000. against £410,000 last year. The Royal Navy for the ensuing year is to consist of 38,000 officers, seamen, and boys to be employed in Her Majesty's fleet; 2,000 officers and men to be employed in the surveying, troop, and store ships; 4,000 officers and seamen to be employed in the Coastguard service afloat, and 3,400 officers and men to be employed in the same service on shore, the whole forming a grand total force of 47,400 officers, seamen, and boys; the navy proper includes 40,000, and the Coastguard, 7,400. There will also be a force of 15,000 Marines.

Literature.

Engineering Precedents for Steam Machinery; Embracing the Performances of Steamships, Experiments with Propelling Instruments, Condensers, Boilers, &c., accompanied by Analyses of the same; the whole being original matter, and arranged in the most useful manner for Engineers. By B. F. ISHERWOOD, Chief Engineer, U.S. Navy. New York: H. Baillière, 290 Broadway. London: H. Baillière, 219 Regent Street. 1859.

MR. ISHERWOOD'S name is known to us as that of the author of many useful papers published in the *Journal of the Franklin Institute*. In the volume before us he has brought together a mass of valuable facts, comprising a very full report on the British gun-boats, mainly the result of personal observation; a similar report on H. M. dispatch screw steamer *Lynx*; a third report on H.M. Steamship *Conflict*; a fourth on the steamers *Sydney, Ireland, and Scotland*; and a statement of the results of comparative experiments with the screw and paddle-wheel, as applied to the U. S. steamers *Spencer* and *McLane*. As the author intends, should the demand for this volume be deemed sufficient, to succeed it by others of like character, we would urge upon our readers the desirability of at once forwarding their orders for future volumes to the publishers. It would be a cause for great regret, if a series of practical engineering works like this should fail for want of due support.

The author professes to have derived most of his information respecting our gunboats from personal examination of those employed in the capture of Canton, which he saw during a cruise on the southern and eastern coasts of Asia. He says the gunboats sent to China proved of indispensable service in the military operations there, "and fully established the great value of this description of vessel for littoral warfare." By the courtesy of their engineers, he examined them both in dock and afloat, took the dimensions of their hulls and machinery, inspected their log-books, obtained indicator diagrams from their engines, and "received a candid account of their performance and general efficiency in the varying circumstances under which they had been tried." The author gives a minute detailed description of the hulls and engines of the several classes of gunboats, and enters into an elaborate comparison of the relative merits of the engines and propellers supplied respectively by Messrs. Maudslay and Field, and Messrs. Penn. As a specimen of the author's style the following passage on the 60-horse power gunboats (p. 9) may be taken:—

"This class was the original type of gun-boat, and the object had in view when constructing it, was to produce a vessel that could support two guns of large calibre for battering at point-blank range a formidable fortress, and at the same time offer a target of the smallest possible size to the enemy. For this purpose, the vessels were to be of very small dimensions with pretty full water lines, to be low on the water, and to have so light a draught as to be able to run close in shore; as they were to receive the fire of the heaviest hostile ordnance, their machinery was to be protected by being placed below the water line, and behind the shelter of the coal-bunkers. Their steam power was to be what was necessary to carry them rapidly in and out of action, and for prompt manœuvring against wind and current. As these vessels were constructed for the sole purpose of attacking Cronstadt, and were expected to be destroyed in that service (for both officers and crews were to be volunteers), excellence of model, kind of machinery, economical application of the power, capacity to perform sea voyages of reasonable length, etc., were quite secondary considerations—very different from what they would have been, had the vessels been destined for general instead of such special service. The great considerations were, small size hull, large size ordnance—the machinery being simply that which would weigh the least, cost the least, occupy the least space, and yet be sufficient for working the vessels quickly even against the current and wind, on the few occasions it was expected to use them. The accommodation for officers and crew, and the quantity of coal and stores carried, were, for the same reason, unimportant matters. The cannon, stores, coal, etc., were to be carried to the scene of action by large screw steamers, from which the gun-boats were to be fitted out, and sent in as bull-dogs to bait a bear. As a necessary consequence of this programme, the hulls were made with tolerably full water-lines, to give strength and displacement; the spars were made very small, and the machinery adopted was a light non-condensing engine, working at high rotatory speed, with a steam pressure of from 50 to 60 pounds per square inch above the atmosphere, and following for two-thirds the stroke of piston. The boilers were tubular, with circular shells—simplicity, fewness of parts, and readiness of access for quick and easy repair, being the governing objects. Only 28 tons of coal were carried in the bunkers, very little water was taken in the tanks, the distilling apparatus being depended on for the daily supply; provisions and stores were also restricted to the least quantity; and then the officers and crew, limited to the fewest number, were thrust into what little space remained.

The author is not correct in supposing that these vessels "were constructed for the sole purpose of attacking Cronstadt," and that they were expected to be destroyed in that service. His description of the vessels is, however, in the main truthful. In the following table (page 30) he gives a résumé of the dimensions of the hulls and screws of the different classes of gun-boats, and of the results obtained in respect of speed, power, distribution of the power, and economical appli-

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cation of the same. This table may fitly appear in connection with the Official Admiralty Tables which are published in connection with this number of our Magazine:—

SCREWS.	DIMENSIONS.	Mean angle of the Helicoidal surface with the plane of the diameter, in function of surface and of its propelling efficiency	28°...52'	22°...50'	26°...52'	26°...16'
		Projected area in square feet, on a plane at right angles to axis	9·243	6·918	4·320	10·794
		Helicoidal area; in square feet	11·270	7·748	5·111	13·247
		Fraction used of the Pitch	4	4	4	4
		Pitch; in feet	8	6	6	8
		Diameter; in feet	6	6	4	6
		Slip of the Screws in per centum of their speeds	31·0	24·5	30·0	27·0
POWER.	DISTRIBUTION OF THE NET POWER APPLIED TO THE SCREW SHAFT; IN PER CENTUM.	In the Propulsion of the Vessel	60·18	65·43	43·67	62·81
		In the slip of the screw	27·03	21·23	43·67	23·23
		In overcoming the cohesive resistance of the water to the passage of the screw surface	5·29	5·84	5·16	6·46
		In overcoming the Friction of the Load	7·50	7·50	7·50	7·50
	RELATIVE ECONOMICAL EFFICIENCIES.	In respect of weight of steam consumed	1·04536	1·00000	0·63533	1·25661
		In respect of Net horses power applied to the screw shaft	0·91993	1·00000	0·66262	0·95987
		In respect of gross horses power developed by the engines	0·93315	1·00000	0·65611	0·97845
	ABSOLUTE QUANTITIES.	Pounds of Steam passed through the Cylinders per minute (representing Fuel)	194·83	127·74	85·00	169·42
		Net horses power applied to the screw shaft; per Indicator	207·82	171·04	108·58	316·35
		Gross horses power developed by the Engines; per Indicator	185·73	127·74	71·27	298·02
		Mean back pressure (including atmosphere) against Piston; in pounds per square inch	20·7	20·7	20·7	20·7
		Mean gross effective pressure on Piston; in pounds per square in.	40·00	32·96	27·40	42·80
DIMENSIONS OF THE HULLS.		Relative resistances of the Hulls	1·000	1·000	1·000	1·179
		Greatest immersed tranverse section; in square feet	130	130	95	142
		Mean draught of water; in feet	6·875	6·875	5·250	7·750
		Extreme breadth; in feet	22	22	22	22
		Length between perpendiculars; in feet	100	100	105½	125
Maximum speed per hour in smooth water uninfluenced by wind or current; in knots of 6,086 feet			8·38	8·26	6·20	9·27
CLASS.			60 Horses Power (Maudslay's Machinery)	Ditto (Penn's Machinery)	40 Horses Power	80 Horses Power

As the batteries of the gun-boats did not vary materially, the foregoing table shows the relative efficiency of the different classes carrying the same armaments at different speeds, with different draughts of water, and the relative cost of the same in power and fuel. The data here furnished must, however, be taken on Mr. Isherwood's authority, as we have not the means of verifying them. We hope he has been careful to examine sufficiently numerous examples of these vessels before venturing upon tabular inductions. He further tells us (p. 30) that

> The machinery of the gun-boats, though well made, and by the best builders, was constantly out of order. Both boilers and engines gave continual trouble; the first from the use of high pressure steam and sea water; the last from the high rotatory velocity employed. In fact, the rotary speed of the engines was so great that it was impossible to keep them in order. During the hostilities at and around Canton, the English established a shop on shore at Hongkong for repairing; they also had at the same place the floating workshop "Volcano," sent out from England completely fitted up with tools and power for doing a large amount of casting, forging, and finishing; and both these establishments were kept constantly employed on the gun-boats, there being, out of about fifteen, usually a couple undergoing repair; in fact the repairs upon them were enormous. For economy of fuel, durability, and reliability as war vessels for constant use, the machinery of these gun-boats cannot be recommended, however well adapted to the momentary purpose for which they were constructed

In his paper on the *Conflict* the author gives an elaborate account of experiments made with five different forms of propeller, viz., a common screw of uniform length from hub to periphery; a common screw with the corners of the blade rounded off; the same with a Griffith's globe at the centre; a common screw with its surface arranged to correspond with the Boomerang propeller; and lastly, the Boomerang propeller itself, by Sir Thomas Mitchell. In his discussion of the results of these trials he says (p. 93):—

> The relative economical efficiencies of screws experimented with in smooth water and uninfluenced by wind, are by no means the measure of their economical efficiencies at sea, struggling against the vicissitudes of weather, and an average increase of the normal resistance of the vessel from one-third to one-half, according to its size. This important consideration has too frequently, if not always, been overlooked in proportioning screws for marine propulsion; for which purpose the screw of least slip in smooth water is, in general, the most efficient. But with screws of equal diameter, a marked reduction of slip can only be obtained by lessening the pitch, which involves a greater speed of engine for equal speeds of vessel, and this is a very serious practical inconvenience, especially with large engines, as regards their durability and certainty of action. Some reduction of slip can, it is true, be obtained by employing a greater fraction of the pitch, but this involves, if carried beyond four-tenths, even in extreme cases, a disproportionately increased loss by the power required to overcome the cohesive resistance of the water; it also involves the no less serious practical inconvenience of increased length and weight of screw.

Again he says (p. 96) that from the experiments it appears how useless are any attempts to increase the efficiency of screws by modifying the outline of the blades.

> No taperings of the latter out or in, or inclinations of them from a perpendicular to the axis either in a longitudinal or lateral direction, and no removals radially of the surface by substitution of globes around the hub, or by other means, can add anything to the propulsive efficiency of the helicoidal surface, and they generally entail serious practical inconveniencies. The only improvement possible on the true screw of uniform length from hub to periphery, is that due to the use of an expanding pitch or curved directrix.

The remaining papers in the volume are exceedingly interesting, and merit the careful study of young engineers, the more so as they are written by a man accustomed to original and independent thinking.

A Manual of Applied Mechanics. By WM. JAS. MACQUORN RANKINE, LL.D, C.E., F.R.S.S., L. & E., President of the Institution of Engineers in Scotland, and Regius Professor of Civil Engineering and Mechanics to the University of Glasgow. London and Glasgow: Richard Griffin and Co, Publishers to the University of Glasgow. 1858.

NUMEROUS but hitherto unsatisfactory have been the attempts to produce what the civil and mechanical engineer is eminently in want of, viz., a manual of applied mechanics, embracing so much of mechanical philosophy as is required to give him a complete view of the subject, and at the same time exhibiting in a simple and attractive form the main applications of the philosophy to the structures and other combinations with which he is chiefly concerned. Perhaps no work so nearly satisfied these conditions in its own day as Emerson's. But mechanical philosophy, with its applications, has made immense strides since the time at which he flourished, and his labours are decidedly out of date. Since his time the treatises that have been published have been partial, written by persons incompletely acquainted with practical engineering, or so full of hobbies and crotchets as materially to detract from their value. France has indeed produced her Poncelet and Morin, who may be looked upon as the founders of the modern school of applied mechanics. Canon Moseley, who for some years filled the chair of Applied Science at King's College, London, followed in their wake, and produced a cumbrous work on the "Mechanical Principles of Engineering," of which we will only say that two-thirds are thrown away in the pursuit of an *ignis fatuus*—the development of the modulus of machines in a form intended to be practical, but in reality most unpractical and forbidding; while the nomenclature, arrangement, and general treatment of the subject are so intricate and involved as to render it the most difficult work to peruse we ever fell in with, and more calculated to repel than to attract the attention of the engineering class for whom it was professedly intended. It cannot, then, be denied that there was ample room for the appearance of such a work as that of Professor Rankine, whose education as a civil engineer, and undoubted mathematical attainments, would point to him as an eminently fitting person to undertake the task—the round man in the round place. It was therefore with no small anticipations of profit that we addressed ourselves to the task of mastering the bulky volume of 640 pages which Professor Rankine has produced.

In order to enable our readers to understand how far our expectations have been realized, we will first premise how we should expect such a subject to be treated. Now, there are undoubtedly two aspects under which mechanical philosophy might present itself to the mind of such a man as Professor Rankine. He might view it as a system of pure scientific truth, to be exhibited in a complete and logically coherent form, without any special reference to its practical applications, but with all the beautiful refinements so delightful to the accomplished mathematician, but possessing but little interest for the engineer. Under such an aspect he would regard the requirements of the professed mathematician—the lover of the science for its own sake—rather than him whose daily occupation is the practical application of scientific principles. In that case, assuming a very considerable acquaintance with the more abstruse and powerful instruments which modern analysis places at our disposal, regarding more the unity of his structure than the simplicity of the several stages employed in its erection, he would elaborate a work most useful in a purely scientific point of view, and most valuable to the theorist—a work calculated to raise his name to a high eminence in the philosophical world, but of little practical value. Such a work would not be fitly called "A Manual of Applied Mechanics," but a "Treatise on Mechanical Philosophy." Or, he might take a practical view of this subject, and, desirous of putting into the hands of the engineer an adequate rationale of the operations he daily puts into practice in his professional calling, and an exposition of the scientific principles which would materially aid him in calling into being any fresh combination of architectural or engineering forms, he would proceed on exactly the opposite track; he would care less for the aplomb—the completeness of his speculations—that, in fact, which would be its most pleasing feature to the accomplished mathematician, than for its adaptability to the wants of those whose scientific attainments are not so extensive, for whom an easy and intelligible explanation is the great desideratum. Such a work, troubling itself little about excursions into mere scientific enquiry, which have no practical outlooks, but keeping in view solely the daily requirements of the practical man, would avoid as much as possible the use of recondite abstruse mathematical methods, would never travel except by absolute compulsion beyond the most ordinary

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paths of algebraical and geometrical investigation, and would confine its necessary incursions into the regions of the differential and integral calculus to their most simple and intelligible parts. We should expect in such a work a clear definition of terms, a simple exposition of methods and principles, travelling upwards by degrees from the more elementary to the more difficult; and we should expect at every turn the practical bearing of these principles to be fully pointed out, and amply illustrated where possible by numerous examples. Such a work, to which the engineer could readily refer for guidance, would be deservedly called "A Manual of Applied Mechanics."

But in both the one and the other of such treatises as we have indicated we should have a right to expect from a competent author an abstention from unusual and incorrect use of terms, and from slovenly, illogical methods. An unfortunate and most mischievous notion has apparently taken possession of practical writers on mechanics of late years—that in order to be practical it is necessary to be loose and indefinite; and if a book were to commence with a strict logical definition of terms, these gentlemen would instantly delegate it to the regions of the unreal and unpractical. Such books as Tate, Hann, and others of that school have put forth, professing to be eminently calculated to inform the practical mind, have done more mischief to the cause of the reconciliation of theory and practice, to say nothing of mechanical truth, than will easily be effaced. To grasp correctly, for instance, the true idea of force, and to separate it from other effects which are too often confounded with it in the popular mind, and thus to see the way clearly through Newton's brilliant explanation of the motion of the heavenly bodies—the principles of which are no less applicable to mundane machines—is doubtless no easy matter, and one in which many make a desperate failure. But it by no means improves the matter to be content with incorrect and insufficient notions of force; for these only lead to confusion worse confounded. How much miserable twaddle has been written on conservation of force, the moon's motion, &c., &c., founded on the purest misconceptions of the most elementary principles to which these so-called *practical* treatises give direct encouragement, if not by positive misstatement, at all events by the negative process of lax and insufficient statement. It is either the most vulgar prejudice and ignorance, or the most arrant imposition, to uphold, whether theoretically or practically, the false assumption that there is less need of logical accuracy in the terms and processes of practical than in those of theoretical mechanics. Force, for example, cannot be one thing when employed in the explanation of the motion of the heavenly bodies, and another thing—more indefinite and loose—when applied to structures or machines. If it require the exercise of some of the highest powers of the mind to grapple with it in the one case, it cannot need merely the indolent exercise of superficial thought in the other. And yet, to judge from the style of so-called practical works—aye, and of considerable repute, too—the main difference between the practical and theoretical, in matters of science, might be better expressed by the terms, *loose and illogical, strict and logical.* So much by the way. We are glad to have an opportunity of entering our protest against one of the most mischievous fallacies which have ever prevented the happy union of theory and practice.

Having premised our opinion as to the two several aspects under which an author might view the subject of applied mechanics, strictly theoretical or strictly practical, it is now time to enquire how far Professor Rankine has satisfied the conditions we have assigned to either of these two views. And we must honestly record our opinion that the work before us, viewed in either light, is to a considerable extent a failure. The author seems to have been embarrassed between the two conceptions we have pointed out. On the one hand, he could not tear himself from the desire to exhibit his subject in a complete and exhausting form, and thus to deviate from the true path of the practical writer; and, on the other hand, in his desire to be practical he has seriously marred its proportions and unity as a purely philosophical work. We do not deny the existence of great merit in the mode of treating many of the subjects; but in its present form the book is a veritable hotch-potch, repugnant to the good taste of the theorist—repulsive to the judgment and beyond the powers of the engineering student. The bulkiness of its form, the introduction of much matter having no practical bearing at all, the meagreness of illustrative examples, the high pretensions of much of the theoretical investigations, elevated into the regions of the abstruse far beyond the ken of the tyro, and in many cases the unnecessary involvement of the nomenclature and symbols, place it out of the reach of the latter; while the former, though gratified by a study of many of the details, is shocked by a laxity of definition and investigation in many cases, and more especially by a most signal failure in the exposition of the first principles of the science, which goes far to undo the favourable impression of Professor Rankine's powers which many separate portions of the work are well calculated to beget. We believe that we have offered the true explanation of this failure—for so we fear we must characterise it—of a man of such undoubted powers as Professor Rankine professedly is, by the theory that like the well-known donkey, he found himself between two bundles of hay—pure theory and true practice—and could not make up his mind to which to incline, and by making a point now at one and now at the other, has ended, like the wise quadruped in question, by missing both.

We think, too, that we detect another cause of failure, viz., that our author is too willing to exhibit originality; and in attempting to avoid the beaten track, has stumbled on byeways, original enough no doubt, but leading far away from the goal he has in view. In the work before us, there is ample stuff for the making of a good theoretical and a good practical work on "Applied Mechanics;" but we confess that from the specimen we have here of the bias of our author's mind, we are much more inclined to predict success for him in the former than in the latter attempt. Nor in saying this are we aware that we say anything disparaging to Professor Rankine as a man of science and of original thought. It too frequently happens that such persons are incapable of descending to the level of more ordinary thinkers—that the drudgery of wading through the elementary principles of a science without making a flight into the more abstruse is too insufferable, and rather than to submit to tell the thrice-told tale, such minds will rather run into brilliant but original error. Professor Rankine is evidently much more at home in the application of the highest instruments of analysis to the investigation of recondite questions than he is in the more humble task of making first principles plain to the anxious student. We suspect that he will find a more useful field for his labours in the pursuit of those investigations which have gained him a name in the scientific world, than in an attempt to write a more "practical" and useful "*Manual* of Applied Mechanics." We must now, for the present, take leave of this work, but we shall soon recur to the subject, and justify by an analysis of the treatise before us the broad opinions we have now expressed.

Illustrations of Carpentry and Framing. By ROBERT SCOTT BURN. William and Robert Chambers: London and Edinburgh, 1859.

THIS is one of a series of works which Messrs. Chambers are bringing out as "Practical Diagrams and Working Drawings for Schools." It contains drawings (to scale) of roofs, partitions, floors, joints of timber and iron framing, trussed beams, cast-iron columns and beams, and wrought-iron roofs, with details of the various parts; together with several pages of notes on the principles of framing and the form of beams, by Mr. R. Scott Burn, whose ability as a writer on mechanical subjects is well-known. The design and plan of the book are well conceived, and in its preparation Messrs Chambers have again attained their long-accustomed excellence. It is well calculated to impart elementary instruction upon a subject which requires to be brought forward prominently as a branch of school education.

Parliamentary Proceedings.

[CONDENSED FOR THE "MECHANICS' MAGAZINE."]

HOUSE OF COMMONS.

THURSDAY, Feb. 10.

NEW FOREIGN OFFICE.

Mr. TITE gave notice that, on the motion for adjournment to-morrow, he should ask what steps had been taken for rebuilding the Foreign Office in Downing-street.

NAVAL ESTIMATES.

Lord J. RUSSELL asked the First Lord of the Admiralty on which day he would bring forward the Naval Estimates, and make the statement of which he had given notice?

Sir J. PAKINGTON—I propose to make a statement of the views of the Government on the Naval Estimates on Friday, the 25th instant.

MARINE ENGINES.

Mr. DALGLISH asked the First Lord of the Admiralty any tenders had been recently given out for marine engines; and, if so, whether the marine engineers of the river Clyde had been asked to tender?

Sir J. PAKINGTON said that tenders for marine engines had been lately called for to a large amount; that a larger number of manufacturers than usual had been invited to tender; and that among them was one manufacturing firm upon the Clyde—the Napiers.

NAVY ESTIMATES.

Mr. CORRY brought up the Navy Estimates, which were ordered to be laid on the table.

FRIDAY. Feb. 11.

PATENT LAW.

Mr. T. DUNCOMBE wished to know whether it was the intention of the Government to introduce any measure for the improvement of the working of the Patent Law Amendment Act (1852), or to reduce the stamp duties payable on letters patent for inventions, especially the 50*l.* payable before the expiration of the third year, and the 100*l.* payable before the expiration of the seventh year, of the patent right, which falls due next autumn.

Sir S. NORTHCOTE said it was not the intention of the Government to make any alteration in the Patent Law further than this, that the alteration in the site of the Patent-office would greatly facilitate the business. It was not at present the intention of the Government to reduce the stamp duties now payable upon patents. The present duties of 50*l.* and 100*l.* were part of a system intended to facilitate the taking out of patents, the patentee only having to pay the larger sum after a certain term of years, when the patent was likely to be remunerative. The period when the payment of 100*l.* would have to be made was now approaching, and it was not the intention of the Government to make any alteration in this respect.

THE NAVY.

Sir C. WOOD moved for the following returns:—Of the number of steamships and vessels added to the navy in the year 1848, and each subsequent year, divided into ships of the line, frigates, and other classes of vessels, and distinguishing those which have been built, converted, and purchased, with the total of each class in each year, and grand total in all the years; and of the number of steamships and vessels in the navy afloat, and building or converting, on the 1st day of January, 1859, divided into ships of the line, frigates, and other classes of vessels, and distinguishing screw and paddlewheel vessels.—Agreed to.

THE BRITISH MUSEUM.

Lord ELCHO asked the Chancellor of the Exchequer, whether Her Majesty's Government had come to any determination as to the enlargement of the British Museum, or the arrangement and distribution of its heterogeneous collections?

The CHANCELLOR of the EXCHEQUER said the arrangement of the British Museum was still under the consideration of the Government.

RAILWAY ACCIDENTS.

Mr. BENTINCK asked the President of the Board of Trade whether it was the intention of Her Majesty's Government to introduce any measure during the present session founded on the report of the Select Committee on Railway Accidents?

Mr. HENLEY said there was no doubt a great deal in that report well worthy of consideration, but the Government had not thought it desirable to institute any measure solely on that report. If any legislation concerning railways should take place it would then be their duty to consider whether those valuable suggestions could not be embodied in the measure.

NEW FOREIGN OFFICE.

Mr. TITE, in asking what steps had been taken relative to rebuilding the Foreign Office in Downing-street, complained of the passing by of Mr. Barry, the first prizeman in the late competition, and the selection of Mr. Scott, the second prizeman, and stated that a building of Mr. Scott's design would be both inconvenient and expensive.

Lord J. MANNERS made an elaborate reply, and stated that the design of Mr. Scott was being somewhat amended,

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and when finally finished would be placed in the library of the House for the inspection of members.

Further remarks were made by Mr. HOPE, Mr. CONINGHAM, General THOMPSON, Lord PALMERSTON, and Mr. BENTINCK.

MONDAY, Feb. 14.

INDIAN PUBLIC WORKS.

Lord STANLEY, in laying his statement on Indian finance before the House, gave an elaborate account of the railways of India; and, with regard to other public works, not railways, mentioned the most important lately sanctioned:—First, the Madras Irrigation Company has received a guarantee of 5 per cent. upon £1,000,000; second, at Madras a pier has been ordered at a cost of £103,000, which is to be completed in two and a-half years; third, at Kurrachee works costing £140,000 are sanctioned for improving harbours, the period for completing which is spread over three or more years; fourth, plans have been directed to be prepared for improving the harbour of Sedashevaghur, south of Goa, and connecting it with the country inland; fifth, a plan for rendering the Godavery navigable for a distance of 300 miles is referred to Madras; and, sixth, there has been a considerable outlay upon small steam cargo-barges and tugs for the navigation of the Ganges and the Indus—15 vessels in all. He did not mention smaller undertakings, which, though of local importance, are of no general interest; but two plans have been taken in hand by the Government which are of an important character. One is the establishment of telegraphic communication between this country and India. After the failure of the experiment with the Atlantic cable it was impossible not to feel that the undertaking presented a greater amount of difficulty and a greater risk of failure than had been at first anticipated. But, whatever the difficulty or risk the object appeared to the Government to be one of so much importance, and the saving that would be effected in every way so great, that they thought it to be their duty to incur that expenditure. A guarantee of 4½ per cent. upon a capital of £800,000 was accordingly given, and operations were begun at once. The cable is nearly ready, and the promoters anticipate that they will be able to lay it as far as Aden by June next. Beyond Aden, where the line touches the southern coast of Arabia, which is inhabited by wild tribes, there is more risk, and the difficulties are considered greater. The Bombay Government will, however, offer all the assistance in their power. But we do not rely upon a single line. The Turkish Government have initiated a line of their own from Constantinople to Bussaret, and the Indian Government on its own account, or some private company, will undertake the completion of that line on to Kurrachee. In this way the risk of interruption will be less. The other scheme which has received the sanction of the Government relates to the supply of civil engineers for the East India service. It is proposed to appoint a special engineering service. The appointments will be competed for by young men of a certain age. They will be required to have passed through a certain practical training here, and they will be sent to India on a small salary to acquire further instruction in their duties. They will then be regularly taken into Government employ for life, with pensions at the same rate, probably, as are given to other uncovenanted servants.

PIERS AND HARBOURS.

Mr. PAULL moved for leave to bring in a Bill to encourage and facilitate the erection of piers and harbours in Great Britain and Ireland.

Lord LOVAINE said that a Bill had been prepared by the Admiralty, which would, he believed, attain all the objects which the hon. gentleman had in view.

Leave was then given to introduce the Bill.

TUESDAY, Feb. 15.

MERSEY DOCKS AND HARBOUR BILL.

Mr. HORSFALL moved the second reading of this Bill.

Mr. TOLLEMACHE moved that it be read a second time this day week, on the ground that it was intended to give the Mersey Dock Board power to raise £300,000 on the trade of the country, when no definite plan had yet been settled.

Mr. SALISBURY supported the motion for postponement, and charged the Dock Board with a breach of faith.

Mr. J. EWART denied that any breach of faith had been committed.

Mr. CHEETHAM supported the second reading.

Mr. HORSFALL denied that there had been any breach of faith. On the contrary, they had done more for Birkenhead than they were under obligation to do. The steam trade of Liverpool had doubled, the timber trade had trebled, and it was to those trades that the Bill had special reference.

Mr. LOWE opposed the Bill.

Mr. HENLEY denied that it had ever been stipulated that no public improvement should be undertaken at Liverpool until the Birkenhead works were, not simply in progress, but actually completed.

Sir B. HALL, as Chairman of the select committee, stated that last year the dock trustees desired to raise 800,000*l.*, to be expended upon the Liverpool side of the Mersey. At that time there was a most distinct understanding come to that that sum should be reduced to 266,000*l.*, and even before that amount was granted the dock trustees pledged themselves that no more money should be expended upon the Liverpool side of the river until the Birkenhead Docks should be advanced almost to completion.

Mr. TURNER supported the second reading.

The House divided, when the numbers were—

For the second reading	181
Against	102
Majority	79

The Bill was then read a second time.

THE THEORY OF NAVAL ARCHITECTURE.

No. IV.

ANOTHER method of approximating to a curvilinear area, is to draw a cubic parabola through the extremities of four consecutive equidistant ordinates, to calculate the area of the figure between this curve and its other boundaries, and take it to be equal to the area required, neglecting as inappreciable the very small area between the parabolic curve and the given curve.

The general equation to what is called the cubic parabola (on account of the third power of x entering into it) is $y = A + Bx + Cx^2 + Dx^3$.

Take as before in Fig 8, $P_1 N_1$, $N_1 N_4$, as the co-ordinate axes of y and x respectively; a_1, a_2, a_3, and a_4 the ordinates, corresponding to x equal to 0, m, $2m$, and $3m$ respectively. Then we have four equations,

$$a_1 = A \quad (1),$$
$$a_2 = A + Bm + Cm^2 + Dm^3 \quad (2),$$
$$a_3 = A + 2Bm + 4Cm^2 + 8Dm^3 \quad (3),$$
$$a_4 = A + 3Bm + 9Cm^2 + 27Dm^3 \quad (4).$$

From which equations the values of A, B, C, and D are readily obtained. Substitute in (2), (3), and (4) a_1 for A, multiply (2) by 2 and also by 3, and subtract the results from (3) and (4) respectively, whence

$$a_3 - 2a_2 + a_1 = 2Cm^2 + 6Dm^3 \quad (5),$$
$$a_4 - 3a_2 + 2a_1 = 6Cm^2 + 24Dm^3 \quad (6).$$

Multiplying (5) by 3 and subtracting from (6)

$$a_4 - 3a_3 + 3a_2 - a_1 = 6Dm^3,$$

also from (5)

$$2Cm^2 = a_3 - 2a_2 + a_1 - 6Dm^3$$
$$= -a_4 + 4a_3 - 5a_2 + 2a_1.$$

Substituting the value of Cm^2 and Dm^3 thus found in (2), and transposing $6Bm = 2a_4 - 9a_3 + 18a_2 - 11a_1$, and the equation to the cubic parabola through the extremities of four consecutive ordinates is

$$y = a_1 + \frac{2a_4 - 9a_3 + 18a_2 - 11a_1}{6m} \cdot x + \frac{4a_3 - a_4 - 5a_2 + 2a_1}{2m^2} \cdot x^2 + \frac{a_1 - 3a_3 + 3a_2 - a_1}{6m^3} x^3 \quad (A).$$

To obtain the area of the figure $P_1 P_4 N_4 N_1$ when the curve is that of the cubic parabola.

Divide $N_1 N_4$ into a large number ($3n$) of equal parts, n of them being contained in the common interval m between the ordinates; imagine ordinates y_0, y_1, y_2, &c., y_{3n} drawn through the points of division; y_0 corresponding to a_1, and y_{3n} to a_4, and join the points where consecutive ordinates cut the curve by straight lines, thereby forming $3n$ small trapeziums. From the general equation to the cubic parabola we have

$$y_0 = a_1;$$
$$y_1 = a_1 + B \cdot \frac{m}{n} + C \cdot \frac{m^2}{n^2} + D \cdot \frac{m^3}{n^3};$$
$$y_2 = a_1 + B \cdot \frac{2m}{n} + C \cdot \frac{2^2 m^2}{n^2} + D \cdot \frac{2^3 m^3}{n^3};$$
$$y_3 = a_1 + B \cdot \frac{3m}{n} + C \cdot \frac{3^2 m^2}{n^2} + D \cdot \frac{3^3 m^3}{n^3};$$
$$\&c. = \&c.$$
$$y_{3n-1} = a_1 + B \cdot \frac{\overline{3n-1} \cdot m}{n} + C \cdot \frac{\overline{3n-1}^2 \cdot m^2}{n^2} + D \cdot \frac{\overline{3n-1}^3 m^3}{n^3};$$
$$y_{3n} = a_1 + B \cdot \frac{3nm}{n} + C \cdot \frac{3^2 n^2 m^2}{n^2} + D \cdot \frac{3^3 n^3 m^3}{n^3}.$$

The area of the first trapezium $= \frac{y_0 + y_1}{2} \times \frac{m}{n} = a_1 \cdot \frac{m}{n} + \frac{B}{2} \cdot \frac{m^2}{n^2} + \frac{C}{2} \cdot \frac{m^3}{n^3} + \frac{D}{2} \cdot \frac{m^4}{n^4}$;

„ second „ $= \frac{y_1 + y_2}{2} \times \frac{m}{n} = a_1 \cdot \frac{m}{n} + \frac{B}{2} \cdot \frac{3m^2}{n^2} + \frac{Cm^3}{2n^3}(1^2 + 2^2) + \frac{Dm^4}{2n^4}(1^3 + 2^3)$;

„ third „ $= \frac{y_2 + y_3}{2} \times \frac{m}{n} = a_1 \cdot \frac{m}{n} + \frac{B}{2} \cdot \frac{5m^2}{n^2} + \frac{Cm^3}{2n^3}(2^2 + 3^2) + \frac{Dm^4}{2n^4}(2^3 + 3^3)$;

&c. $= \&c.$ $= \&c.$

„ last „ $= \frac{y_{3n-1} + y_{3n}}{2} \times \frac{m}{n} = a_1 \cdot \frac{m}{n} + \frac{B}{2} \cdot \overline{6n-1} \cdot \frac{m}{n} + \frac{Cm^2}{2n^2}(\overline{3n-1}^2 + \overline{3n}^2) + \frac{Dm^3}{2n^3}\left\{\overline{3n-1}^3 + \overline{3n}^3\right\}$.

Sum of all the trapeziums $= a_1 \left\{\frac{m}{n} + \frac{m}{n} + \frac{m}{n} + \&c. \text{ to } 3n \text{ terms}\right\}$ or $3a_1 m$

$$+ \frac{Bm^2}{2n^2}\left\{1 + 3 + 5 + \&c. \text{ to } 3n \text{ terms}\right\} \text{ or } \frac{Bm^2}{2n^2}(3n^2)$$
$$+ \frac{Cm^3}{n^3}\left\{1^2 + 2^2 + 3^2 + \&c. \text{ to } \overline{3n-1}^2 + \frac{3^2 n^2}{2}\right\} \text{ or } \frac{Cm^3}{n^3}\left(\frac{3n}{6} + \frac{3^3 n^3}{3}\right)$$
$$+ \frac{Cm^3}{n^3}\left\{1^3 + 2^3 + 3^3 + \&c. \text{ to } \overline{3n-1}^3 + \frac{3^3 n^3}{2}\right\} \text{ or } \frac{Dm^4}{n^4}\left(\frac{3^2 n^2}{4} + \frac{3^4 n^4}{4}\right)$$
$$= 3a_1 m + \frac{B9m^2}{2} + 9Cm^3\left(1 + \frac{1}{18n^2}\right) + \frac{81Dm^4}{4}\left(1 + \frac{1}{9n^2}\right)^*$$

This expression represents the sum whatever n may be. When n is infinitely large, the sum of these trapeziums will be the exact area included between the parabolic curve and the other boundaries of $P_1 N_4$; and the qualities $\frac{1}{18n^2}$ and $\frac{1}{9n^2}$ vanish.

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* The sum of the series $1^3 + 2^3 + 3^3 + \&c. + (3n)^3$, may be found by the method of Indeterminate Coefficients, thus—

Assume $1^3 + 2^3 + 3^3 + \&c. + (3n)^3 = {}^3A + B \cdot 3n + C(3n)^2 + D(3n)^3 + E(3n)^4 + \&c.$,

writing $3n + 1$ for $3n$;

$1^3 + 2^3 + 3^3 + \&c. + (3n)^3 + (3n+1)^3 = A + B(3n+1) + C(3n+1)^2 + D(3n+1)^3 + E(3n+1)^4 + \&c.$

Subtracting the first equation from the second

$$(3n+1)^3 = B + C(6n+1) + D(27n^2 + 9n + 1) + E(108n^3 + 54n^2 + 12n + 1);$$

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$$\therefore \text{Area} = 3a_1m + \frac{B}{2}.9m^3 + 9Cm^3 + \frac{81Dm^4}{4}.$$

Putting for B, C, and D their values already found, given in the general equation (A); multiplying out and arranging we have, area $= \frac{3}{8}m\,(a_1+3a_2+3a_3+a_4)$.

The area between the ordinates a_4 and a_7 will be, writing a_4, a_5, a_6 and a_7 for a_1, a_2, a_3, and a_4 respectively, $\frac{3}{8}m\,(a_4+3a_5+3a_6+a_7)$.

Between the ordinates a_7 and a_{10} the area will be $\frac{3}{8}m\,(a_7+3a_8+3a_9+a_{10})$,

and so on continually. Consequently the whole area between the first ordinate a_1 and $\overline{3p+1}^{th}$ ordinate, represented by a_{3p+1} (where p is any natural number), is

$$\frac{3}{8}m\left\{a_1+a_{3p+1}+3\,(a_2+a_3+a_5+a_8+\&c.)+2\,(a_4+a_7+a_{10}+\&c.+a_{3p})\right\}.$$

Whence the following rule, to find any curvilinear area like that represented in Fig. 8 when the number of equidistant ordinates is some multiple of three increased by one, or when the number of equal spaces is a multiple of three:—

RULE. 1° *Add together the first and last ordinates.*

2° *Add together the second, third, fifth, and all the other ordinates except those which are multiples of three increased by one: and multiply by three.*

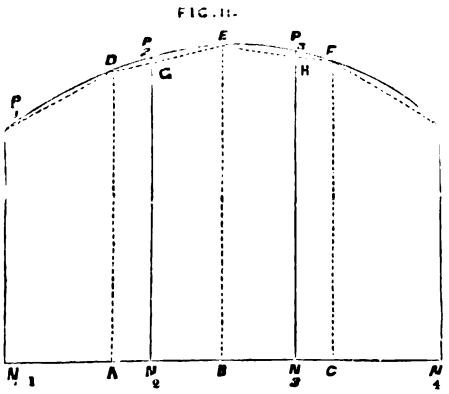
3° *Add together all those ordinates which are multiples of three increased by one, multiply the sum by 2.*

The sum of the three results here found, multiplied by $\frac{3}{8}$ths the common interval, will give the whole area required.

This is called Rule 3.

By an artifice similar to that employed by M. Poncelet for proving the rule to find the curvilinear area when there are three equidistant ordinates, we may prove the above rule for finding the area when there are four equidistant ordinates. Let $P_1P_4N_4N_1$ (Fig. 11) be the curvilinear area required, the ordinates of which are represented by a_1, a_2, a_3, and a_4, and the common interval between them by m. Divide N_1N_4 into *four* equal portions in the points A, B, and C, and through these points draw AD, BE, and CF, perpendicular to N_1N_4 meeting the curve in the points D, E, and F, respectively: join P_1D, DE, EF, and FP_4 by straight lines, thus forming four trapeziums.

FIG. 11.



Let the straight lines DE and EF cut P_2N_2 and P_3N_3 in G and H respectively.

Now $N_1A = AB = BC = CN_4 = \frac{3}{4}m$.

$$\text{And the Area of trapezium } P_1A = \frac{3m}{4}\left(\frac{P_1N_1+AD}{2}\right) = \frac{3}{8}m(a_1+AD);$$

$$\text{,, ,, } DB = \frac{3m}{4}\left(\frac{AD+BE}{2}\right) = \frac{3m}{8}(AD+BE);$$

$$\text{,, ,, } EC = \frac{3m}{4}\left(\frac{BE+CF}{2}\right) = \frac{3m}{8}(BE+CF);$$

$$\text{,, ,, } FN_4 = \frac{3m}{4}\left(\frac{CF+P_4N_4}{2}\right) = \frac{3m}{8}(CF+a_4);$$

$$\text{Sum of all the trapeziums} = \frac{3m}{8}\left\{a_1+a_4+2AD+2CF+2BE\right\}.$$

In the Figure $N_2G = AD + \frac{1}{3}(BE - AD) = \frac{2AD+BE}{3}$;

$\therefore 2AD + BE = 3N_2G = 3P_2N_2$ nearly, since G is very near to P_2, the ordinates not being far apart.

In the same manner it may be proved that $2CF + BE = 3P_3N_3$ nearly;

$\therefore$ sum of all the trapeziums $= \frac{3m}{8}(a_1+a_4+3a_2+3a_3)$; and since putting P_2N_2 and P_3N_3 instead of N_2G and N_3H will give a small increase to the area above that of the trapeziums, and the curvilinear area is also a small increase over that of the same trapeziums, it is readily seen that, approximately, the curvilinear area $= \frac{3m}{8}(a_1+a_4+3a_2+3a_3)$.

Proceeding as above with the other sets of four equidistant ordinates, the Rule 3, just stated, is readily obtained.

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all the other terms after E being separately equal to Zero, since there is no term on the left hand side of the equation in n^4.

$$\therefore 27n^3+27n^2+9n+1 = 108En^3+(54E+27D)n^2+(12E+9D+6C)n+B+C+D+E.$$

Equating like powers of n we have

$$\begin{aligned} 108E &= 27 && \text{or } E = \tfrac{1}{4}\\ 27D+54E &= 27 && \text{or } D = \tfrac{1}{2}\\ 6C+9D+12E &= 9 && \text{or } C = \tfrac{1}{4}\\ B+C+D+E &= 1 && \text{or } B = 0\\ & && \text{also } A = 0 \end{aligned}$$

$$\therefore 1^3+2^3+3^3+\&c.\ldots\ldots+3^3n^3 = \frac{3^2n^2}{4}+\frac{3^3n^3}{4}+\frac{3^4n^4}{4};$$

$$\text{and } 1^3+2^3+3^3+\&c.\ldots\ldots+\overline{3n-1}^3+\frac{3^3n^3}{2} = \frac{3^2n^2}{4}+\frac{3^4n^4}{4}$$

$$= \frac{3^4n^4}{4}\left\{1+\frac{1}{9n^2}\right\} = \frac{81n^4}{4}\left(1+\frac{1}{9n^2}\right).$$

ON A QUICK-WORKING POWER ENGINE.

(Continued from p. 91)

THE PLAN.

SUPPOSE a double pump, with cylinders of large diameter, short, and set far enough apart for the strokes of the pistons to be sufficiently long. Suppose at its front, two pipes of large bore rising from near the bottoms of the cylinders at the nearest opposite sides, and united before they reach the top of the pump, so as to form one pipe. This should pass over between the cylinders and descend perpendicularly at the back, tapering to an end on a very shallow close reservoir. Suppose that, besides the valves in the bottoms, there is a vertical one at the side of each cylinder, hinged at the lower edge of the opening into the pipe. Lastly, suppose the single pipe formed by the junction of the other two to be divided just under its bend, by a space which an oblique sliding-valve should fill, and this part to be inclosed, to form a small chamber where a vacuum might be made.

There should also be a valve to be slid up and down at the junction of the pipes; because, otherwise, when the working was stopped by thrusting in the other valve, the water which could circulate through the junction of the pipes would not instantly hold the pistons fast, as would be necessary with a view to starting again—a point that will be further explained.

The above are the main features of the plan: the following are minor details, but in part not less essential to the success. The valves in the bottoms should be coupled under the pump by a bar moveable up and down on a support at the middle and bent upwards at the ends, where it should be attached to the under surface of the valve, so that, when horizontal, it should hold them a little open, in order that when one was raised to double the extent, it might, through the bar, hold the other down tight. The reason is, that the pressure from the reservoir tending to open the valve that should be closed would be very far stronger than the downward pressure from the piston over it, tending to keep it closed. The coupling bar, its fastenings, and the valves must be strong. The influx, the force of which would be relied upon, might be strengthened by the bottoms of the cylinders being shaped like hollow cones, with openings at the truncated summits, to which a body of water would run up as through a short tapering pipe.

The strokes being intended to be much longer than in common pumping, the parrellel motion should be applied to the pistons. Then opposite to where the rods in that mechanism would issue from the tubes that contain them, four worm springs should be placed so that, with the pistons fixed at the highest and lowest levels by the ends of the beam preparatively to the pivot stroke, one spring above and one below might be pressed by screws in framework into tension against the upper end of one and the lower of the other. The other two would be screwed forwards not so much (and the first two should be screwed a little back after they had served the purpose of starting), to be forced into tension at the end of the stroke. The reaction of the two couples in their turns would cause the changes of the strokes to be without any interval of time.

There should be a stopper on an opening of the reservoir, to be loaded or unloaded for safety against bursting, and for the regulation of the internal force. A very small forcing pump, worked by the beam of the main one near the middle, would supply, by injecting once in two strokes obliquely upwards into one of the pipes, any deficiency from waste of water up the sides of the pistons and by exudation. If it throw in too much, the excess would settle in the small chamber, whence it would run into the cistern of the little pump.

RAILWAY AND CANAL BILLS.—The number of bills for railways in Great Britain deposited this session is 172, of which 129 authorize new works to the extent of 1,129 miles, in the whole of the United Kingdom; besides 95 miles of deviation lines, and 12 projects for enlargement of stations.

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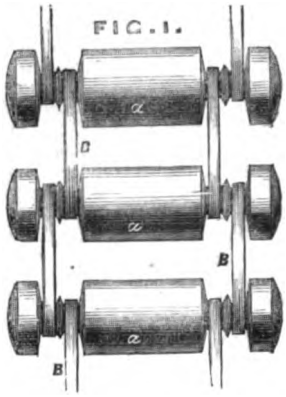
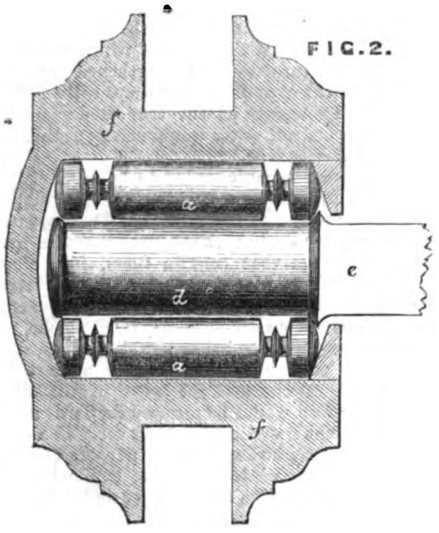
M. BRUSSAUT'S INVENTIONS.

ANTI-FRICTION ROLLERS AND WEIGHING MACHINES.

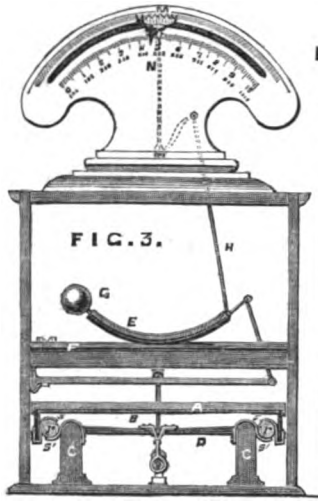
M. BRUSSAUT, a French engineer, whose inventions have been mentioned with great favour in the scientific journals of Paris and Brussels, is now in this country, drawing attention to his improved apparatuses. They comprise, first, a modification of the well-known anti-friction axles, an improved arrangement of which (the invention of Mr. Rowan, of Belfast) was described and illustrated in the MECHANICS' MAGAZINE for June 15, 1844, No. 1088, Vol. 40. The chief feature of M. Brussaut's invention consists in leaving each anti-friction roller free to revolve, and at the same time connecting all the adjacent rollers to each other by small endless belts of vulcanised India-rubber or other suitable material, as shown in Figs. 1 and 2 of the annexed engravings. The rollers are thus allowed all necessary freedom, while rolling action only is produced between the surfaces in contact. In Fig. 1 the rollers *a* and the belts only are shown; in Fig. 2 the rollers are supposed to

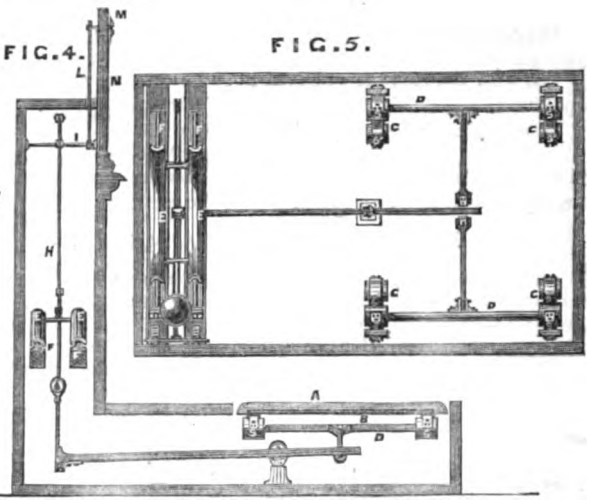


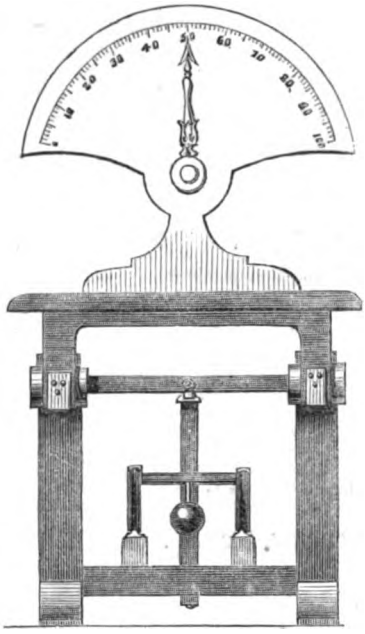


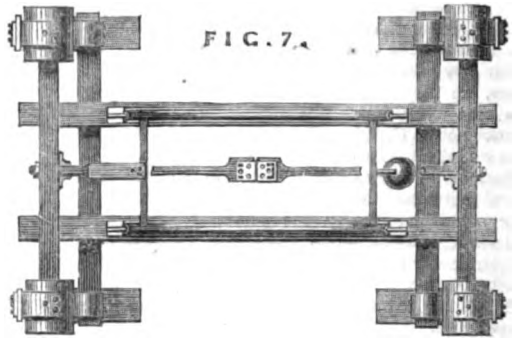
be interposed between the axle-box and axle of a vehicle. In the latter fig. *a a* are the rollers, and *d* is the portion of the axle *e*, which receives the wear; *f* is the axle-box, with which, as well as with the surface of *d*, the rollers *a a* are in contact. By the employment of apparatus of this kind, not only is the friction reduced to an extremely small amount, but lubrication is entirely dispensed with, and yet no heating takes place, even with the highest working velocities, under great pressures.* The apparatus is, of course, applicable, in modified forms, to shafts and axles of all descriptions.

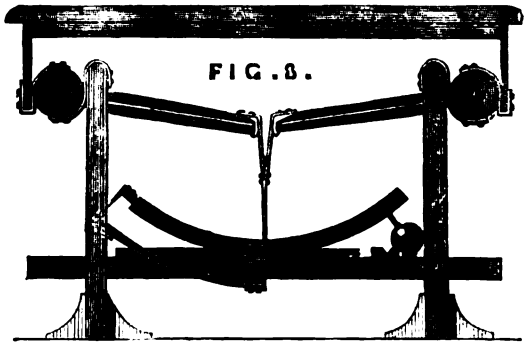
* The giving the anti-friction rollers sufficient strength of resistance in order to prevent their becoming crusted or deformed is simply a matter of proportion. In many cases, however, the diameter of the axle or shaft must be increased; and then Mr. Brussaut employs hollow iron, the superior strength of which is well understood, but the use of which would be impossible with the shafts at present in use, which, so to speak, are merely greased brakes.



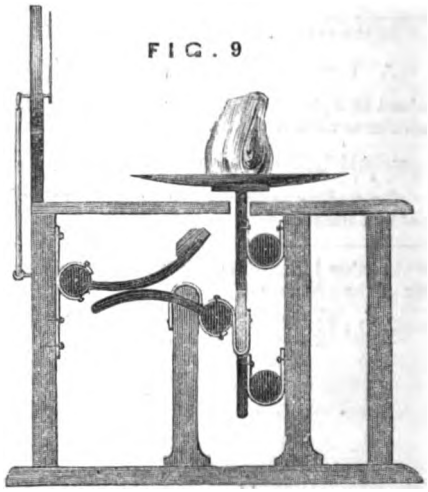








M. Brussaut's inventions next comprise a set of weighing machines in which all coiled springs, moveable weights, &c., are dispensed with. Fig. 3 is a transverse view partly in section, Fig. 4 a longitudinal view partly in section, and Fig. 5 a plain view of one of the improved machines, with the scale, &c., removed. *A* is the scale or weighing platform, supported on the plate *B*, which is carried by the bands *s s*. These bands are attached to short cylinders *r r*, carried by other similar bands *s' s'* secured to the uprights *C C*. To the cylinders *r r* are attached the cross-bars *D D*, which, by means of a series of levers connected and arranged as shown in the engravings, communicate, with the arcs *E E*, which roll on the rails *F F* and have a weight, *G*, fixed at their extremities. From the other end of these arcs a connecting rod, *H*, leads to a crank on the spindle *I*, on which the indicating needle *L* is mounted. This needle carries a vernier *M*, where necessary, in order to indicate the divisions on the card or face *N*, as minutely as may be desired. It will be apparent, from the foregoing description, that when the parts are once properly adjusted, the weight of any article placed on the platform *A*, will be indicated by the needle on the card. The apparatus is found to be exceedingly sensitive. In Figs. 6, 7, and 8, we have shown views of a modified form of the apparatus, in which, although the relative positions of the parts are very different from what they are in the former case, the action is essentially the same. In Fig. 9 we have illustrated an arrangement in which the arcs are employed in a modified manner, adapted for use on a counter.



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The whole of these machines depend upon the action of the bands, &c., only for the motion of the needle, on the weight being applied, and are therefore but little liable to get out of order. In the various dispositions of parts above described the principle of the apparatus is the same throughout. The absence of all variable or delicate parts renders them peculiarly well fitted for weighing luggage at railway stations, retailed goods, and other like articles.

ON TELEGRAPHIC CABLES.

By Capt. Jasper Selwyn, R.N.

Captain Selwyn, R.N., of Woodland Crag, Grasmere, sends the following able paper for publication. We give it place with much pleasure, not doubting that its value will be duly appreciated:—

Gentlemen,—Believing that where conjectures on nautical matters have to be made, seamen are of all the most fitted to give those conjectures the nearest possible approach to truth, I venture to submit to your readers the belief which I entertain as to the causes of failure in the present Atlantic cable, and the means to be adopted to remedy, and in future to prevent such failures.

The cable, we may assume, was, previously to its being laid, perfect in its insulation, and only gradually, after being laid, ceased to be so. I reject here from consideration the fault said to have been cut out on board the *Agamemnon*, because that does not appear to have affected the first messages; and what I now seek are the causes which were evidently at work shortly after the cable was laid, in diminishing and eventually in destroying the insulation.

I will first show cause against, and attempt to eliminate, two suggestions on this head which have been made, and which do not seem to me, as a seaman, to carry probability with them.

The precipices which mark the deep-sea boundary on both sides have been supposed to be, by the cable sawing over them, causes of injury. Had this been the case, and had the cable in the first week after laying been so injured from this cause as to expose the gutta percha and damage the insulation, no long time could have elapsed before the cable would have been cut through, which does not appear even yet to be the case; and besides, our knowledge, such as it is, of the action of water at that depth does not encourage the idea that any such force is there at work. (I will say in passing that this precipice ought to have been avoided, unless such sudden descents extend much farther under water than they generally do on land. A little more time given to soundings would have been well employed.)

There is next the idea that the water pressure due to the great depth has damaged the insulation. But if that were the case, it would have shown itself in a few hours at most after submersion, and would, (as it would have affected equally, and at the same time, nearly the whole length) have been complete, not partial.

I take these two, because, if really existing it is evident they would be fatal to the whole scheme; but neither I believe is to be feared or lamented. I will now consider those causes which I regard as probable.

In the old Mediterranean cable, which was supposed before its failure to have been laid in a perfect state, and parts of which have been recovered, several "kinks" exist, beginning as in

Fig. 1, and when strained, resembling Fig. 2; and where, from the strain of raising, or from any other force, these, as at Fig. 1, have been partially straightened, the result is that the cable is untwisted, as at Fig. 2, at the point where the "kink" was, and the gutta percha, or even the copper wire, exposed. I believe the existence of these 'kinks" to be the main cause of failure in the Atlantic cable. There is a second possible and indeed probable future cause of failure originating in the construction of the cable itself, which though not so likely to take effect as that to which I have adverted, is still worth considering. It is that a cable with a soft core and rigid exterior is always liable to injury by stretching. Take a length of four-stranded rope which, in a measure, fulfils these conditions, and examine it after having been long in use, or subjected to any considerable strain, and it will be found that the "heart" or "core" has separated into lengths of a few inches, while externally the rope appears perfect. And it is useless to say that in the trials of strength to which the Atlantic telegraph cable was subjected, the outer wire always gave way first; for this will no doubt be the case in short lengths, but not so when the strain is brought on miles at once. Four-stranded rope might be called five stranded, being in fact composed of four outer tightly twisted strands, and an inner central less-twisted soft core, not laid up with, but running straight through the four outer. The result of strain is, of course, that the outer spiral presses on the soft centre, that centre yields to compression, the spiral consequently diminishes in diameter and increases in length, and the centre not doing so proportionably gives way. This would occur the more certainly in proportion as the softer centre occupies a greater space, which in the telegraphic cables is very considerably the case. The cables proposed by Mr. Allan appear to be the only ones which provide for and obviate this fault.

I will now return to the question of "kinks," with the view of showing how they are now caused, and how they may in future be avoided.

Let a common cotton reel be taken, and having smoothly wound about it some narrow tape, let it be set on end on the table. This will fitly represent the state of the coil of cable in the hold of a vessel. If now the tape be taken off, by holding the end, and lifting each turn over the top of the reel (as must be done with the coils of cable) it will be seen that for each turn so taken off a turn has been taken in the tape. It may be said that I am only reversing the operation which took place when the cable was coiled into the vessel, and that the turns then taken in are now taken out (or *vice versâ*.) Granted, but the circumstances are totally different. The pressure of the water, increasing and becoming very great as the cable descends, here manifests itself in the shape of friction, resisting any turning of the cable below. The consequence is, that there is a constant tendency to accumulate turns on that portion of the cable near the stern of the ship. In the *Agamemnon*, accordingly, the cable between the stern and the spot where it entered the water was observed to be constantly in rapid revolution. Now, to see the effect which turns so caused may probably produce, take a piece of whipcord, or any strongly-twisted thread, and after slightly increasing the twist by turning it between the fingers, and while holding it in a nearly vertical position between the two hands, dip the upper hand suddenly two or three inches. The result will be that a "kink" will form. And this is nearly what takes place when the ship pitches in a seaway. Thus, then, kinks may be taken in the cable under water, and without the knowledge or fault of those engaged in the operation.

But if—as I am informed was the case—such an act of suicidal folly be committed as, on arriving in shoal water, to pay over any considerable amount of slack, then the result would inevitably be that the cable so deposited would first take its place on the bottom in the form of coils, which, when the strain of currents or tides inshore, or of the settling in the deep water came upon the cable, would be converted into kinks, destroying the cable, each in proportion to the strain brought upon it, by opening the strands, and exposing the copper wire. The damage thus caused would, theoretically, present all the phases of gradual increase which have actually been observed.

As I have said, I see little reason to doubt that to the existence of these kinks, mostly situated in the comparatively shoal water, may be attributed the present defective state of the cable. I will now proceed to consider how these or any other defects may be remedied.

This can only be done either by raising entirely, or by the operation known to seamen as underrunning, which in its ordinary form may be thus described:—We will suppose that a line or rope has been laid across water between any two points, and that it has sunk to the bottom. It is clear that if a floating body of sufficient size to bear the weight be brought under the rope at one end near the shore, and by any force, say by hauling ahead by the rope, that floating body be impelled towards the other end, the whole rope will be exposed to view while passing over it. So, practically, a boat is used to underrun a hawser or small cable. It is hauled in at the bow, and passes out as fast over the stern, but meanwhile we can examine it as it passes, and stop it for repair if necessary. I believe some twelve miles of the cable have been thus treated and found to be in good order. Such a mode of under-runing is, however, necessarily slow, and could scarcely be employed with effect for any great distance or depth. I propose a different method by means of a large cylinder, which I will hereafter explain. But the greatest danger, and it is one which can but partially be obviated, is that a "kink" or "kinks" should have so weakened the cable as that it shall no longer be able to bear its own weight in water. This indeed might be fatal to any attempt to raise it, but we must hope that such faults will not be in the deepest parts, as in fact, there is every reason to believe. At any rate, the value of the property at stake (about £200,000) is so great that the experiment must be well worth trying; and I believe that if done without loss of time, and either by the method which I propose or by some better one, if that can be found, there is the greatest probability of success in attempting the operation of repairing, or lifting altogether and relaying, the present Atlantic cable.

I have now to explain how I propose to avoid these and other dangers, and facilitate the laying in good condition of future cables. This is to be done by means of large floating cylinders of sheet iron, which it is clear may be of a size proportionate to the weight and thickness of the cable adopted. I will, however, confine myself to the calculations which would be necessary for the present cable. It is proposed to construct two or more cylinders of sheet iron, (if two) the length required will be 60 feet, and diameter 50; roughly calculated as costing £12,000 each. These will each be capable of supporting, at considerably less than half immersion, 1,500 tons (or miles) of the cable to be reeled on the outside like cotton on a bobbin. The cable being of §-inch diameter, the thickness of coils when the whole is reeled on will be about 2 feet 4 inches. There are flanges of this height at each end of the cylinder. It is evident that if the cable so disposed were to be taken to sea, by towing from the axles (as a garden roller is dragged along the walk) and if on arriving in deep water the end were allowed to sink and the cylinders to revolve freely, the whole would run off. But to prevent this, and to act as breaks, to the ends of the cylinder are attached paddle floats or boards. These cause the cylinder to revolve (as the friction of the gravel does with the garden roller) at the rate due to the velocity of the towing vessel, and the circumference of the paddle wheels. They also resist any tendency of the cable, by its own weight, to drag itself off, but only gradually, and as the resisting medium is water, not absolutely but only in proportion to the strain and therefore the velocity of rotation. By a proper proportion of the area of float or paddle board immersed, we can always ensure the turning of the cylinder and consequent release of cable, with a less force than the breaking strain. But the occurrence of such strain can scarcely be expected, because by making the barrel of the cylinder of greater diameter than the paddle wheels which govern the revolutions, a certain

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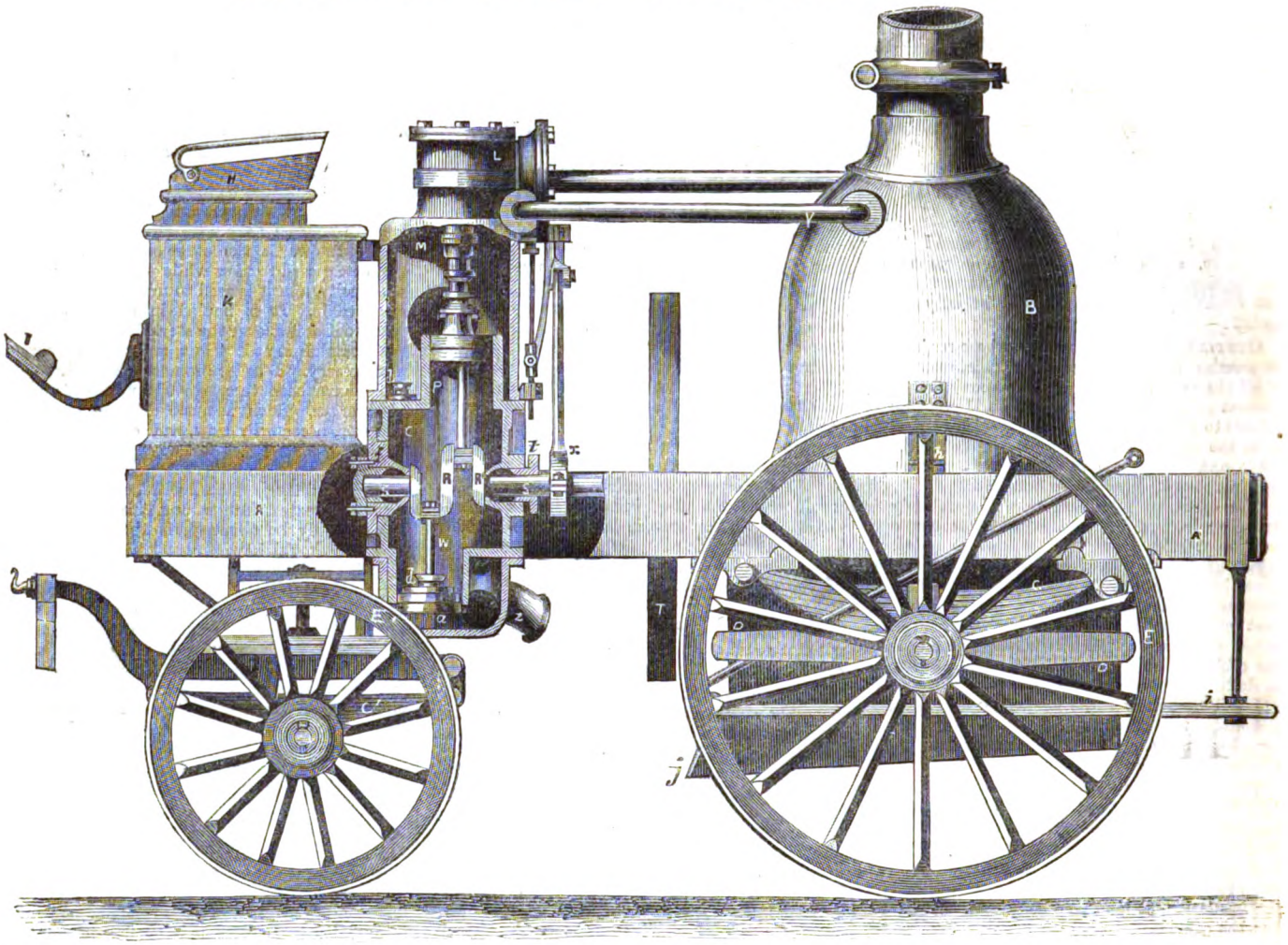
SHAND AND MASON'S STEAM FIRE-ENGINE.



easily-regulated amount of slack can be always thrown off at each turn. The electric communication is kept up by passing the *inner* end of the cable as coiled on through one end of the axles, and thence on board the towing vessel, where it is dipped into a cup of mercury.

I will now furnish a list of the advantages which I suppose to be derivable from the use of these cylinders, premising that, with a model made from a 50 gallon cask, with a small line in proportion, in the presence and to the satisfaction of Commander Gibson, R.N., late first lieutenant of the *Agamemnon*, I performed on the lake at Grasmere the operations of laying, under-running, and raising most sucessfully.

Advantages.—1st. The cylinder is the strongest, smallest, and cheapest known form for carrying a given weight in water. 2nd. The coil is nowhere smaller than 50 feet diameter; the cable is, therefore, but little bent. 3rd. Once coiled on from the works, it is never again moved or bent till laid. 4th. The resistance or brake power being derived from the water, is always proportionate to the strain on the cable, and this without any attention being needed. 5th. No extra weight or impediment is placed on board the vessel towing, her safety is not endangered, and though the resistance to towing approaches that of a vessel of the same draught of water, minus the friction, yet this diminishes with every turn of the cable which is thrown off. 6th. The cable is laid without any strain, and with as great a per centage of slack as may be desired, suitable means of expanding or reefing the paddle floats being provided; thus the slack can be increased or diminished at pleasure. 7th. The cylinder can be made to reel up the cable simply by passing the end on the opposite way, and towing as before, or if necessary in circles. 8th. The cable may be laid without danger at whatever speed the towing vessel can accomplish. 9th. The cylinder may be left as a buoy on the cable (the towing vessel lying by it), if from bad weather or any other cause, it be necessary to discontinue the operation for a time. 10th. The whole operation will be less expensive, and the first cost for cylinders will suffice for the laying or repairing many lines. 11th. The cable is little subject to the ordinary risks by fire, leakage, or storms. 12th. It can be coiled on the cylinder with little trouble or expense as fast as the cylinder can be turned in the water, with the floats off, and by means of portable steam engines from the wharf, the cylinder being moored off. 13th. The cable can be laid in almost any weather; nothing but such a gale as would stop the towing vessel, or else ice, would interfere with it. 14th. No twist or kinks can by any means be taken in, as may be seen by experimenting with the tape on a reel, before referred to. 15th. No change in the weights on board the towing vessel takes place, such as was found injurious to the stability of the *Agamemnon*, and nearly caused her loss. 16th. A leak, if existing, could easily be got at, as the cylinder, at each revolution, is in fact turned bottom up, but this need scarcely be feared, as it may be proved by hydraulic pressure before being used. 17th. The cable, instead of being a cause of straining and weakness to the structure carrying it, is, in fact, a source—and a great one—of strength, as, when coiled on the cylinder, its effect, like hoops on a cask, is to bind the whole together. 18th. No heat injurious to the gutta percha, and, therefore, to the insulation, need be feared, which has been found to be the case in the hold of a vessel, and is more to be dreaded in hot climates. 19th. The cylinder is peculiarly adapted to the otherwise difficult task of under-running the cable for repair, or even, if desired, of raising it entirely. 20th. This one machine is capable of accomplishing all that can be needed in laying, under-running, or raising the cable.

SHAND AND MASON'S STEAM FIRE-ENGINE.

MESSRS SHAND and MASON, the well-known fire-engine manufacturers, of Blackfriars-road, Southwark, have lately introduced a class of steam fire-engines, the first of which was despatched to St. Petersburg a month or two since. As one of these engines is found to deliver as much water in a given time as three engines of like size worked by twenty-eight men each, and as the manufacturers have had great experience in the construction of fire engines—being the makers of the floating Thames engines, among others—we shall now probably make a considerable advance towards the general application of steam to the extinction of fires.

The above engraving represents a side elevation of the engine, with the pumps and details connected therewith shown in section, for the purpose of more clearly illustrating their construction and arrangement. *A* is the main framing of the engine, composed of wood and wrought iron combined, and supporting a vertical tubular or other suitably-formed boiler, *B*. This frame is suspended on suitable bearing springs on the hind axle, which is made to surround, without being in actual contact with, the lower portion of the boiler, suitable arms projecting from each side

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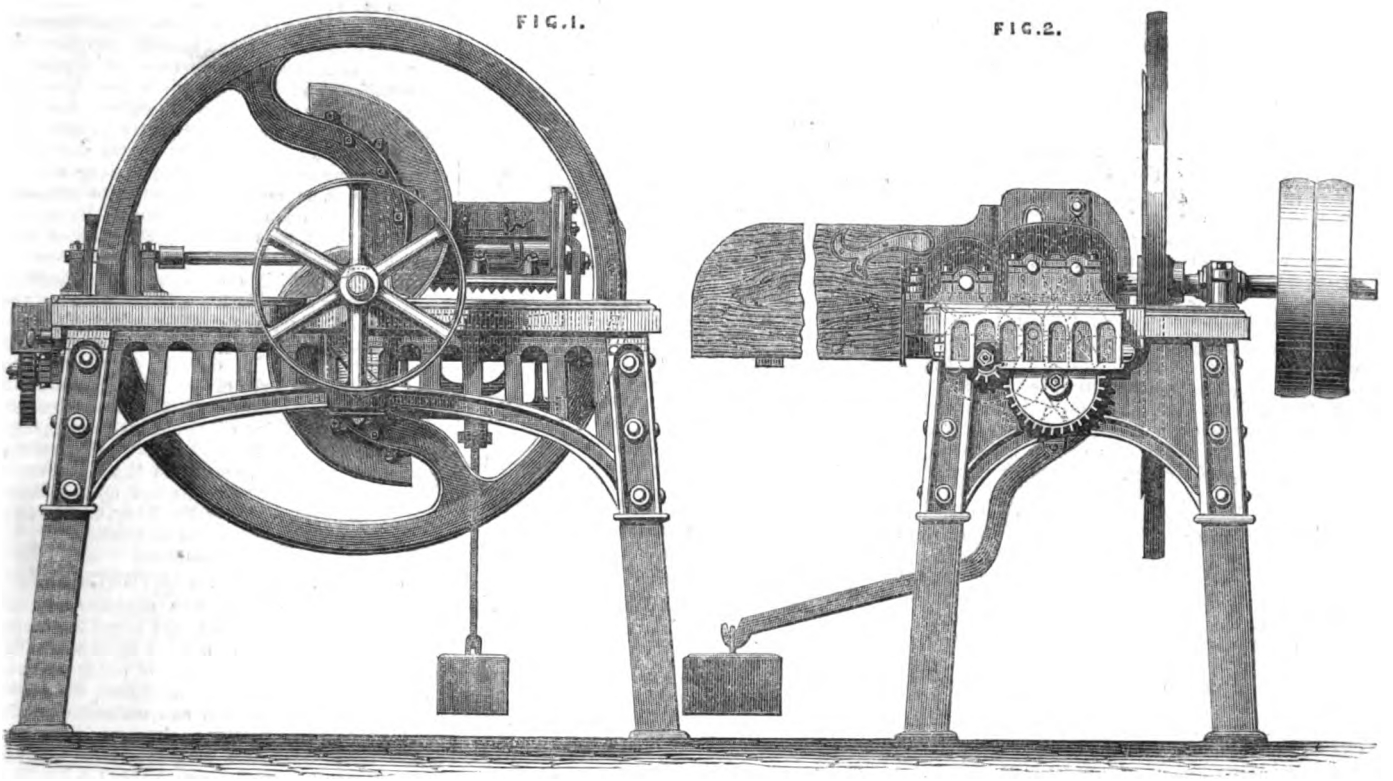
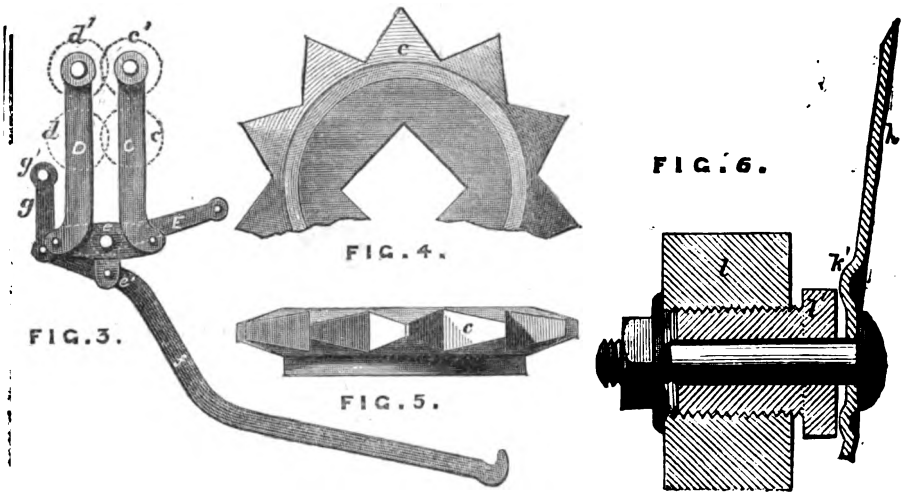
RICHMOND AND CHANDLER'S IMPROVED MACHINES FOR CUTTING HAY, STRAW, &c.



of this annular part of the axle serving to carry the large hind wheels. *F* is a wrought-iron fore locking carriage, furnished with bearing springs *C'*, wheels *E'*, and a pole or shaft (not shown for horses. Above this front portion of the framing is fixed the driver's seat *H*, and foot board *I*, a box, *K*, beneath the seat serving to contain the hose and implements, or, if preferred, a hose reel. The suction pipes are carried on each side of the framing. The combined steam and fire engine is fixed to the framing, *A*, between the front and hind axles in such a position as to admit of the front wheels locking round freely on a centre. The steam cylinder *L* is cast in one piece with, or is bolted on to, the top of the air vessel *M* in an inverted position, and the piston rod, after passing downwards through a double stuffing box has keyed or otherwise secured on to it the piston of the upper pump, the barrel of which is placed immediately beneath the steam cylinder. The piston and pump thus serve as effectual guides to the piston rod of the steam cylinder. A connecting rod jointed to the underside of the pump piston connects that piston and the piston rod of the steam cylinder with the crank *R*, on the engine shaft *S*, fitted with a fly wheel. This shaft works fluid tight by the aid of the stuffing boxs *t t*, in the casing *c*. The lower pump piston, or bucket working in the lower barrel is connected by the rod *W* with the crank at *R'*, set diametrically opposite to the crank *R* of the upper pump and cylinder, by which means the two pumps will be kept in constant or continuous action. The slide valves of the engine are worked from an eccentric at *x*, another eccentric not shown in the drawing serving to work the boiler feed-pump; another feed-pump to be worked by hand being also provided. Steam is admitted to the steam cylinder from the boiler by the steam pipe, and when the pumps are thereby set simultaneously to work, water is drawn in by means of ordinary flexible suction pipes through one of two inlets *Z* (one of which only is shown in the drawing, the other one being cut away) into the suction air vessel *a*, into the lower pump barrel through the valve in the piston or bucket thereof into the air tight casing *c*, and into the upper pump barrel,



the piston of which forces it through a valve or valves, *d*, into the air vessel *M*, and thence through outlets in the bottom of the air vessel into the hose pipes. In order that the water may be allowed to flow in one direction only through the pumps in place of being driven back through the valve *d* by the descent of the upper pump piston this latter piston may be furnished with a valve or valves similar to those in the lower piston and the valve *d* dispensed with, by which arrangement the water will be lifted in one unvarying direction into the air vessel. The crank may be readily got at for repairs by simply removing the side cover *f* of the casing *c*. The boiler, *B*, is supported on the framing, *A*, by short arms or girders riveted to the boiler sides, and let into the framing on the inner sides; and a bracket piece is also riveted to the boiler on each side, which rests upon the top edge of the framing. *i* is a foot board for the stoker to stand upon, the boiler being stoked from the back end of the engine. A suitable damper is provided at *j* for the purpose of regulating the draught.

RICHMOND AND CHANDLER'S IMPROVED MACHINES FOR CUTTING HAY, STRAW, &c.

MESSRS. RICHMOND & CHANDLER, the well-known agricultural implement makers, of Salford, Manchester, are now introducing a class of improved machines for cutting hay, straw, &c., embodying several patented improvements, which add considerably to their efficiency and durability. Their invention consists, first, in supporting the upper feed rollers of such machines in adjustable bearings, so that each roller can rise or fall independently of the other; secondly, in casting the mouthpiece of cast-steel; thirdly, in making the teeth of the first pair of feed rollers tapered, and radiating from the axis; fourthly, in an improved mode of constructing the knives; and, lastly, in an improved mode of connecting the knives to the fly-wheels or other fixings of such machines.

Fig. 1 is a side-elevation of a chaff-cutting machine to which their improvements are applied; fig. 2 is an end-elevation of the same; fig. 3 is a detached view of the adjustable bearings of the

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top feeding-rollers; fig. 4 is a detached view of part of the feed-rollers, showing their improved mode of shaping the teeth; fig. 5 is a plan of the same; and fig. 6 is a detached view of the cutting-knife, showing how the same is constructed and connected to the fly-wheel.

In fig. 3, *c* and *d* indicate the two bottom feed-rollers, supported in fixed bearings, as is now customary; and *c'* and *d'* are the top feed-rollers, which are so supported that each can rise or fall independently of the other, according to the depth of the feed. To the axles of the rollers *c'* and *d'* are suspended the links *C* and *D*, the lower ends of which are jointed to the beam *e*; to the centre part of the beam is cast the projection *e'*, to which is jointed the long lever *f*, furnished with a weight; the lever *f* is also jointed to the swing frame *g*, whose fulcrum is at *g'*. To the beam *e* are cast or fixed the levers *E*, the ends of which are jointed to brackets fixed to the under side of the feeding-plate. The mouthpiece consists of a bottom-plate and side-plates, in which are cast slots for the bearings of the top feed-rollers *d'*, and for the cover, which moves up and down with that roller, as is now customary. The mouthpiece is cast of the metal known as cast-steel, the object being to prevent the mouthpiece being injured by the action of the knives, *k*, *k* (fig. 6), which are connected to the fly-wheel *l*, fixed to the main-shaft, revolving in bearings cast to the bed-plate. The feed-rollers are turned round from the main-shaft by a bevel pinion gearing into a bevel wheel, and by the various wheels indicated in the engravings, which do not require to be described in detail, as they are common to machines of this description. On referring to fig. 4, it will be seen that the teeth of the first pair of feed-rollers, *c* and *c'*, are made to radiate from the axis, and that they are taper, as shown in fig. 5, whereas the teeth of the second pair of feed-rollers, *d* and *d'*, are of the usual shape. The improved-shaped teeth of the rollers *c* and *c'* take better hold of the hay, straw, or other vegetable substance to be cut, and consequently convey it more regularly to the second pair of rollers, *d* and *d'*, the teeth of which enter in the spaces between the teeth of the first pair of rollers, and strip them. The teeth of the second pair of feed-rollers are stripped by plates serrated in the usual manner. As it is of the utmost importance in machines for cutting hay, straw, &c., to be able to adjust the knives to the face of the mouthpiece, the patentees construct the knives and connect them to the arms of the fly-wheel or other fixing in the following manner: the blade of the knife *k*, shown in section in fig. 6, is set at an angle to the face of the fly-wheel, as is now customary; each blade is stamped with four or other convenient number of projections, *k'*, the outer faces of which are diagonal to the blade, and in a line with the face of the fly-wheel. The projections *k'* fit against the screwed bushes *l'*, which are furnished with six-sided heads, and are screwed into the arms of the fly-wheel *l*; the bolts *m* pass through the projections *k'* of the knives *k*, through the bushes *l*, and are tightened up against the arms of the fly-wheel, thereby firmly securing the knives. When it is necessary to adjust the cutting edge of the knife, the nuts of the bolts *m* are slackened, and the bushes *l'* are turned round or partly round, either in one direction or the other, to increase or diminish the distance of the cutting-edge of the knife from the face of the mouthpiece, and then the nuts of the bolts *m* are again tightened. By this means the separate adjusting screws usually employed are dispensed with, and the knives are easier to adjust, and more securely attached to the fly-wheel or other fixing than heretofore. In fig. 3 the feed-rollers and the machinery by which they are weighted are shown in the positions they occupy when the machine is not at work, but when the hay, or straw, or other vegetable substance to be cut is supplied, and the machine is set in motion, the top roller *c'* of the first pair of feed-rollers rises, while the top roller *d'* of the second pair of feed rollers will probably remain closer to that below it than the first pair, but each top roller can rise or fall independently of the other, according to the depth of the feed; consequently the pressure between the rollers is at all times equal, and the hay or straw is always securely held between the front pair of rollers, which object could not be obtained in the machines of the ordinary construction, in which both top rollers move simultaneously.

THE MICRO-ELECTRIC TELEGRAPH.

THE Micro-Electric Telegraph recently invented by Mr. Isham Baggs, and for which he has obtained provisional protection, consists of a combination of optical, chemical, and electrical apparatus, and it promises to maintain in a state of permanent efficacy, under all the various conditions of weather and humidity, any line of telegraph, short or long, to which it may be applied. It is very well known that all suspended lines of telegraph are liable to derangement in a humid state of the atmosphere, and that the effective action of the current under these circumstances is greatly weakened,—so much so, that the needles or other indexes of electric communication, are frequently rendered thereby so faint and sluggish in their movements, as to become practically useless. The reason of this is that wherever a mass of matter, great or small, is required to be moved, a certain amount of force is required to move it, and that in proportion as the preponderance of power over friction and other opposing influences is diminished, so is the resulting motion decreased, both in amount and velocity. In other words, an electric current or impulse despatched from London may reach Newcastle or Aberdeen, but in so impaired a state with reference to quantity, as to be unequal to the task of executing its mechanical functions.

In the present invention the movement of particles is substituted for that of masses, so that any quantity of electricity, however minute and otherwise inappreciable, cannot fail to produce a certain corresponding effect. A single wire is the medium of communication, and the earth, as at present, completes the circuit.

The results and their application may be well illustrated by the decomposition of water. If two poles of a corrodable metal are employed for this purpose, hydrogen is given off from the negative, and oxygen absorbed at the positive. Now, as either wire may be rendered negative at pleasure, and the process of making contact repeated with any required velocity, we have only to consider the evolution of the gas from the right or the left hand pole as being equivalent to the right or left hand movement of a magnetic needle, and we have in all respects a chemical counterpart of the existing mechanical telegraph. The indications so given are marked, sudden, and characteristic, and are produceable, as before stated, with the smallest amount of electricity, and therefore under the most disadvantageous conditions.

Let us suppose a case, and assume that we have a long line of telegraph in a most defective state of insulation from wet or otherwise, and that only the one-hundredth part of the electricity dispatched from one terminus is capable of reaching the other; then that one-hundredth part, which will not move a needle or stir a magnetic armature, is still capable of decomposing a definite amount of water, and of liberating a corresponding quantity of gas. Of course the quantity of gas so liberated is very small; still the results are always manifest, for the inventor works the decomposition trough in the focus of a powerful oxy-hydrogen microscope, and throws upon a screen a retracted image of the wires and the liberated bubbles of gas, magnified to the extent of *six millions of times their actual sectional dimensions*. In very extreme cases, this power, great as it is, is made to undergo a further extension, and the gas bubbles so produced are generated under a vacuum, whereby a greatly increased augmentation of volume is realized. Suppose, for instance, the vacuum is equal to half an inch of mercury, then the increase of volume would be sixty times that of the original, and though in such case the increase in sectional area would be only as the square of the cube root of expansion, yet here, as the visibility of the result depends not merely upon length and breadth, but also upon apparent thickness, the true increase of value in the manifestation of the signals is directly as the expansion itself. The effect therefore produced upon the screen is amplified THREE HUNDRED AND SIXTY MILLIONS OF TIMES its actual size when viewed by the naked eye. After stating such a fact as this, it appears to us to be quite unnecessary to dilate upon its application. It simply amounts to this, that wherever the faintest current of electricity traverses an electric wire, it can be rendered visible in its effects, and used as an ever ready and effective substitute under the worst conditions for the existing telegraph. We have illustrated the matter by the adduction of a very extreme case. In ordinary practice an Argand lamp or the light of day, when available, is ample for all purposes, and when the wires are short, or the electricity is abundant, no amplifying power whatever is required. We shall return to the subject again, meantime the invention is about to be publicly demonstrated upon a large scale at the Polytechnic, by Mr. King, the lecturer on natural philosophy at that Institution.

CAPTAIN NORTON'S INVENTIONS.

ON Thursday, the 10th, some experiments took place near the field-works of the Royal Engineers at Chatham, for testing some of those admirable inventions of Captain Norton, of which we have frequently made mention. Although the afternoon was exceedingly wet and unfavourable for carrying on the operations, a number of officers of the Royal Engineers were present. The experiments first made were with Captain Norton's liquid-fire rifle-shell. The object of this missile is to set on fire the sails, rigging, and even the hull of any vessel against which it is thrown, and the experiments proved that the shell in question is one of the most extraordinary projectiles ever introduced into the art of warfare. The chemical substance with which the hollow shell is filled, is prepared chiefly with phosphorus dissolved in bi-sulphate of carbon, and is placed in a glass phial within the shell. Immediately on this shell striking any ignitable matter the glass in broken, and so powerful is the liquid that it almost instantaneously sets the object in a blaze. During the experiments yesterday afternoon a number of large sacks were suspended on poles to represent the sails of a ship, and these were soon soaked through with rain so as to become completely saturated. Captain Norton then took a heavy three grooved rifle, of 1 3-16ths inch bore, which he loaded with one of his shells, weighing about 7-oz., the shell sliding down on the cartridge by its own gravity, following the spiral turn of the rifle. Notwithstanding the wetness of the sacking the effect on firing was exceedingly surprising, the liquid spreading through the canvas, which in a short time began to smoulder, and after an interval burst forth into a flame, entirely consuming the whole. Had the sacking been dry the effect would have been instantaneous. Captain Norton undertakes with the same description of shells, but of larger size, to set fire to any line-of-battle-ship in the navy. He now attaches the gossamer cartridge to the base of this shell, thereby expediting the loading, as no ramrod is required. The next experiments undertaken were with a new description of rifle-shot which has been named the "Spinster." This bullet, which can be fired by Captain Norton at a distance of no less than 1,800 yards, is intended for blowing up ammunition waggons, or bags of gunpowder, or setting fire to the camp of an enemy. The bullet, which in shape and size resembles the Enfield rifle-ball, has a chemical substance attached to its base, which becomes ignited the instant it is fired, remaining burning long enough to do the execution for which it is intended. A bag, containing about two pounds' weight of gunpowder, mixed with a great quantity of sawdust, was placed upon

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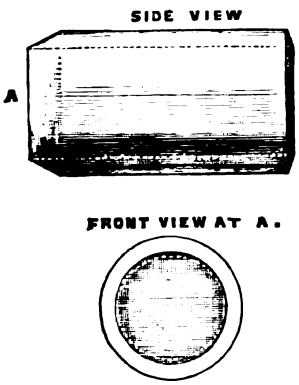
the ground, the powder being soon wetted through by the rain. One of the "spinster" shots was fired at the mass by means of Captain Norton's gossamer seemless cartridge, but owing to the powder being so wet no immediate result followed as the gunpowder was mixed up with the sawdust' After a short time, however, the powder was ignited and blown up. Captain Norton afterwards exhibited some of his "frictional igniters," which are a kind of hand grenade, and can be made to explode when thrown from a glacis in the face of assailants. The frictional igniters are for firing grenades at any spot, or at any distance required. They may be had, on previous notice, of the principal London gunmakers. The use of the gallant Captain's frictional grenades (upon which Captain Lempriere reports very favourably), thrown from the towers of parish churches would convert all the villages in England into so many Hugomonts. For the hand grenades used in the defence of posts they are invaluable, as they do away with all risk of accidental explosion in the hands of those about to throw them—a thing, under the present system, of not unfrequent occurrence, owing to defective fuzes. In the defence of works the frictional igniter can be made to explode at any height from the bottom of the ditch, and thus prevent the possibility of the grenade being thrown back into the work by the attacking force before it explodes. The engineer officers present expressed themselves in satisfactory terms at the result of the experiments made with Captain Norton's inventions.

CAPTAIN NORTON'S RIFLE BULLETS.

THE steel cutter represented in the annexed engraving has the section of Lancaster's rifle bevelled at one end, where it has a sharp edge, and is designed for forming the bullet shaft. A piece of



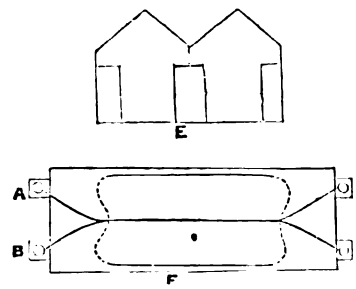
seasoned willow wood is cut to the length required for the shaft of the shot, which may be from an inch to two or more inches in length; the cutter being placed on it so as to run with its grain, is then struck with a mallet till the shaft is formed. The shaft having one end formed somewhat smaller with a rectangular stud, or short pillar, is then placed in the base of the mould, and the molten lead is poured in at the head; the stud having a groove round its base the head holds fast on. The shaft may be forced or swedged through a section of the elliptic barrel a size less than the cutters, which makes it smooth and more dense.—J. NORTON.

CUNNINGHAM'S PATENT TOPSAILS.—The following extract from the Meteorological Register of the barque *Victory*, from the coast of Africa to Bristol, illustrates the utility of Mr. Cunningham's system of sails:—"Wednesday, Jan. 19th, 1858, lat. 38° N., long. 38° W. At 7·30 p.m., the wind shifted suddenly from S.W. to N.N.W. in a very violent squall with ice like rain; as it did not give us the usual amount of warning, and we were carrying a press of canvass to keep clear of the sea, we might have been dismasted had we not been fitted with Cunningham's invaluable patent which enabled us to be under close reefed topsails in about three minutes, and that in a 'certain measure unprepared.'"

HANDS' PATENT FOR DRYING CHAMBERS.

MR. HANDS, of Epsom, of whose valuable process of drying we had occasion to speak in terms of praise some time ago, has been actively employed throughout Great Britain and the Continent in raising kilns and other buildings for dessicating various materials—animal, vegetable, and mineral. Mr. Hands has recently erected a factory on the banks of the River Maeler, leading to Stockholm, and about 20 miles from Gothenburg, Sweden, for the manufacture of bricks, tiles, pipes, pottery, &c. The four kilns hold 35,000 bricks each, forming a complete factory, being so arranged that they all work into one flue down the centre of one drying shed. The middle flue divides the shed into two, consequently they are both always hot from the radiation, and by means of dampers the action is reversed, and a heat of 130 degrees and upwards is thrown on either side at pleasure.

For instance, *E* is a section of the drying-room. *F* is a plan showing the alternate working of the kilns, one being burnt every three days throughout the year; *A* is burning; *B* is cooling; *C* is filling, and *D* emptying.



By an arrangement in connection with the passage leading to the consumer or exhausted receiver in the kiln, through which all the humid atmosphere is drawn from the drying chamber as required—a damper regulating the same—the manufacture of plastic ware can go on in all weathers and in all seasons under this system of heating and ventilating. Mr. Hands was engineer and managing director of the whole fabric, and he is about to build four more kilns at the same place.

SUPERHEATING STEAM.

THE following references were omitted from Mr. Taplin's letter on the above subject in our last number:—*A*, boiler; *B*, water; *C*, steam; *D*, chimney; *E*, superheating chamber; *F*, pipe to convey steam from boiler to superheating chamber; *G*, pipe communicating with the cylinder to supply it with dry superheated steam; *H*, damper; *I*, furnace; *K*, safty-valve. Common steam produced in the boiler *A* ascends the steam pipe *F F*, and passes freely into the superheating chamber *E E*, where it is converted into dry transparent superheated steam, and passes out through the pipe *G*, as such into the steam cylinder. The boiler was designed in 1827, by Mr. Taplin, then of Her Majesty's Dockyard, Portsmouth, and used by him on several occasions for practically illustrating a series of lectures on "Steam and the Steam Engine."

DOCK YARD APPOINTMENT.—We understand that Mr. G. L. Cole, Measurer, of Woolwich, and late Foreman of Caulkers at Malta, is to be reinstated in that capacity at Portsmouth, in place of Mr. Baker, recommended for superannuation.

FLOATING BATTERIES.—"I am informed," says the Paris correspondent of the *Times*, "that six floating batteries are about to be constructed in the French ports on the model of the Gemappes. The batteries about to be constructed are different from those employed in the Crimean war, inasmuch as they are not flat-bottomed and may be navigated like ships." We may state that (as some of our ship-builders know) our Admiralty are not inactive in the matter.

NOTICES.

The following articles and letters stand over until next week:—

The Case of Henry Cort.
Mr. Foster's paper on New Metal Aluminium.
Mr. Hall's letter on Telegraphic Cables.
Chromo-Lithographs.
Patent Law Reform.
New Dock at Port Louis.

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Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 6 o'clock on Thursday evening each week. None can be received after 5 o'clock on Thursday evening for the ensuing number.

CORRESPONDENT'S QUERY.

GENTLEMEN,—Is there anything novel in the following matter? I have not been able to find an explanation of it in any work on electro-magnetism to which I have access.

I have a coil machine arranged to stand upright on three feet; the hammer for breaking contact is placed underneath it, immediately below the cord, which can be shifted up and down to any required distance from the hammer. Some days since I was experimenting with it, having two cells of a Callan's battery attached, the core being about two inches above the hammer to make it vibrate slowly; happening to touch the top of the core with a pair of pliers which I had in my hand, I was surprised to find the hammer commence to vibrate quickly; removing the pliers, it returned to its former speed. I then substituted for the pliers pieces of soft iron of various dimensions, and found that the application of a piece of iron, however small, had always the effect of quickening the vibration; I should say that the speed was trebled. The core was composed of several pieces of thick iron wire insulated. A solid soft iron core gave the same result.

I am, Sir, your obedient servant,
Cork, February 3, 1859. T. C. H.

BOOKS RECENTLY PUBLISHED.

Black's General Atlas of World, new edit., 3s.
Burn's Illustrations of Carpentry and Farming, 3s.
Chevallier (M.) On Probable Fall in Value of Gold, trans. by R. Cobden, 5s.
Chick-seed without Chick-weed, 31th edit., 1s.
Delamotte's Book of Ornamental Alphabets, 2nd edit., 4s.
Faraday's Experimental Researches in Chemistry and Physics, 8vo, 15s.
Ferguson's Tables of Interest, 3rd edit., 5s.
Guernsey's Homœopathic Domestic Practice, 2nd edit., 5s.
Hardwicke's Shilling Baronetage, 32mo, 1s., cl.
Hardwicke's Manual of Photog. Chemistry, 5th edit., 7s. 6d.
Half-Hours with the Microscope, by West, 2s. 6d.
London University Calendar, 1859, 3s.
Landell's Boy's Own Toy-Maker, 2nd edit., 2s. 6d.
Lund's Elements of Geom. and Mens., Part III., 3s. 6d. 3 Parts in 1 vol., 7s., cl.
Murray's Zool. Sketches, new edit., 3s.
Mechi's How to Farm Profitably, new edit., 2s.
Murchison's (Sir R.) Siluria, 3rd edit., 42s.
Principles (The) and Practice of Harmonious Colouring in Oil, Water, and Photog. Colours, 2s. 6d.
Pratt (Anne) British Grasses and Sedges, 10s. 6d.
Smith's Arithmetic and Algebra, 6th edit., 10s. 6d.
Smith's Household Surgery, 4th edit., 4s. 6d.
Swainson's New Zealand and its Colonisation, 14s.
Slaughter's Railway Intelligencer, No. 10, 10s.
Smith (J. W.), Handy Book on Law of Private Trading Partnership, 1s.
Sinclair's (Capt. A.) Reminis. of Royal Navy, 1s.
Traditions of London, by Waters, 5s.
Thomson's Explanations, with Examples for Azimuth and Timeproof Plate and Scale, 3s.
Taylor (A. S.) On Poisons, 2nd edit., 12s. 6d.
Wornum's Sketch of Hist. of Painting, new edit., 6s.
Wilson's Electricity and Elect. Teleg., new edit., 1s.
Wilson's Progress of the Telegraph, a Lecture, fcp. 8vo, 1s., sewed.
Whitworth's Miscell. Papers on Mechan. Subjects, 5s.

EXPECTATION OF LIFE.—A paper on this subject by Mr. Charles M. Willich was read at the Institute of Actuaries on the 31st ultimo. Mr. Willich gives for the expectation of life at any age (a) from 5 to 60, the simple formula, $e = \frac{2}{3}(80 - a)$; or in words, the expectation is = to two-thirds of the difference between the age of the party and 80. This formula is easily recollected, and the results correspond very closely with those obtained from Dr. Farr's English Life Table; indeed so closely, as to raise the question whether the law may not be as true as the result from such an immense mass of returns as those of all England and Wales.

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CURRENT EVENTS

IN THE CENTRES OF THE IRON, COAL, MACHINE, AND SHIPPING TRADES.

[COMPILED BY OUR OWN CORRESPONDENT.]

Stockton and Darlington Railway: Good Profits—Houses on the Stour Valley Railway—Inspectors' of Factories Reports: Infringements of the Act! Number of Accidents and Prosecutions—Training Ship at Liverpool—Tyne Commissioners and the Dues—Second Reading of the Mersey Docks and Harbour Bill—Strike of Stonemasons—Machines for Boot-making at Northampton and Stafford—Gunboats for Egypt—Isle of Man Telegraph—Proposed Wedgwood Monument and Institute—Suggested Monument to Watt at Soho—Bursting of a Canal—Iron Safe and Burglars—Bursting of a Steam Boiler—Fatal Explosion of Gunpowder—Horse Shoe Machine—Engines for War Steamers.

A HALF-YEARLY meeting of the Stockton and Darlington Railway Company was held on Monday. During the past six months the trade had considerably increased upon the previous period and also upon the corresponding six months. The receipts of the first week in Feb., this year, were more than those of 1858 by £1,800. The available balance for the payment of dividends was £37,000; and this after the payment of all the interest and the preference dividends. There was declared on the ordinary shares of the Company a dividend of 9½ per cent. payable on the 23rd inst.——Thirty-one houses have been built through the exertions of the Marquis of Chandos upon the Stour Valley branch of the London and North Western Railway for the use of the station masters and other *employés*. The number is to be increased in spring, until all the servants on that branch between Birmingham and Wolverhampton shall have a dwelling apart from the places of abode of the mass of the South Staffordshire people—an event which, in his lordship's estimation, will tend to the increased discipline of the officials.——The reports of the inspectors of factories issued on Tuesday last, draw prominent attention to the infringement of the act in Mr. Horner's (the Manchester) district especially, and urge the Home Secretary to prepare an amending act to prevent such evasions. In Mr. Horner's district the accidents arising from machinery during the half-year were 924, of which 120 were to children and 396 to "young persons." The cases of prosecution numbered upwards of 70.——At the Burnley petty sessions on Monday there were 67 cases of working 12 minutes over-time preferred by the sub-inspector against Messrs. E. and H. Rawlinson, and convictions taken by arrangement.——The training ship *Conway*, for which the Liverpool Mercantile Marine Association have been so long in treaty with the Admiralty, has arrived in the Mersey. The *Conway* is a 26-gun ship, and has been fitted-up expressly for the purpose of a training ship for young sailors.——The Tyne Commissioners have resolved, first, "That this Commission do petition Parliament, and also memorialise the Government, in favour of the abolition of passing tolls, and for the transfer to the respective harbour authorities of all dues levied on ships, and goods carried in ships, in such harbours." And next, "That another attempt be made to obtain an amicable settlement of the Tyne dues."——In the House of Commons on Monday night, after some discussion upon the Mersey Docks and Harbour Bill, the second reading of that measure was carried by a large majority.——The stonemasons at Halifax are at present on strike, in consequence of a disagreement on the question of wages with their employers.——Some of the principal firms among the boot and shoe manufacturers of Northampton advertised to their men, that on the 14th of the month they should introduce machine-sown tops into their trade, as "any further delay in the introduction of sewing-machines" by the masters would be permanently injurious to the trade generally.——The bootmakers of Stafford have followed up this notice by one of their own, in which they say after its expiration they shall take on no fresh hands, thereby indicating their sympathy with their Northampton brethren.——The firm of R. Smaile and Co., of Newcastle-upon-Tyne, have in hand an order for crucibles for Egypt, ordered through the firm of Messrs. R. Stephenson and Co., engineers.——*Mona's Herald* understands that the whole of the capital required for the Isle of Man telegraph has been subscribed, and that a sample cable has been fixed upon by the Provisional Committee.——The respective schemes for commemorating the genius and worth of Wedgwood seem to pretty signally divide public favour. For the statue £2,000, and for the institute £1,900. A model of the proposed statue has been exhibited at Stoke-upon-Trent.——Correspondents to Birmingham papers are suggesting a movement to erect a monument that shall "point out to railway travellers where the celebrated Watt lived and died."——Fifty million gallons of water, weighing upwards of 200,000 tons, escaped upon and greatly damaged the surrounding land, from the Dearne and Dove canal, at Barnsley, on Friday. The crevice from which the water ran was 25 feet below the level of the canal bottom, which was considerably above the valley through which it ran.——Burglars at Halifax last week are supposed to have made a desperate two-hours' attack upon one of the case-hardened safes of Mr. G. Price, of the Clevland Works, Wolverhampton, but without being able to open it.——A large cylindrical boiler went off last week at the Dan Lane factory, Atherton, and seriously injured four persons.—Three children of a butty collier of Wednesbury, in Staffordshire, went with a light into an out-building where their father kept blasting powder; a spark from the candle ignited the powder. One child was killed, and the other two were seriously injured.——The horse-shoe making machine (1847 patent) of Mr. Burden, of Troy, State of New York, has been temporarily erected for the purposes of the inventor at the Chillington Ironworks, Wolverhampton. The machine is alleged to be capable of turning out perfect shoes per minute.——The *Daily News* city article says, we are informed that Government have given out orders for the construction of sixteen engines destined for war steamers.

NOTES FROM THE EASTERN DISTRICTS.

[FROM OUR OWN CORRESPONDENT.]

Bedford, Potton, and Cambridge Railway—Proposed new Town Hall at Cambridge—Observatory at Bury St. Edmunds—Colne Valley and Halstead Railway—English Agricultural Engines in Russia—Gas in Houses, &c.—The Dams in the Nene: another chapter—Norfolk Estuary Works—The Non-gremial Examinations of the University of Cambridge.

THE proposed new Bedford, Potton, and Cambridge Railway has received hearty support at a public meeting called in the latter town. As usual on such occasions, there was a good deal of grumbling at the management of the Eastern Counties Railway. The proposed line will facilitate communication between Cambridge and Oxford and the Midland Counties.——A new town hall is proposed at Cambridge; £4,000 is required, and promises for £3,000 have been obtained.——An observatory is about to be constructed on the roof of the Bury St. Edmund's Athenæum.——The works on the Colne Valley and Halstead Railway are advancing rapidly towards completion. An engine can now run from Chapel (on the Sudbury branch of the Eastern Counties) to Blue-bridge, near Halstead. The line will be opened for traffic in a few weeks.——Mr. J. Shuttleworth, of the important firm of Clayton and Shuttleworth, who have turned out such large quantities of agricultural engines of late years at Lincoln, has left that town for Russia, for the purpose, it is understood, of devoting his personal attention to the development of a trade with the agriculturists of that empire. Mr. Shuttleworth will visit Moscow and St. Petersburg.——At Rétford, Messrs. H. and F. Bailey are reported to have invented an apparatus for making gas, applicable for gentlemen's residences, farms, railway stations, villages, &c., in an improved manner. The apparatus, it is stated, can be managed by a person of little experience in gas matters, while it occupies a small space, &c.——The MECHANICS' MAGAZINE of last week noticed under this head the odd manner in which the dams placed in the Nene by the Nene Valley Commissioners had been removed by certain parties connected with Wisbeach. Of course the Commissioners could not permit these doings to pass without notice; and eleven persons, some of them well to do in the world, have been charged before the Isle of Ely magistrates (under the 7th and 8th Geo. IV., cap. 30) with having unlawfully, maliciously, and feloniously thrown down the Waldersea dam, the same being the goods and chattels of the Commissioners. A number of witnesses were examined, and the proceedings were protracted over seven hours. The bench decided that there was not a case of felony against the defendants, but intimated that they had committed an unjustifiable act. It was stated that the defendants would be required to enter into recognizances in £50 each for the next twelve months. The counsel for the defence objected to recognizances being entered into, and stated that those who instructed him would bring the matter forward at the Assizes. One of the magistrates afterwards said—the defendants promising to do nothing irregularly in future—that although the bench had the power to require recognizances, they did not care to exercise it. The chairman of the bench told Mr. Shelford, C.E., the acting superintendent of works for the Commissioners, that whatever orders might come from Mr. Fowler, chief engineer, the dam at Waldersea must not be re-constructed; the country would not stand it. These dams—if one may credit the statements made on the subject—certainly appear to have been a very serious grievance to the port of Wisbeach, the dues having fallen off in consequence of the impediments offered to free navigation.——It appears that Messrs. Peto and Betts have given up their contract for the Norfolk Estuary Works, as they contend that it is impracticable to carry out the arrangements contemplated without some modification of the plans, to which the company will not agree. The directors have received a tender from Mr. Sissons, of Hull, for the completion of the works, and Messrs. Peto and Betts will pay over the difference between the amount of their contract for the work in question and the amount of Mr. Sissons' tender. During the last half-year about 550 acres of land have been reclaimed, and the first sale of land is expected next year.——As considerable interest attaches to the non-gremial examinations instituted by the universities, it may be desirable to show how the experiment has succeeded at Cambridge. The whole number of students examined at the towns selected—Birmingham, Brighton, Bristol, Cambridge, Grantham, Liverpool, London, and Norwich—was 386; and of these 106 have obtained honours, or 27·46 per cent. of the whole number. As regards the remainder 134 have "satisfied the examiners" but are not included in the honour classes. There remain, therefore, 146 youths of whom no account is given. The towns which have come out of the ordeal the best in proportion to the number of candidates are Liverpool and Grantham. Norwich cuts the worst figure of all.

NOTES FROM THE SOUTH WEST.

[FROM OUR OWN CORRESPONDENT.]

South Devon and Tavistock Railway—Telegraph from France to the Channel Islands—The Electric Telegraph at Plymouth—Timber Contract—Dublin and Bristol: Relative Trade—Cotton Works hinted at at Bristol—New Landing Stage—West Somerset Railway—The Brighton and South Western Dispute—Southampton Docks—The Vanderbilt Line of Steamers—The Transport of Troops to India—The Australian Mail Contract of the P. and O. Company—Water Supply in case of Fire at Southsea—Winchester Barracks—Lymington Railway—Naval Matters.

THE works on the South Devon and Tavistock Railway are in such an advanced state that the opening of the line is expected to take place early in the spring. The Grenafen tunnel—a work of some difficulty in consequence of the nature of the ground—is not yet finished, but is reported to be progressing very satisfactorily.——The French Government has granted a subvention of a line of telegraph from the French capital to the Channel Islands. The British Government must consent, however, before the arrangement can be carried out.——The Plymouth Chamber of Commerce have held a special meeting to consider a letter from the Electric Telegraph Company with reference to the want of additional accommodation for rendering telegraphic communications from the eastern part of the town. They say they could not incur the expense of laying down wires, but if the inhabitants would do that, they would maintain a proper staff. The Chamber agreed to contribute £50 towards the establishment of a branch office in the exchange, or its neighbourhood.——The Government contract for the supply of English oak, rough-sided, thick stuff, and plank for the years 1859, 1860, and 1861, has been taken by Mr. Murry Marshall, the contractor for the three previous years.——It might be thought that the port of Dublin did a more extensive trade than Bristol, but this, as appears from the following figures, is not the case. In 1858, 452 British ships with an aggregate tonnage of 105,372 tons, and 394 foreign vessels with an aggregate tonnage of 93,747 tons, entered Bristol; while 147 British vessels with an aggregate tonnage of 37,705 tons, and 74 foreign vessels with an aggregate tonnage of 27,397 tons, cleared outwards. In the same year, 305 British ships with an aggregate tonnage of 67,711 tons, and 258 foreign ships with an aggregate tonnage of 51,223 tons, entered Dublin; while 43 British ships with an aggregate tonnage of 10,405 tons, and 14 foreign ships, cleared outwards.——A power-loom, exhibited at the Bristol Athenæum, has found a purchaser in that city. The loom, which obtained a prize at the Great Exhibition in Hyde Park, was subsequently hired by Lanca-hire and Cheshire manufacturers, who took it as a model by which to improve their own looms. It was also hired at the Great Western Cotton Works for the same purpose. A correspondent of a local journal ingeniously argues that this loom may prove the nucleus of a new cotton works in Bristol, and that the town is well suited for such an undertaking.——A new landing stage at the Hotwells, Bristol, is now ready for opening.——A public meeting, held at the Egremont Arms Hotel, Williton, Sir Peregrine Acland in the chair, has adopted a resolution to the effect that those present earnestly desired the construction and completion of the West Somerset Railway, and pledged themselves to use their utmost exertions to aid the directors in their efforts to raise the further sum necessary for this purpose. It is understood that arrangements are in progress for an early commencement of the works.——It seems that the dispute between the Brighton and South-Western Companies, with reference to the Ports-mouth traffic, is not yet at an end. The question will come before an equity court on the Wednesday before Good Friday. The defendants (the South-Western and Portsmouth Companies) are to keep an account, in the meantime, of the traffic on the disputed portion of line, and, after payment of working expenses, to hold the balance to be applied in whatever manner may be directed.——It was stated at a meeting held a day or two since that the Southampton Dock Company has, since its formation, expended £700,000 in the construction of docks at that port.——The first steamer this season on the Bremen and New York line *(Vanderbilt)* will leave Southampton on the 22nd inst.——A proposal made by Messrs. Croskey and Co. to the Government for the employment of the vessels of the European and American Steam Shipping Company in the transport of troops to India has not been adopted.——The March Australian mail will be despatched from Southampton in the Peninsular and Oriental Company's steamer *Indus*. This will be the first despatch under the contract recently concluded with the company.——A meeting of the ratepayers of Southsea has been held to consider the adoption of the best means for securing with certainty, and instantaneously, an ample supply of water in case of fire. In the course of the proceedings, Mr. R. W. Ford, clerk to the new water-works company, stated that within the year the great reservoir on Portsdown Hill, and the enlarged mains, with a constant supply of water at all times, would be brought into operation. At present there were between 30 and 40 fire-plugs in Port-mouth, and between 40 and 50 in Portsea; but in Landport and Southsea there were none at all. Resolutions were passed to the effect that an engine and fire-escape should be obtained in every district, in addition to the supply of water.——Some improvements are in progress at Winchester Barracks. New quarters are to be erected for married soldiers; the foundations are to be completed by the end of March.——The Lymington Railway Company are applying to Parliament for power to raise an additional £13,000 to enable them to build a new and more commodious station, and to complete other improvements now in progress. The dividend declared at the half-yearly meeting just held was at the rate of 2 per cent. per annum.——Continued activity prevails in Chatham Dockyard in consequence of the approaching launches in April. The *Hood*, 93—92 broadsiders and one pivot gun—and the *Charybdis*, 20, screw-corvette, will, it is expected, be the first vessels launched. The engines of the *Hood* will be of 600-horse power.

NOTES FROM SCOTLAND.

[FROM OUR OWN CORRESPONDENT.]

Shipbuilding on the Clyde; the "Bohemian" steamer—The Pig Iron Trade—Coals—Importation of Valonia—The Steam Plough in Stirlingshire—Monklands Railway—The approaching meeting of the British Association at Aberdeen—Highland and Agricultural Society; the condition of the labouring classes—Improvements at Leith—Loss of the "Ignez de Castro" steamer—Scottish Railway, &c., Bills in Parliament.

THERE is some improvement noticed in the shipbuilding trade of the Clyde. Messrs. Laurence, Hill, and Co., of Port Glasgow-road, have received an order to commence an iron steamer for the Londonderry trade. At Greenock nine iron steamers are in course of construction in the various

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yards, and five wooden vessels. Messrs. Caird and Co. have five pairs of engines on hand, and are repairing the *Teutonia* (s. s.). Messrs. M'Nab and Co. are engaged on three pairs of engines, and in executing some repairs in sugar-houses. Messrs. Smith and Co., Port Glasgow-road, are also executing machinery for sugar-mills in the West Indies. Messrs. Denny and Brothers, Dumbarton, have just launched a handsome iron screw steamer of 2,200 tons for the Montreal Steam Ship Company's line. This fine vessel is the fourth of the same size which has been launched from the yard for the same owners within the last ten months. The new vessel, which has been named the *Bohemian*, is 300 feet in length, and will be fitted with engines of 300-horse power by Messrs. Tulloch and Denny, Dumbarton. The *Bohemian* will afford accommodation for 450 first and second-class passengers. ——The Glasgow pig iron market was flat and dull up to Saturday. On that day, however, the market stiffened, and up to Tuesday had slightly recovered.——In coals no change is reported. ——The brigantine, *Henry Curwen*, from Smyrna, and *Scala Nova* has landed in Victoria harbour, Greenock, 150 tons of valonia, the first cargo of the article ever brought into the port. Valonia is the modern name adopted for a species of acorn exported from the Morea and the Levant for the use of tanners. One of its chief excellencies is that it makes leather impervious to moisture. It is said to be rising into favour with the trade. ——A successful—and what is more important still, economically successful—trial has been made with Fowler's steam plough, near Stirling. The committee of judges estimate the daily expense of a steam plough at £2 2s., or £12 12s. per week, allowing, however, time for removal, short days and wet weather, four days a week are reckoned as the average of working time for a steam plough throughout the year; and the judges, therefore, deduct from the £12 12s. two day's coal and water, £1 6s. For the net expenditure of £11 6s., they consider 35 acres would be ploughed, while the expense of ploughing the same quantity of land by horses would, they state, be £15 6s. 3d., leaving a balance of £4 3d. in favour of steam. The judges note that the work performed by the steam plough was equal to anything done by the common plough. ——The dividend of the Monklands' Railway Company is at the rate of 8 per cent. per annum. The working expenses and charges have been reduced £1,678 as compared with the corresponding half-year of 1857.——With regard to the approaching meeting of the British Association at Aberdeen, it may be interesting to state that the colleges have tendered every facility in their power to the Association for the transaction of its business. The forenoon meetings of the various sections will probably be held in Marischal College, which contains ample accommodation for all the departments. It is proposed to form a collection to illustrate the natural history of the extensive district from the Forth to the Shetland Isles; and the Music Hall rooms will contain an exhibition of portraits and other objects illustrating the history and antiquities of Aberdeenshire. Other arrangements are also being matured.——The late meeting of the Highland and Agricultural Society at Aberdeen is refered to, in point of numbers and excellence of stock and implements, as the most successful ever held under the auspices of the Society. The condition of the labouring classes and their cottages is engaging the attention of this Society. ——Works for a new graving dock have been commenced at Leith. The contractor (Mr. Wilson) has brought forward the necessary plant, driven two long rows of piles seaward of the site of the dock, and laid on the top a line of rails for waggons to be used in conveying stones for a stone bulwark to be made for the protection of the dock, and another line for a travelling crane. A great part of the excavation will be through sand, and the water springing up through it is expected to prove a serious obstacle. To meet this difficulty a steam engine of 150 horse-power is being erected. The works on the Leith branch of the North British Railway are also advancing, and it is believed that it will be opened for locomotives in the course of next month.——Intelligence has been received in Glasgow of the loss of the screw steamer *Ignez de Castro*, one of the vessels of the Glasgow and Lisbon Steam Packet Company. ——The following is a list of the principal private Scottish Bills before Parliament:—Glasgow Public Parks; Galleries of Art; Tweed Fisheries; Forth and Clyde and Navigation; Charlestown Railway and Harbour; Perth, Kinross, and Fife Roads; Maybole and Girvan Railway; Fudborn Harbour; Kirkwall Harbour; Border Union (North British) Railway; North British and Selkirk and Galashiels Railways; Glasgow Corporation Water; Dundee and Newtyle Railway; Border Counties Railway; Banff, Macduff, and Turriff Junction Railway; Formartine and Buchan Railway; Great North of Scotland Railway; Caledonian Railway (to enable the company to make branches to the Wilson-town mineral fields); Carlisle, Langholm, and Hawick Railway; Castle-Douglas and Dumfries Railway; Scottish Central Railway, &c.

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated December 22, 1858.

2920. R. Clegg, of Islington, F. Angerstein, of Kennington, and G. Ferry, of Hackney. Improved mechanism for imparting reciprocating motion to machinery, and more especially pumps.

2924. M. Renney, of Dublin, Mechanical Engineer. Improvements in bridges.

Dated January 8, 1859.

68. E. Cobbold, of Hendon, Gentleman. Improvements in instruments for writing and marking, and for the preparation of certain substances for conversion into instruments for writing and marking, and for the application to useful purposes of certain products, arising from preparation aforesaid.

Dated January 19, 1859.

160. P. A. Sparre, of Stockholm. Improvements in the manufacture of paper, suitable for bank-notes, cheques, bills, and similar articles.

Dated January 21, 1859.

190. C. O'Hara, of Toronto, Canada, Esq. Improvements in propellers, for propelling steam-boats, ships, and vessels.

Dated January 22, 1859.

202. B. Templar, of Bristol, Dyer. Improvements in umbrellas and parasols.

204. M. Henry, of Fleet-st.. Improvements in machinery or apparatus for manufacturing corks and bungs. A communication from Messrs. Dalverny and Thouzellier.

206. T. W. Rammell, of Spring-gardens, Civil Engineer. Improvements in atmospheric propulsion, and the structures, tubes, machinery, and apparatus applicable thereto.

208. R. Barter, of Blarney, Cork, Doctor of Medicine. Improvements in heating and ventilating buildings, and in apparatus connected therewith.

Dated January 24, 1859.

209. W. C. Homersham, of Adelphi-terrace, Civil Engineer. Improvements in floating gridirons or stages for repairing ships or other vessels.

210. R. Mushet, of Coleford, Metallurgist. Improvements in the manufacture of cast steel and iron.

211. R. Mushet, of Coleford, Metallurgist. An improvement in the manufacture of cast steel.

212. R. A. Brooman, of 166 Fleet-st., E.C., Patent Agent. Improvements in pumps. A communication from F. Ruff, Paris.

213. J. Laubereau, of Paris, Civil Engineer. Improvements in air engines.

214. J. and W. H. Smith, of City-road, Manufacturers. Certain improvements in manufacturing paper, and in producing watermarks, patterns, figures, letters, and devices thereon, and in the construction of the mechanism employed therein.

215. J. Savory, and W. R. Barker, of New Bond-st., Chemists. Improvements in bottles for medicines and poisons.

216. J. Fowler, jun., of Cornhill, R. Burton, of Kingsland, D Greig, of New Cross, and J. Head, of Newcastle-on-Tyne. Improvements in agricultural implements, and in apparatus used for hauling agricultural implements by steam power.

217. A. Warner, of Threadneedle-st., and W. Tooth, of Southwark. Improvements in the manufactnre of iron, and gases for such and other uses.

218. J. G. Proger, and D. Davies, of Cardiff. Improvements in lanterns used on board ship to signal to the steersman.

219. Earl of Caithness, of Hill-st., Middlesex. Improvements in parts of the permanent way of railways.

220. M. Swan, of St. John's Wood, Civil Engineer. Improvements in ballasting ships, applicable also to the extinguishing fires on board ships.

221. William Tasker, jun., of Waterloo Iron Works, near Andover, Engineer. Improvements in ploughs.

Dated January 25, 1859.

223. J. H. Johnson, of Lincoln's-inn-fields. Improvements in machinery or apparatus for cutting and shaping wood. A communication from P. H. Niles.

224. R. Bodmer, of Thavies' Inn. Improved resin and resinous substances. A communication from J. Creuseton.

225. W. Cutts, of Oldham, Engineer. Improvements in the manufacture of bobbins, spools, and cop tubes, and in the machinery employed therein.

226. W. and H. Hodgson, of Bradford, York, Tool Makers. Improvements in machinery or apparatus for preparing and spinning wool and other fibrous substances.

227. J. White, of Finchley, Surgeon. Improvements in means or apparatus to facilitate respiration under water, or under the influence of fire, or in other situations where an artificial supply of air may be required, part of which improvements is also adapted to facilitate movements in or upon the surface of water.

228. W. Andrews, of Cornhill, Engineer of the Submarine Telegraph Co. Improvements in electric telegraphs.

229. F. J. Jones, of Aldermanbury, Manufacturer. An improvement in shirt fronts.

230. H. Brecknell, of Bristol, Brass Founder, and J. Dyer, of the same place, Gentleman. Improvements in cocks and valves.

231. I. Woodcock, of Spitalfields, Frame Maker. Improvements in barometer and thermometer dials.

232. B. Spedding, of Birkenhead. Improvements in apparatus for generating and regulating gas, and for impregnating the same with volatile hydrocarbon fluids.

233. C. G. Kelvey, and W. Holland, of Birkenhead, Chronometer Makers. An improved escapement for chronometers and other time-keepers.

234. W. E. Newton, of Chancery-lane. An improvement in life preserving vests. A communication from A. T. Diano.

Dated January 27, 1859.

235. W. R. Alexander, of Glasgow, Merchant. Improvements in furnaces, and apparatus for the manufacture of sugar, and for the consumption or prevention of smoke.

236. I. Hammond, of Winchester, Gun Maker. Improvements in breech loading fire arms, and in cartridges to be used therewith.

237. O. Hussey, of Baltimore. Improvements in the construction of ships' blocks.

238. D. Graham, of Wapping, Millwright and Engineer. An improved method of driving centrifugal machines. A communication from T. Hanning.

239. J. Wells, of Keighley, Brass Founder, and W. Clough, of Sutton, near Keighley, Millwright. An improved coupling for railway carriages and analogous uses.

240. F. C. C. Paulsen and A. Alsing, of Linehouse. Improvements in preparing beverages usually called punch.

241. M. Fernandez, of Devonshire-sq., Bishopsgate, Merchant. Improvements in straw and hay cutters.

242. J. Kerr, of Southwark, Engineer. Improvements in the construction of revolving fire arms.

243. J. Mercer, of Boston, United States, Currier. Improvements in the process of currying leather. A communication from J. Armstrong.

244. W. Azer, of Rhorsburg, Columbia. Improvements in machinery for cleaning rice.

245. T. Hartshorne, of West Bromwich, Brassfounder. An improved metal to be used for making journey brasses for mills, rollers, forges, and all kinds of shafts and machinery, and also for shipping and for bearings for shafts and journey brasses in general.

246. E. Dixon, and H. Whittaker, of Preston, Mechanics. Improvements in apparatus used in weaving textile fabrics.

247. J. Meacham, of Birmingham. Improvements in pens and penholders.

248. H. D. P. Cunningham, of Bury, near Gosport, Esq., An improvement in the rig of ships or vessels.

249. H. Rawson, of Leicester. Improvements in machinery for preparing wool and other fibrous substances.

250. J. Buckingham, of Walworth Common, Civil Engineer, and G. Salt, of Saltaire, near Bradford, Manufacturer. Improvements in the construction and adaptation of drawing and other rollers employed in drawing and compressing fibres, which improved construction of rollers is also applicable in compressing fabrics.

251. E. T. Hughes, of Chancery-lane. Improvements in the manufacture of biscuits. A communication from Messrs. Pascal and Sirben.

252. G. F. Bradbury, of Oldham, and J. J. King, of Glasgow. Improvements in certain apparatus applicable to sewing machines.

253. W. Crowther, of Leeds, Manufacturing Chemist. Improvements in the manufacture of prussiates of potash or soda, and in recovering a useful material therefrom.

254. J. Gathercole, of Camberwell New-road, Gentleman. Improved machinery for manufacturing envelopes and paper bags.

Dated January 28, 1859.

255. I. Zacheroni, of Liverpool, Artist. An improved method of preventing the escape of smoke into the atmosphere, and in the construction of chimney pots or tops for curing smoking chimneys.

256. W. Robertson, of Manchester, Mechanician. A new apparatus for propelling boats on canals, rivers, and lakes of moderate depth.

257. G. Bartholomew, of Linlithgow, Tool Maker. Improvements in shoes for horses and other animals requiring such shoes, and in the means of attaching the same to the feet.

258. C. E. Amos, of Southwark, and J. Francis, of Bangor, Engineers. Improvements in water pressure engines, and their application to pumping machinery.

259. F. Prince, of New Bond-st., Gunmaker. A new breech-loading gun.

260. W. Yates, of Bromley, Middlesex, Engineer. Improvements in furnaces.

261. R. Griffiths, of Mornington-road. Improvements in regulating the pressure of steam in boilers, and in preventing the accumulation of deposit therein. Partly a communication from C. N. Copeland.

262. H. Watson, of Newcastle-on-Tyne. Improvements in the manufacture of Knotter plates, used in the manufacture of paper.

263. A. Barclay, of Kilmarnock, Engineer. Improvements in obtaining and distributing or applying electricity and magnetism.

Dated January 29, 1859.

264. L. Leisler, of Glasgow, Merchant. Improvements in extracting metallic copper from the pyrites residuum of vitriol works, and from other substances. A communication from Dr. Hasenclever.

265. J Lane, of West Bromwich, Machinist. New or improved machinery for the manufacture of screws, and for tapping nuts for screws.

266. J. MacKenzie, of St Martin's-le-grand, Gas Engineer. An improved method of operating ventilating valves, especially applicable to ventilating gas burners.

267. J. Marino, of Stockholm, Mechanician. An inodorous closet or commode.

268. G. Davies, of Serle-st., Lincoln's Inn. Improvements in apparatus applicable to measuring, regulating the pressure of, and consuming gas for illumination. A communication from J. M. Legris.

269. H. Grissell, of Eagle Wharf-road, Engineer. Improvements in machinery for moving ships or vessels on slips or inclined ways.

271. J. Meacham, of Birmingham. Improvements in apparatus for clasping and closing books, purses, reticules, and other similar articles, and for retaining and securing paper documents, letters, bills, and other memoranda.

Dated January, 31, 1859.

272. T. P. Smith, of Stanmore, Schoolmaster. An apparatus for guiding or directing the pen or pencil in writing or drawing.

274. J. Raywood, of Wentworth, Yorkshire, Engineer. Certain improvements in the constructton and method of working sewing machines.

276. J. Robertson, of Glasgow, Engineer. Improvements in details, by which motive force is transmitted in machinery.

278. J. P. Booth, of Cork, Feather Factor. Improvements in ventilating ships.

Dated February 1, 1859.

280. J. Grimond, of Manchester, Manufacturer. Improvements in the manufacture of hearth rugs.

282. J. Hosking, of Gateshead, and T. Cock, of Cleatormoor, near Whitehaven. Improvements in furnaces or fire places.

286. M. A. Walker, and R. Walker, of Birmingham, Percussion Cap Makers. Certain improvements in the manufacture of percussion-caps, and in the apparatus for effecting certain parts of the same.

288. T. P. Purssglove, of Battersea. Improvements in barometers.

292. C. Crockford, of Holywell, Flintshire, Smelter. A mode or method of producing metallic sulphates.

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294. E. H. Bentall, of Heybridge, Essex, Ironfounder. Improvements applicable to machinery for grinding or pulverising various substances.

Dated February 2, 1859.

296. E. E. Allen, of Brompton-row, Engineer. Improvements in stereoscopic apparatuses.

298. R. Lancaster, of Orrell, near Wigan, Mining Engineer. An improved mode of ventilating coal and other mines.

300. J. R. Cooper, of Birmingham, Gun Maker. Improvements in breech-loading fire arms.

302. J. Buncher, of Birmingham, Brass Founder. Improvements in the manufacture of eyes or fastenings for stair rods.

304. J. Hirst, jun., of Saddleworth, York, Merchant, and J. Hollingworth, of the same place, Joiner. Improvements in the construction of power looms.

306. H. F. Kemp, and W. Skey, of Louth. An improved food for cattle.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

325. J. M. E. Masson, of Evreux, France, Gentleman. Improvements in apparatus to facilitate working under water. Dated Feb. 4, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, Feb.* 15, 1859.)

2198. J. C. and E. W. Holman. Pianoforte action.
2201. R. Dolby and J. Gates. Transfer printing.
2205. F. Trevithick. Sails and keels of vessels.
2212. G. Hamilton and W. H. Nash. Locks.
2221. C. Hill. Omnibuses.
2225. C. Baylis. Under-ground chambers for pipes, &c.
2226. D. Nicoll. Cloaks and other garments.
2229. J. C. Nouveau. Stoppering bottles.
2230. D. Naylor. Looms.
2234. J. Luis. Press. A communication.
2235. J. Leetch. Fire-arms.
2236. E. V. Rippingille. Fire-arms.
2237. T. Waller. Stoves and fire-places.
2242. T. Roberts and J. Dale. Obtaining salts.
2244. A. Felton. Fixing eylets.
2247. F. W. Gerhard. Aluminium and sodium.
2252. W. Crofts. Twist lace machinery.
2259. J. Beattie. Steam-engines.
2269. J. F. Swinburn. Fire-arms.
2280. R. Ridley. Safety cages.
2283. A. Benda. Models of figures. A communication.
2291. T. Ingram. Signalling.
2292. W. Clark. Tanning hides. A communication.
2294. H. Martin. Starch and gluten.
2306. G. T. Bousfield. Wood screws. A communication.
2323. R. A. Brooman. Chains and links. A communication.
2326. A. W. Drayson and C. R. Binney. Telegraph cables.
2338. J. Grant. Ovens.
2364. R. Kennedy and J. Armstrong. Drying grain.
2365. C. Clay. Cultivating land.
2387. B. Goodfellow. Steam engines.
2410. J. Smith. Hats.
2487. W. Ziervogel. Distilling.
2493. E. Alcan. Paper. A communication.
2648. R. Nelson. Raising water.
2809. M. A. F. Mennons. Lever balances. A communication.
2908. S. Hunter. Anchors.
2954. J. Radley. Cooking apparatus.
2995. S. S. Bateson. Generating steam.
68. E. Cobbold. Writing and marking instruments.
82. B. Robbin. Working pumps.
221. W. Tasker, jun. Ploughs.
224. R. Bodmer. Resin. A communication.
237. O. Hussey. Ships' blocks.
250. J. Buckingham and G. Salt. Drawing rollers.
261. R. Griffiths. Steam boilers. Partly a communication.
263. A. Barclay. Electricity and magnetism.
304. J. Hirst, jun., and J. Hollingworth. Power looms.
325. J. M. E. Masson. Working under water.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed February 11, 1859.

1824. J. T. Pitman.
1826. R. C. Gist.
1840. R. Jobson.
1842. R. Jobson.
1844. R. Jobson.
1845. W. B. Nortcliffe.
1848. C. L. Light.
1850. J. Petrie, jun.
1851. T. Worth and H. Spencer.
1855. J. Cartmel.
1857. J. Holt.
1858. J. Smith and S. A. Chase.
1860. S. C. Lister and J. Warburton.
1879. J. Luis.
1885. A. Pilbeam.
1918. W. H. Harfield.
1954. J. D. Brabazon.
1988. A. V. Newton.
2001. G. T. Bousfield.
2111. T. Vicars, sen., T. Vicars, jun., T. Ashmore, and J. Smith.
2321. C. West.
2633. C. F. Vasserot.
2701. C. Burrell.
2720. C. Bodells.
2776. E. A. Servier.
2839. G. F. Wilson.

Sealed February 15, 1859.

1856. P. E. Chappuis.
1868. L. A. and E. I. E. Hermann.
1872. W. E. Evans.
1875. J. Norton.
1876. F. Shaw.
1901. F. F. Delpy.
1993. G. Price and W. Dawes.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

345. J. W. Duncan.
356. H. Bessemer.
359. R. A. Brooman.
363. J. Mills.
366. S. Fox.
380. W. McFarlane.
385. E. Morewood and G. Rogers.
390. E. Deiss.
403. H. J. Hyams.
405. A. V. Newton.
452. J. S. C. Heywood and G. Lloyd.

LIST OF SPECIFICATIONS, &c.

Published during the week ending February 11, 1859.

No.	Pr. s	Pr. d	No.	Pr. s	Pr. d	No.	Pr. s	Pr. d	No.	Pr. s	Pr. d	No.	Pr. s	Pr. d	No.	Pr. s	Pr. d
1493	1	5	1505	0	3	1518	0	7	1532	1	4	1543	0	7	1555	0	10
1494	0	5	1506	0	7	1519	1	5	1533	0	3	1544	0	3	1560	0	3
1495	0	6	1507	0	3	1520	1	5	1534	0	5	1546	1	4	1561	0	3
1496	0	3	1508	0	4	1522	1	3	1535	1	4	1547	4	9	1564	0	3
1497	2	3	1510	0	9	1523	0	5	1536	0	10	1548	0	3	1566	0	3
1498	0	7	1512	0	4	1524	0	6	1537	0	7	1549	0	3	1568	0	3
1499	0	4	1513	1	0	1526	0	3	1538	0	3	1550	0	3	1571	0	3
1500	3	4	1514	0	6	1528	0	8	1539	0	10	1551	1	5	1575	0	3
1502	0	6	1515	0	6	1529	0	7	1540	0	3	1552	0	9	1576	0	3
1503	0	7	1516	0	7	1530	0	3	1541	0	6	1553	0	3			
1504	1	7	1517	0	9	1531	0	10	1542	0	10	1554	0	10			

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINES, &c., 1365, 1367, 1374, 1385, 1390, 1394, 1419.
BOILERS AND THEIR FURNACES. *None.*
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1392.
SHIPS AND BOATS, including their fittings, 1366, 1386, 1387, 1388, 1389.
CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 1362
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals. *None.*
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1363, 1364, 1371, 1383, 1400, 1402, 1405.
BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c., 1391, 1399.
LIGHTING, HEATING, AND VENTILATING, 1372, 1398, 1403.
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1369, 1380, 1401, 1409.
METALS, including apparatus for their manufacture, 1368, 1376, 1410.
CHEMISTRY AND PHOTOGRAPHY, 1382, 1404.
ELECTRICAL APPARATUS, 1381.
WARFARE, 1373, 1321.
LETTER PRESS PRINTING &c. *None.*
MISCELLANEOUS, 1370, 1373, 1374, 1375, 1377, 1379, 1381, 1385, 1392, 1393, 1395, 1396, 1397, 1406, 1407, 1408.

1362. W. SAWNEY. *Improvements in apparatus applicable to screening, winnowing, and corn-dressing machines.* Dated June 16, 1858.

This invention consists:—1. In adapting to screens a set of toothed wheels to produce a quick tremulous motion of the screen. The wheels are mounted so as to admit of the screen resting upon them, and pieces of metal are inserted on the under side of the screen frame with inclined surfaces for the teeth of the wheels to work against successively, so as to raise the screen by the passing of the tooth over the inclined surface, and allow it to drop when the tooth has quitted the same. 2. In adapting to screens travelling brushes, for cleaning them while in use. The brushes are inserted in rollers, the axes of which are connected to a travelling endless chain on each side of the machine. The axes are mounted in grooved guides in the machine, or in such a way as to allow the brushes as they travel along to yield to the cross bars on the underside of the screen, by the roller in which they are inserted, being made to turn on coming into contact therewith. *Patent abandoned.*

1363. J. J. CREGEEN. *Improvements in the treatment of India and China grass, pine apple, hemp, flax, and other similar fibrous materials, and in the machinery or apparatus employed therein.* Dated June 16, 1858.

This invention relates to a mode of treating such vegetable fibres as India and China grass, pine apple, plantain, wild rhea, nilgerry nettle, fate, hemp, and flax, and other fibrous plants, whether green or after having been retted, in order that a silky or woolly material may be obtained, suitable for spinning. The patentee proposes to treat all resin-bound fibres (but especially pine apple and plantain, India and China grass, which cannot in this country be treated green from the soil) by steeping them in warm water, and afterwards washing and wringing them by pressing them between a drum, having an undulating surface, and small drums placed round it, or between two rollers having undulated surfaces. The central drum is heated in the wringing machines by passing the waste steam of the engine therein, or by gas-burners inside it, or otherwise, so as to wring the fibres, yarns, or fabrics nearly dry. The fibres are then bruised or crushed in a large perforated drum, having a slightly undulated surface, and fitted with ribs shaped like double or molar teeth, which ribs art in conjunction with others shaped like molar and canine teeth, and arranged alternately on the surfaces of a number of smaller and different sized drums surrounding the large one. When the fibres are dry a fan inside the main drum blows off the dust and resin. By making the surface of the main drum undulating, a beating action on the part of the smaller drums is obtained. This machinery can be driven either by hand, wind, water, or horse power, but the patentee prefers to connect the main drum with one of Hall's patent oscillating cylinder engines. The smaller drums surrounding the central drum are fitted in sliding brasses for readily disconnecting them from the teeth of the large drum. The brasses slide between anti-friction rollers. The fibres are next carried to steeping vats for the finishing process, previous to being spun, where they are steeped in oil of any kind, mixed with water and ammonia, or its carbonate, render the mixture saponaceous. The fibres are suspended in the vats by galvanised iron holders, and the hot water is poured over them into the vat through a perforated lid or cover. Steam pipes are used for keeping the mixture up to about 80° or 90° Fahr. If strength and length be preferred to fine quality of fibre, the patentee prefers immersing the fibres for about 12 hours in the saponaceous mixture, boiling water being added, and the whole then left to cool down under a closed cover. The fibres are now removed to a washing machine, which consists of a number of small fluted revolving rollers arranged round a central fluted and perforated drum. The lower rollers are partially immersed in a water tank, and a continuous jet of hot or cold water is directed into the perforated drum through its axle upon the fibres. The upper rollers squeeze out the dirty or resinous matter, and the attendant, after well washing the material, lifts it from the water tank, and passes it through the upper set of rollers only, whence it is removed, partially rung, to the dry wringing machines similar to that before referred to, which completes the process. These machines are applicable to the washing and wringing of yarns and piece goods. The same mode of treatment is equally applicable to green hemp and flax straws, and similar wood and resin-bound fibres, but in this case he first cleans out all the woody and resinous matter before washing and wringing and discharges, by means of hot water, all the dirt and resin. *Patent completed.*

1364. J. H. DICKSON. *Improvements in machinery or apparatus for scutching and hackling flax, hemp, and other similar fibrous materials.* Dated June 16, 1858.

This invention relates to apparatus for scutching and hackling flax, hemp, India and China grass, and other similar fibrous substances, and consists in the use of a peculiar combination of brushes, and scrapers, and openings, the scutching and hackling being effected in one machine. The fibres are presented to this machine by a pair of fluted nipping rollers in connection with a feeding drum, having a partial rotatory motion imparted to it by an internal segmental rack and a pinion. This drum is moved forward towards the cleaners and openers by a screw spindle, so that the fibres (which lay over a leather apron when under treatment) are accurately presented to the cleaning and opening apparatus. The openers which first operate on the fibres consist of blades or scrapers attached to rotatory arms at gradually diminishing distances from the centre, and are each fitted on their outer flat surfaces with projecting teeth, which incline back slightly, so as not to tear the fibres as they pass through them. The cleaners and brushers consist of brushes attached also to rotatory arms, and having spring knives placed within them for scraping or brushing off the resin and woody matter. The feeding drum is slowly turned round while the fibre is being operated upon, so as to present the whole length of fibre successively to the revolving cleaners and openers. The feeding apparatus can be easily adapted to the Irish scutching machines; or a round horizontal revolving table may be used with suitable holders and circular cleaners and openers of the description above referred to, these latter fitting the periphery of the horizontal table. *Patent completed.*

1365. J. C. HILL. *Improved apparatus for ascertaining and indicating the height of water in steam boilers.* Dated June 16, 1858.

The inventor connects a float (by a rod or cord, say) to a balance wheel, counterweighted on the opposite side, and fixed to a spindle which is mounted in bearings in the fork of a vertical steam pipe, and is perforated transversely like the spigot of a cock. When the hole in the spindle is brought opposite the steam pipe (which it is when the water either rises or falls excessively) steam passes to the whistles. A visible indicator may be also attached to the balance wheel. *Patent abandoned.*

1366. J. WESTWOOD. *Improvements in the construction of iron ships.* Dated June 16, 1858.

This invention was described at p. 47 of No. 3, for Jan. 14, 1859. *Patent abandoned.*

1367. G. DAVIES. *An improved equilibrium slide valve for steam engines.* (A communication.) Dated June 16, 1858.

The inventor's object is to obviate, in a great measure, the expense and delay of converting an ordinary slide valve into an equilibrium slide valve, by retaining the ordinary valve face, the steam induction and eduction passages, and the valve rod, so that only the valve itself and its casing require alteration. The form of the valve employed is

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prismatic, and it is enclosed in a well-fitting case or cap, which serves as a guide to its longitudinal movement. This casing is A shaped, forming two sides of the prism, and the cylinder facing containing the steam ports forms its third side. In order to poise the middle of the valve, the steam is allowed to escape round the out-side of the valve by a groove passing round it. The steam passes to both ends of the box, either along an exterior passage, or through a longitudinal canal formed through the valve, in order that there may be the same pressure at each end of the valve. And in order further to counterbalance the outward pressure of the steam in the cylinder, the sides of the said canal are perforated, to admit steam between the upper sides of the valve and the casing or cap. In order to compensate for wear, one of the sides of the casing is recessed, and is fitted with a moveable plate, which is kept up to its work by wedges at the back, which are advanced when necessary, say by a screw. *Patent completed.*

1368. T. STEVEN. *Improvements in making moulds for casting.* Dated June 16, 1858.

Claims, 1, making external moulds—for casting pipes and other articles having two halves symmetrical about a plane through their respective axes, "and of which the halves require for their proper adjustment the coincidence of at least two pairs of counterpart points in their sectional surfaces"—by means of half patterns placed upon flat plates, as described. 2, making cores for pipes and similar moulds, by means of a pattern which forms a recess in one half of the core to receive the projecting part of the core bar partly imbedded in the other half of the core, and by shaping the said pattern and core bar respectively so as to form passages for air or vapour in the finished core. 3, the use, in moulds for casting axle bushes for cart wheels, of metal surfaces for chilling the ends of the bushes, as described. *Patent completed.*

1369. J. H. MARSDEN. *Certain improvements in the manufacture of hats.* Dated June 17, 1858.

This invention consists in forming the body of hats of straw, grass, chip, palm leaf, or other similar material, and the brim of felt, gossamer, or other suitable material, thus combining durability with lightness. *Patent abandoned.*

1370. F. WALTON. *A new or improved manufacture of japanned wares.* Dated June 17, 1858.

The inventor makes the body of iron as usual, applies a coating of black japan or other varnish, sprinkles on a powdered vegetable fibre—say, unsized paper pounded—hardens the japan, &c. (by stoving or otherwise), pastes sheets of unsized paper upon the flock (as in making papier maché), and finishes as is usual with japanned wares. *Patent abandoned.*

1371. J. HASLAM. *Improvements in looms for weaving, and also in shuttles and pickers connected therewith.* Dated June 17, 1858.

This invention consists, 1, of a longitudinal slide plate attached to the shuttle box, and so arranged that the back or top of the picker shall work in or against it, to steady the picker. 2, in cutting away part of the shuttle near the point, either at the top, bottom, or side, to form a shoulder against which the picker is to strike (instead of against the point as hertofore), so that a more solid blow is given, and the picker is not so soon worn out as when it strikes the metal point of the shuttle. The shape of the spring which acts upon the cop pin is also somewhat varied, to avoid the necessity of cutting away so much of the wood of the shuttle as usual. 3, in forming the pickers with a solid projection adapted to strike against the above shoulder of the shuttle. The picker may be of any suitable material, and the hole through which the guide-rod runs is to be fitted with a fast or loose bush of metal, glass, or earthenware. *Patent abandoned.*

1372. J. ALLARDICE and W. MILLER. *Improvements in gas-liers.* Dated June 17, 1858.

This invention was described at p. 47 of No. 3, for Jan. 14, 1859. *Patent abandoned.*

1373. A. DAWSON. *Improved apparatus for converting small coals or coal dust, or small coals and coke, or coal dust and coke, with the admixture of water or other materials, into artificial fuel.* Dated June 17, 1858.

Claims, 1. "The making of an endless trough such that the bass or bottom parts are so formed and connected to each other that, during the motion of the trough, these bottom parts form as they pass round the cylinder at each end of the chamber a smooth cylindrical surface, whereby the materials are capable of being scraped off the trough without exposure to the atmosphere. 2. The passing the endless trough with the materials into the heated chamber in such a manner that the top of the chamber forms the corner of the trough, and thus the materials are heated in the closed part of endless trough. 3. The general combination of the above described parts, which form the complete apparatus for manufacturing the blocks of fuel as above described." *Patent completed.*

1374. G. HALE. *Improved apparatus for obtaining motive power.* Dated June 17, 1858.

This relates to a mode of imparting motion and power to a horizontal shaft by means of a series of weighted levers, the weights of which shift so as to produce continuous motion. *Patent abandoned.*

1375. S. and D. TAYLOR. *Improvements in machinery or apparatus for putting machine straps or belts on to pulleys or drums, and for removing the same.* Dated June 17, 1858.

The inventor claims the use of a supporting surface for receiving the strap, capable of being removed from, and brought into coincidence with, the periphery of the drum; and also a siding apparatus described therewith for pushing forward the strap. *Patent completed.*

1376. C. CROCKFORD. *Improvements in the treatment of he ores of zinc, and in spelter making.* Dated June 17, 1858.

This invention consists, 1, in utilizing the sulphur contained in the ores of zinc. For this purpose the inventor so constructs a furnace for calcining the sulphuret of zinc that it may be introduced continuously in small quantity at one end of a chamber heated from below, and as it traverses the said chamber be acted on by a current of heated air, whereby the sulphur is converted into sulphurous acid which passes away in a continuous stream, and may be used for making sulphuric acid, or for any other purpose. 2, in a mode of treating carbonate of zinc for obtaining carbonic acid, &c. The carbonate is treated in a vessel with sulphuric or muriatic acid, and carbonic acid is given off. The sulphate or muriate of zinc which is also formed may also be collected and used. 3, in a mode of obtaining products from the zinc vapours passing through the flues of the retort furnaces used in spelter making. He injects a stream of muriatic gas and a jet of steam into such flues, whereby the zinc fumes are converted into muriate of zinc, which may be condensed and collected. Or muriatic or other acid may be thrown into the flues in showers, and zinc salt be collected. 4, in treating the residue left in the retorts after the reduction is completed. This residue consists of about equal proportions of oxide of iron and oxide of zinc, and this being mixed with a small quantity of clay, or lime, or both, is submitted to a blast in a cupola or blast furnace the vent of which is conducted into a cistern of water. The iron is thus reduced, and may be drawn off at the tap-hole. The oxide of zinc is carried into and deposited in the water, whence it is collected. *Patent abandoned.*

1377. W. BLIZZARD. *Improvements in india-rubber, gutta percha, and drying and other oils.* Dated June 18, 1858.

This invention is for manufacturing from india-rubber and gutta percha a transparent solution for indurating textile fabrics, papers, woods, marble, stone, cements, and all other porous materials, to render them waterproof. The agents used are sometimes plain water, or water with seeds dissolved therein, to which is sometimes added a little quick lime. These are sometimes submitted to different degrees of temperature. *Patent abandoned.*

1378. J. SHAW. *Improvements in fire-arms.* Dated June 18, 1858.

The inventor uses a safety bolt, which locks the hammer, except when pressure is applied to the end of the stock, as when it is pressed against the shoulder previous to firing. *Patent abandoned.*

379. R. S. NEWALL. *Improvements in the manufacture of cords, ropes, and cables.* Dated June 18, 1858.

This consists in laying yarns into a strand so as to retain the twist given to them in the spinning. A number of such strands are then laid into a cord or rope without altering the twist of the strands. The yarns or strands may also be laid round a core, which core may be either of yarns, or an insulated wire, so as to form, in the latter case, a submarine electric cable. *Patent abandoned.*

1380. W. SPENCE. *Improvements in clogs, shoes, or supports for the feet.* (A communication.) Dated June 18, 1858.

Here the sole is of thin metal, hinged to give flexibility. At the hinder end is a shell of leather or metal to receive the heel, and at the fore part is a toe piece of leather or metal. A blade or skate, hinged like the sole, is rivetted to the shoe. On each side of the sole at the hinder part is a lug in which is inserted a stud for holding each end of a strap for confining the sole to the foot. The strap is fitted so as to be adapted to the height of the instep of the foot. *Patent abandoned.*

1381. P. B. E. MARTIN. *Improvements in obtaining electro-motive power.* Dated June 18, 1858.

This invention consists in obtaining motive power by means of the expansion or dilatation produced in a mixture of combustible gas and air, on the same being put into a state of combustion by the electric spark, either with or without the aid of steam generated by the combustion of the said gas and air, or of steam otherwise generated. The heated dilating gasses may be applied to heat a steam boiler, or the gasses and vapour combined may be employed in the same manner as ordinary steam to produce motion by direct re-action upon fluids for propelling vessels or otherwise; or they may be used for projecting projectiles, and for any other purposes to which such sources of power may be applicable. *Patent completed.*

1382. F. G. SPILSBURY. *Making tungstic acid and certain of its salts, and for using the same to decolour acetic acid and its compounds.* Dated June 19, 1858.

The inventor mixes with wolfram—or with ores containing wolfram—bisulphate of soda or potash, or a mixture of sulphate, or muriate of soda or potash, and sulphuric acid, and subjects the whole to a red heat, "until the wolfram is separated into tungstic acid, and sulphate of iron, and magnesia." He decolours acetic acid by boiling a solution of coloured acetate of lime or lead with tungstic acid, whereby the colouring matter is precipitated with the tungstate of lime or lead, and acetic acid is left in solution. He then combines the acetic acid with oxide of lead or barytes, and precipitates with tungstate of soda, whereby he obtains tungstate of lead or barytes, and pure acetate of soda. He prepares tungstate of soda or potash by boiling wolfram, or tin ores containing wolfram, under pressure in solutions of caustic soda or potash. He also decolours acetate of lime or lead by adding tungstate of soda to its solution. Lastly, he obtains tungstate of lead, barytes, strontian or lime, by boiling their respective sulphates or carbonates (with or without pressure) in a solution of tunstate of soda or potash; or by heating in a furnace either of the above sulphates or carbonates, previously ground, with dry tunstate of soda or potash, or dry tungstic acid. *Patent abandoned.*

1383. S. HEWITT. *An improved application of printed designs to cotton and other fabrics, and for improvements in the treatment during the processes of printing and finishing such fabrics.* Dated June 19, 1858.

This consists in printing the design on one or both sides of a woven fabric, having a pattern thrown up in the weaving on the plain side; and in then dyeing such printed fabrics in fast colours. Also, in certain treatment during the printing and finishing. The object of these improvements is to produce fabrics on which the design is printed in imitation of fabrics with woven designs. *Patent completed.*

1384. Application was made for the provisional protection of an invention bearing this number, but the protection was refused by the law officer. *Patent abandoned.*

1385. J. BRADSHAW. *Certain improvements in apparatus for obtaining and producing motive power.* Dated June 19, 1858.

Here a vertical shaft carries a horizontal disc furnished with radial iron bars which are permanently magnetised, and the poles of which are alternated. Above these bars, and just clear of them, is arranged a series of electro-magnetic coils, connected with a battery. The magnets of these coils impart motion to the bars (and therefore to the disc and shaft) both by attraction and repulsion, as is well understood. *Patent abandoned.*

1386. R. and T. WINANS. *A new and useful improvement in the form of the hulls of steam vessels.* Dated June 19, 1858.

The inventor forms the hulls of vessels with all their transverse sections, circles, and all their longitudinal axial sections composed of two arcs of a circle, their object being "to diminish the variation of resistance to winds and waves which causes a vessel to roll;" and "to diminish those resistances which prevent the vessel when 'careened' or inclined to one side from 'righting.'" *Patent completed.*

1387. R. and T. WINANS. *A new and improved steam vessel.* Dated June 19, 1858.

This invention, which relates particularly to ocean steamers, and has for its object "the attainment of a more constant rate of progression under different conditions of weather than is attainable in vessels of the ordinary form," consists in the combination of a hull circular in all its sections and tapering towards both ends, with a transverse vertical propeller occupying a space between the two portoins of the vessel, which are secured together by a framing or "sleeve" extending over the propeller. The invention also comprises the "sleeve" and a series of ribs for connecting the ends of this sleeve respectively with the adjacent ends of the two parts of the vessel, steadying the vessel like a keel, and with the "sleeve" directing the water to and from the blades of the propeller. And it further consists of means for affording ingress to, and egress from, each of the two parts of the vessel, a communication between them, and a means of ventilating them. *Patent completed.*

1388. R. and T. WINANS. *A new and useful improvement in ocean steamers.* Dated June 19, 1858.

This invention consists in the combination of a vertical transvere trunk within the hull of a vessel, with a large screw propeller, the blades of which project beyond the hull. *Patent completed.*

1389. R. and T. WINANS. *A new and useful improvement in the mode of combining the engines and propeller shafts of steam vessels.* Dated June 19, 1858.

This invention consists in the combination of two engines, or two sets of engines, with an intermediate vertical transverse propelling wheel, to the shaft of which the engines are connected. *Patent completed.*

1390. R. HALLDON. *Certain improvements connected with engines worked by steam or atmospheric power.* Dated June 19, 1858.

This invention consists in increasing the power of engines by interposing lazy-tong levers between the piston rod and the crank. *Patent abandoned.*

1391. H. BECU. *Improvements in the manufacture of laths, and in fixing and nailing the same.* Dated June 19, 1858.

The inventor cuts parallel slots through long pieces of wood, each thick enough to be slit up into several laths, leaving solid wood between the slots to come against the joists or timbers to which they are to be nailed. He then slits these pieces into laths of a proper thickness, such laths are nailed to the joists or timbers through their solid parts. *Patent completed.*

1392. Sir J. C. ANDERSON, Bart. *Improvements in locomotion, parts of which are applicable for other purposes.* Dated June 21, 1858.

1. On a concrete and stone foundation the inventor places a pavement of stone, bricks, or wood, or timber plated with iron, and on this a tramway. Between the rails of his tramway he lays down a T rail, and to the locomotive he connects horizontal wheels running under the head of this T rail, which wheels guide the train round curves, and prevent its leaving the line. 2. When a train has to ascend an incline, he connects to it one end of a rope which passes round a pulley at the top of the hill, and has attached to its other end a loaded carriage, which counterbalances the weight of the train, and leaves the engine its usual amount of duty only. 3. He makes the flanges of his wheels partly conical (like ordinary railway wheel flanges) and partly cylindrical; the conical part runs on the rails, and the cylindrical part runs when desired on common roads. 4. For ascending inclines, he builds a small inner wheel on the inside of each of the outer wheels, and lays down a raised track for such small wheel to run on, taking the weight of the train. He thus loses speed but gains power. The small wheels and their track may be cogged if necessary. 5. To the fore wheels he connects steering apparatus to run the train off the rails when necessary. 6. To increase friction he causes the carriage wheels to run on the concave surfaces of larger wheels, and provides for causing "the weight of each carriage to become a propelling power." 7. He has an arrangement for drawing a vertical shaft by means of a locomotive attached to a beam projecting horizontally from the said shaft, and running on a circular cogged tram-road, in such manner that "gravitation" will become a propelling power, which may be increased to any extent. 8. By forcing air by a fan through a small pipe contained within a large one, the latter being open at both ends, and leading from the front of the locomotive into the ash-pit, a strong blast is to be drawn through the large outer pipe into the ash-pit. *Patent abandoned.*

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1393. H. H. HENSON. *Preserving or waterproofing ropes, strands, cordage, cables, and other similar articles.* Dated June 21, 1858.

The inventor coats the ropes, &c., with wax, resin, glue, shellac, India rubber, gutta percha, vulcanite, marine glue, or oil, paints, pitch, tar, varnish, or japan, or solutions of any of these in naptha, turpentine, or other solvent, or mixtures of any two or more of them, and he then passes the ropes, &c., if required, through grooved rollers, or finishes in the ordinary manner. Or he saturates the fibre, the rope, &c., with any of the above-mentioned materials, or with tallow, mixed or unmixed with arsenic, or with tannin, with or without subsequent subjection to fatty matter, or to a mixture of water, sulphate, or silicate of potash, and alumina, and compounds of lead, or to a saponaceous matter, and subjects them to the action of silicate solutions; and he effects their saturation by immersion, or by pressure, or exhaustion, with suitable vessels and chambers. Or he passes the rope or other article, when complete, through a mixture of asphalte, vulcanite, marine glue, gutta percha, or other similar material, and then passes it through rollers grooved to give it any desired form, and dusts it with siliceous compounds, vegetable, or animal dust, or powder, or covers it with hemp. Or he covers the rope, or each strand forming the rope, &c., with a covering of pure or mineralised caoutchouc. *Patent completed.*

1394. R. A. BROOMAN. *Improvements in steam cocks.* (A communication.) Dated June 21, 1858.

This invention consists in constructing steam cocks, so that the plugs shall not be liable to stick or jam, and that steam may not pass off through the casing in which the plugs are fitted. The plugs are made in brass, hollow and conical, and have a small aperture open to the steam when passage through the cocks is shut off, which aperture leads into a space between the solid top of the plug and a cap or shield formed on the lower part of the key for turning the plug. The cap or shield is kept from rising by a cover bolted on to the body of the cock; in this cover there is a stuffing-box, through which the shaft of the key works. A screw works through a stuffing-box bolted to the bottom of the body of the cock, which can be brought to bear on the bottom of the plug, and, if necessary, ease it up off its bearings. The body of the cock may, for economy's sake, be made of iron and the plug of brass, or the whole may be of brass, or gun or other suitable metal. *Patent abandoned.*

1395. R. A. BROOMAN. *Improvements in treating wood to preserve and colour it, and in apparatuses to be employed therein.* (A communication.) Dated June 21, 1858.

These improvements consist, 1, in extracting the air from the cells of the wood to be treated in a close vessel; in then admitting of steam, which will enter, heat, and expand the cells of the wood; in then withdrawing the steam, and finally in forcing, preserving, or colouring fluids into the vessel, and into the expanded cells of the wood. The preserving fluids employed are the metallic salts in solution, principally the sulphate of copper, with which is sometimes combined sea salt, or sulphate of soda, or both. The colouring fluids employed may be of any suitable kind. They consist 2, in the employment for the purpose described of a cylindrical, or other vessel, with a moveable end or cover attached to it by hooks or screws, with a ring of india rubber between the two, with which are also combined a pump for exhausting it, a boiler for supplying it with steam, and reservoirs for supplying it with preserving and colouring fluids, together with suitable pipes, taps, valves, pressure guages, &c. They consist, 3, in treating telegraph posts, and other lengths of wood, by smoothing one of the ends of each, and placing upon the smoothed end a ring of india rubber, and against that a disc or discs of wood, or other material, so as to form a closed chamber within the india-rubber ring, and by forcing a preserving fluid into this chamber under great pressure, until the fluid is caused to penetrate and pass through the timber, saturating the same. The discs are temporarily secured to the ends of the posts by bolts or screws, or otherwise, and have a hole in the centre to admit the fluid. By connecting a number of flexible cubes to one feed-pipe, and leading such flexible tube to a post, any number of posts may be treated simultaneously. By means of this invention a continuous current of steam may be passed through or into the wood under treatment, and withdrawn by the action of the condenser, so that it will not condense in the pores of the wood. The employment of a separate condenser in communication with the vessel containing the wood, also prevents that cooling down of the vessel which results from the system of direct condensation. If the preserving and colouring solutions be introduced hot, they will tend to still further distend the pores of the wood which the steam has already distended, and thus to impregnate the wood more effectually than otherwise. *Patent completed.*

1396. J. LAWDER. *A method of supporting or carrying knapsacks, packs, and other weights on the back.* Dated June 21, 1858.

This invention consists in attaching two straps to the fore part of the body of the trousers, one on each side, the two to be united, say by a buckle, when on the wearer. Through an aperture in each side of the coat the inventor connects this strap by hooks to the waist belt, and brings straps attached to the knapsack or weight to be carried over the shoulders, one on each side, and connects these straps to the waist belt; or, if preferred, directly to the straps on the trousers. The bottom of the knapsack, or weight to be carried, is furnished with a steadying strap, which is connected at back to the waist belt. *Patent abandoned.*

1397. J. CROSSLEY. *Improvements in machinery for grinding, smoothing, and polishing glass.* Dated June 21, 1858.

In carrying out this invention a vertical crank shaft or axis communicates rotatory motion by two connecting bars or rods to two other upright cranked axes, and these axes are connected by a third connecting bar or rod longer than the other two. Each bar has a bearing for the upright axis of one runner, the longer one giving motion to two runners. The glass to be ground, &c., is so fixed on a horizontal table, that the rubbers will each be caused to be moved on its surface by the connecting bars or rods, the axis of each rubber describing a like circle to the three cranks before mentioned, the rubbers being each also capable of rotating with its own axis, and the rubbers are so arranged that in their action they overlap each other's extent of action and the edges of the glass. The number of cranks, connecting bars, &c., may be varied. *Patent completed.*

1398. W. C. WILKINS. *Improvements in lamps.* Dated June 21, 1858.

This invention will be described in a future number. *Patent completed.*

1399. W. THRIFT and A. HIGH. *Improvements in house water-closets.* Dated June 21, 1858.

These improvements relate to the application of certain gear for actuating the water-supply valve, and the tumbling basin or soil pan, the motion being communicated thereto by the raising and falling of the seat of the closet by the weight of the person sitting on and removing therefrom. The inventor employs two basins, one in connection with the seat, the other with one arm on the axis of the tumbling pan, and with the valve to admit the water. When the seat is depressed, a weighted catch suspended from the end of the first lever (that connected with the seat) swings over a stop on the pan lever. When the sitter rises, the catch descends and moves the valve lever, but again releases itself before reaching its lowest position. Certain contrivances for causing the valve to shut slowly are also used. *Patent abandoned.*

1400. W. E. NEWTON. *An improved method of effecting the separation of the fibres of wood for the manufacture of paper therefrom, which is also applicable to the separation of the fibres of flax or other substances for the manufacture of textile fabrics, and also to the separation of other substances for similar or other purposes.* (A communication.)

This invention consists in subjecting wood, &c., in a strong cylinder to the action of steam, air, gas, hot water, or other fluid under a high pressure, for the purpose of charging its small tubes (in which the sap circulates), as well as the spaces between them, and in then suddenly projecting the wood from the cylinder into the atmosphere, or into a partial vacuum, the expansive force bursting the tubes, and separating the fibres. *Patent completed.*

1401. A. V. NEWTON. *An improvement in the manufacture of spoons and forks.* (A communication.) Dated June 21, 1858.

The inventor uses malleable cast iron instead of the copper or brass used in electro-plated ware. *Patent abandoned.*

1402. W. E. NEWTON. *Improvements in the process and machinery for obtaining from waste and refuse felted fabrics of wool, fur, or other materials, fibres in a suitable condition for being worked into felt and other fabrics.* (A communication.) Dated June 21, 1858.

This consists, 1, in subjecting the waste felts to the action of steam preparatory to, and in combination with, the action of machinery for picking and tearing the fibres from each other, the steam having the effect of loosening that interlocking of the fibres which is produced in the original felting action. 2. In tearing apart waste felts by combining a steaming apparatus with a picker, so that the felts may be thoroughly steamed before and during the picking operation. 3. In acting on fibres of fur or wool obtained from the disintegration of waste felts, so as to separate the fibres from impurities, and from lumps of felt which have not been thoroughly disintegrated, by so combining an inclined deflecting surface with a rotating picker or brush, that as the stock to be separated is separated from the feed rollers by the rapidly rotating picker or brush, and thrown violently against the inclined surface of the deflector, the separate fibres will be carried up by the current of air induced by the rotation of the picker, and discharged over the upper edge of the deflector, whilst the impurities and the lumps of felt will roll down the deflector, and be discharged at the bottom. *Patent completed.*

1403. G. R. SCRIVEN. *An improved apparatus for ventilating, and for circulating, moving, or otherwise acting upon air or other fluids.* Dated June 21, 1858.

This invention consists in the combination of a cylindrical drum of uniform diameter revolving on journals (by preference horizontal), one of which is tubular from the end of the drum, with a spiral pipe or passage coiled around or within the drum, open at one end, so as to freely admit air and water or other fluids in contact with one outer surface of the drum, with a free passage through such coils into the tubular journal, "into which the other end of one pipe or coiled passage enters water and air-tight through the said tubular journal into a vertical or other stationary pipe attached water and air-tight to it by the usual method of packing, and in which it turns out of one side pipe at its opposite end. A reservoir enclosing the clyndrical drum, and in which it revolves partially immersed in water or other fluid, provided with air and water feed-pipes, and a float valve to regulate the quantity of water therein. A reservoir of water and air-tight, into which the coiled pipe communicates through the tubular journal and the air and water discharge pipe, when necessary the discharge water pipe conducting back to the reservoir, and an air discharge pipe for the escape of air. Lastly a contrivance to receive the water or other fluid at its maximum point of elevation in the vertical pipe, and transfer it back to the cylindrical drum, there to act to one extent of its gravity as a motor, or driving power, any deficiency thereof being supplied by any known motive power, or by hand labour." *Patent abandoned.*

1404. H. DEACON. *Improvements in purifying alkaline lees.* Dated June 21, 1858.

This relates to processes for purifying the liquors or alkaline lees containing alkaline sulphides obtained in the manufacture of alkalines, such as soda and potash, or carbonates thereof. These processes consist, 1. In adding hydrated protoxide of iron, or hydrated peroxide, or hydrated magnetic oxide of iron, to such lees at any convenient temperature not exceeding 130° Fahr. 2. In separating at any lower temperature not exceeding 130° Fahr., the precipitate produced in and upon such lees, by the reaction at a higher temperature of any salt of iron, except its sulphides, or of any oxide of iron when added thereto. 3. In adding any salt of iron, or oxide of iron, to such lees in a state of concentration, at or near their boiling points, and in subsequently diluting them and separating the precipitate. 4. In exposing the said lees after any salt or oxide of iron, manganese, or zinc bars have been applied thereto, to the action of atmospheric air and agitation 5. In the application of temperatures between 130° Fahr. to such lees when containing any ferro or ferri-cyanides. 6. In the admixture of caustic lime or magnesia to the precipitate produced by a metallic salt or oxide reacting on such lees, for the purpose of retarding the oxidation of the precipitate during the separation of the alkaline lees therefrom. 7. In roasting such precipitate, when not mixed with lime or magnesia, with an alkaline chloride, with the view of producing a corresponding alkaline sulphate, so as to utilise the precipitate. *Patent completed.*

1405. M. MAYALL and G. JACKSON. *Improvements in machinery or apparatus for spinning cotton and other fibrous substances.* Dated June 22, 1858.

This relates to the self-acting mule, and consists in substituting a friction coupling for the ordinary clutch-box gearing hitherto used on the vertical shaft, which causes the drawing up or running in of the mule carriage. This coupling may be adjusted to convey any required amount of driving power, and to stop the carriage on the slightest obstruction occurring. *Patent abandoned.*

1406. G. SCHAUB. *Improvements in the manufacture of door plates, sign-boards, and other surfaces, having inscriptions, designs, or ornaments thereon, and in the manufacture of detached letters, designs, and ornaments to be affixed to walls and sign-boards or used for other like purposes.* Dated June 22, 1858.

Claims: 1. Manufacturing the above-named articles by electro-deposition, either upon a compound matrix, built up of separate matrices, or upon a matrix obtained by taking a mould from a pattern surface, built up of several pieces, or made of separate pieces attached to a plain surface. 2. Manufacturing such articles by casting an easily fixed metal, or alloy, or plaster of Paris, or other cement upon the backs of letters or ornaments placed face downwards in the proper order upon a plane surface. 3. Manufacturing such articles by electro-deposition effected on matrices, portions of which are stopped out by varnish, gutta percha, or other non-conductor of electricity, the said matrices being obtained by electro-deposition from plates engraved with lines serving as guides in applying the varnish, or the said matrices being produced by transferring designs obtained from lithographic stones, &c. 4. Making inscribed or ornamented plates to be used for printing from, or otherwise, by taking an electro-deposit from a metal plate on which a design printed from any convenient surface has been transferred, the deposition being continued until the reduced copper or other metal has spread over and covered the lines of the transfer, and thus produced a continuous plate, having a sunken design on it. *Patent completed.*

1407. W. and J. GALLOWAY. *Improvements in machinery for cutting, bruising, chipping, and rasping, and otherwise treating or preparing dye woods and roots or other vegetable substances.* Dated June 22, 1858.

The first part of this invention is not described apart from the patentee's drawings. For cutting, chipping, or rasping dye woods they employ a disc, a cylinder, or an angular rasp barrel, as described in the specification of their previous patent, dated May 14, 1856. They fix in such disc, cylinder, or barrel, plain sharp knives, in addition to, and alternating with the ordinary grooved or serrated knives, so that the wood is reduced to a finer state than grooved knives alone will reduce it. The machine may be used for reducing dry roots. *Patent completed.*

1408. J. PYM. *Improvements in machinery for felling trees.* Dated June 22, 1858.

Instead of using the axe or cross-cut saw in the ordinary way, the inventor bores with augurs (mounted on a frame, and made to work by toothed gear) one or more holes in a line through the butt or lower part of a tree; and, with a saw or saws, he saws the tree nearly in two, leaving as much wood uncut on each side of the tree as will prevent its settling down and pinching the saws. He then withdraws the saws and cuts with an axe or other instrument one or both sides of the tree until it falls. The augers and saws are each placed in a frame attached to a carriage with gearing to work the augers and saws, which gearing he sets in motion by manual or other power. Drills may be used in the place of augers, but he prefers the latter. *Patent abandoned.*

1409. J. A. RAINE. *Improvements in collapsible framework for bedsteads, sofas, and other like articles of furniture.* Dated June 22, 1858.

This invention consists in applying a system of cross levers, similar to lazy tongs, so that by a single set of them on each side of the bedstead or other frame it can be distended or collapsed and fixed at any intermediate length. *Patent completed.*

1410. W. E. KENWORTHY. *Improvements in the manufacture of steel.* Dated June 22, 1858.

This invention consists in the use of woollen rags, or woollen waste, as a substitute for charcoal in the manufacture of steel. *Patent abandoned.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, FEBRUARY 25, 1859.

THE ELEVATION OF MR. ARMSTRONG.

HONOURS and emoluments have descended upon the inventor of the new rifled cannon. On Wednesday last, Mr. WILLIAM GEORGE ARMSTRONG, of the Elswick Works, Newcastle-upon-Tyne, was presented to the Queen to receive the honour of Knighthood, and on his appointment as Engineer to the War Department for Rifled Ordnance. Mr. ARMSTRONG was presented by General PEEL. All praise to the Government that knows so well how to value and reward the ability of a practical hard-working Engineer! Twice during their short term of office have Lord DERBY's Government dignified men whose sole claims to honour are to be found in their scientific skill, their courageous industry, and their undoubted excellence of character. Sir CHARLES BRIGHT, who though young in years, is old in experience and in good repute, and whose anxious and unremitting exertions during the memorable expedition in the *Agamemnon* will never be forgotten by those present, was the first engineer whose talents and zeal received the homage of the Government now in power. And now like homage is paid by the same Government to another man who richly deserves the honours accorded to him. For, it should be recollected, Mr. ARMSTRONG's services in connection with gunnery did not commence either this year or last. For a long period he has applied himself to ordnance improvement, and has throughout displayed an aptitude for the work that has been very remarkable. Most cordially we congratulate Sir WILLIAM ARMSTRONG on his promotion, and on his appointment also; and with equal cordiality we recognise the spontaneity and grace with which Ministers have acted in the matter. In honouring him, General PEEL and his colleagues have brought honour to themselves.

There will not, doubtless, be wanting those who will see in this act of the Government little beyond a bid for popular favour. But there is more in it. There is this, at least, viz., a recognition of the dignity which belongs to inventors, and to practical men generally. And beside this, there is in it an open declaration before the world that the self-reliant and self-sustaining spirit of this country is strong in us yet. In the midst of our own peaceful manufacturing classes we have men who can turn, if need be, to the arts of war, and carry them forward far beyond the point to which the great military nations of the continent can of themselves attain. And, still further, there will result from the promotion of Sir WILLIAM ARMSTRONG a positive accession to our national prestige. The nations that stood in just awe of us yesterday, will stand in greater awe of us to-day, when they learn that an English engineer has put into our hands a weapon of such decided merit that Ministers of the Crown have sought his services, and the Queen herself has done him public honour.

The only drawback to our gratification on occasions like this is the thought of those who have deserved like favours, but deserved in vain. Who can doubt, for example, that, if the stream of Ministerial and Royal favour flowed with uniform freedom, the name of LANCASTER would at this moment be unhonoured? It may serve the purposes of some to speak lightly of the merits of the great Lancaster guns, and to dwell upon the defects which bad materials and bad manufacture produced. But everyone who remembers the influence which the very name of those weapons exerted during the late war, and who knows the real merits of the oval bore cannon, will act otherwise. Apart from ordnance altogether, Mr. LANCASTER has done so much for the nation—in producing those admirable rifles which are the desire of the Service—that no name deserves to stand before his. A wise Government would see to this.

But these reflections must not lead us to think lightly of the justice which *is* done. We have all along felt that the time must come when honour would be cheerfully shown to the genius of science, in both its theoretical and practical embodiments. That time seems now to be fast approaching, and the Government of Lord DERBY may justly feel proud of the part they are taking in hastening it.

THE TONNAGE LAWS.

"SOME are born great, some achieve greatness, and some have greatness thrust upon them." Mr. ATHERTON and his co-mates in the Tonnage Law agitation may justly lay claim to be inscribed in the category of those who "achieve greatness." Perseverance which, when boys, we learnt was the surest road to success, cannot, at all events, be denied them. The inauguration of the movement by the reading of a paper at the Society of Arts in January, 1856, will be in the recollection of our readers—followed by the appointment of a committee to report on the subject by the British Association, under the chairmanship of Lord HARDWICKE, the same year. On that committee all the practical ship-builders, except Mr. JOHN SCOTT RUSSELL, refused to serve, and it will be remembered that even under these circumstances Mr. ATHERTON was unable to obtain a report in his sense. Well, at the Dublin meeting of 1857, another committee was appointed whose nominal duty was to inquire into "shipping statistics," from which much of the former adverse element was eliminated, and which was, unfortunately for Mr. ATHERTON, opened by an act of repudiation on the part of Admiral MOORSOM, and Messrs. SCOTT RUSSELL and M'CONNELL, leaving Mr. FAIRBAIRN the only independent representative of public interests in this body. It is, we should think, no exaggeration to say that the report presented at the last meeting of the Association was the sole production of Mr. ATHERTON, and his *fidus achates*, Mr. ANDREW HENDERSON. This report has already appeared in our columns. As might have been expected, the attempt to pry into the private concerns of the shipping classes has proved a decided failure, although Mr. ATHERTON says it has not been "wholly fruitless." A stronger condemnation of the movement, and of the just suspicions of the shipowners, could not be found than in the candid but surely unwise admission in the report, that "ship-owners, ship-builders, and marine-engine manufacturers have been generally reluctant to communicate particulars whereby the dynamic merits of ships may be numerically classed and compared, the results of which classification and comparison *might, if promulgated, affect the commercial value of their property, and the relative professional reputation of constructors.*" What right has a committee of the British Association to take upon itself functions which might result in the private injury of commercial and engineering firms! The adaptation of steam to shipping purposes is necessarily progressive; fresh discoveries are made every year; and a firm which stood highest one year might, by accidental circumstances, be outbid the next. But upon the whole the progress has been satisfactory and healthy. Mr. ATHERTON's committee, had they been successful in their attempts, would have achieved the grand triumph of ruining all the ship-builders and engine-makers, whatever had been their previous merits, for the benefit of the individual firm which happened, in the tentative process which has been employed by all, to have made the last most successful hit. In whose interest is such a result desirable? Not of the commercial classes, as Mr. ATHERTON confesses; not of the public—for the undue establishment of a monopoly which this scheme must have resulted in, would soon have been felt most prejudicial to the public interest. It surely never can be to the public advantage that all the shipping and engines which do not come up to the latest improvements of 1859, however meritorious in their day, should be broken up as so much old wood and iron, and the commercial navy of the country be required to undergo a "complete re-construction" with every fresh discovery. The question is,—Do ship-owners and ship-builders manifest an anxiety, in the additions they are continually making to the commercial navy, to profit by the most approved methods of construction and engine adaptation? It is manifestly their interest to do this in order to insure success in the vast competition they have to encounter; and we believe they are fairly successful. The construction and adaptation to steam purposes of the commercial navy has shown a steady and healthy progress, which it would be most unwise to impede by any unhealthy attempt to accelerate it.

The committee succeeded, it seems, in obtaining a full account of the *Bremen*, of 3,340 tons—of her lines, her engines, and her performance. And nothing can illustrate more strongly the mischievous effects of the proposed action of the committee than this report. We give her builders full credit for their readiness to afford the information requested. But what is the consequence? The main ingredient of the report is a laudation of this ship; and by the adoption of this report the British Association for the Advancement of Science have really converted themselves into advertisers of the *Bremen* and all concerned in her construction, her engines, and her navigation. A dignified and honourable situation for this august body!

We regret to see the name of Mr. FAIRBAIRN appended to this report. That gentleman has experienced in his own person the advantages of public competition and individual enterprise to such an extent, that we are astonished to see him lending his great authority to a movement which, if successful, would so shackle the shipping interest as to reduce them to a state of prostration, or rather paralysis, from which they could with difficulty recover. In the name and for the interests of the public let us by all means have the most improved ships and engine adaptation. But do not let us, to reach this end, ruin the existing shipping interest.

Mr. ATHERTON'S unprecedented success has induced him to apply for, and the British Association to grant, a new committee, compared with which all former committees sink into the "cold shade." In this way has he now achieved greatness. Three live lords—yatch club *dilletantes*—and an ex-first Lord of the Admiralty (too old a bird, we think, to be caught by chaff of any kind), are now united to prosecute this precious movement, we presume in behalf of the shipping interests, of which we see no representative but Mr. SCOTT RUSSELL—who has before "repudiated." Surely the unanimous disapproval of ship-owners, ship-builders, and marine-engine-makers might open the eyes of any one less determined than Mr. ATHERTON to the real nature of the course on which he has entered!

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THE CIVIL SERVICE.

As the Civil Service Superannuation Bill is at length passing through its various stages, and taking its place on the Statute Book of the State, it becomes the duty of all guardians of the public interests to take especial note of the spirit in which the Government intend to carry out its enactments. The age-limitation clause of the new Bill is certainly one of its most important points, for it will inevitably place in the hands of the Ministry a great amount of patronage. It may safely be asserted that there is not one establishment—be it Dockyard, Arsenal, Mint, or merely official Institution—in which vacancies will not naturally result from the action of the Derbyite Civil Service Bill. In all these places it has been the practice for veterans—who in their day may, doubtless, have been of great value to the country—to retain possession of their posts and their pay until long after the capacity for either doing the duties of the one or enjoying rationally the advantages of the other has passed away. And antiquated gentlemen who have not the sense of justice sufficiently strong within them to know that in clinging to salaries which others earn for them they are guilty of dishonesty, require to be told that such is the fact. In every Government establishment throughout the kingdom, we say, instances of this kind exist. On fair retiring allowances these impediments to improvement will now be removed, and it becomes a question of momentous consequence to the *tax-payers* of the nation as to who shall fill their situations.

It will not be submitted to at this time of day that political influence, official intrigue, favouritism, or any other corrupt power shall have effect in the appointments and promotions which must follow the dislodgment of these ancients. There is fortunately at this hour a Vigilance Committee constantly sitting and keeping watch and ward over the public good. That Vigilance Committee does not, however, like its Californian prototype, act upon the rough principles of Lynch, but rather upon the deliberate results of truthful deduction. We need not say that that Committee is composed of the representatives of the Free Press of England. With such an institution keeping it in check, sifting its motives, and examining its doings with argus eyes, it will not be possible for Ministers, be they whom they may, to perpetrate injustice to any extent in the carrying out of the great work which is now before them. It is a time when the fittest men ought to be put into the fittest places, and the opportunity for doing so must not be lost. Let those who, with patient endurance and plodding industry, have been doing—as deputies for the retiring veterans—the duties of offices superior to their own, have now their merits recognised, and those offices with the proper emoluments given them for their zeal. It will not be tolerated that efficient and meritorious men shall be slighted and beclouded by the introduction over their heads of any Higgins's or Dowb's who may happen to have relatives or friends in power. Nepotism is a strong passion in the official mind generally, but it must be controlled; and so far as we are concerned it shall be looked after. It is our purpose to maintain—at all hazards and without reserve—the indefeasible right of the practical, useful, and efficient men of the Civil Service, and also of the Naval and Military Services, to obtain advancement according to their deserts, lingering no longer in the cold shade of aristocratic or class influence. We have in our eye at this moment a Royal establishment, where two or three years ago red-tapery was paramount, and abuses of every kind were rife, which has been completely reformed by the simple investment with superior powers of two practical and working men—men, that is, who will work with their heads, and, if needs be, with their hands too. These indefatigable assistants to a strong-minded and able chief officer have effected savings—by legitimate improvement and judicious economy—which the Treasury know well may be estimated by thousands of pounds. Will these valuable public servants have their indisputable claims to promotion admitted by the Ministry of the day, or will they, as too many other deserving subordinate officers have been, be neglected and left to reflect upon the ingratitude of their country? We shall see. The compulsory 65-years-of-age clause will assuredly create vacancies in the upper stratum of the official department of that establishment; will these active and persevering candidates for elevation be raised thereto, or will patronage step in and close the ranks against them? Vigilantly, in these particular instances, we shall regard the movements of the Treasury, and certainly shall not fail to applaud its decision, provided that decision be in accordance with simple justice. Whenever else the opportunity offers itself for obtaining—as completely as in the cases in question—possession of facts bearing upon promotions *earned* by merit, we entreat members of the Committee—other journalists, that is—to make known the same, and to see that no jobbery or injustice of any kind shall deprive industrious and useful public servants of their fair rewards.

By these means a purification of our great national establishments may be finally obtained, and the various offices in them filled with men qualified in all respects for the varied and important duties pertaining to them. If such effects result from the passing of the Civil Service Superannuation Bill, the year 1859 will become memorable in the annals of social progress, and Mr. Chancellor of the Exchequer DISRAELI will all but immortalise himself.

THE CASE OF HENRY CORT,
AND
HIS INVENTIONS IN THE MANUFACTURE OF BRITISH IRON.

BY

THOMAS WEBSTER, M.A., F.R.S., &c., Barrister-at-Law.

No. III.

DUDLEY appears to have met with the fate of most inventors, in experiencing the opposition of conflicting interests; he complains of the sufferings sustained from time to time during forty years, and his own great charge, pain, and time spent for the general good of his invention for the preservation of Great Britain's wood and timber. The author of the "Metallum Martis," after assigning various reasons that induced him to undertake the invention after the many failures of others, and giving an account of the troubles which he experienced from the destruction of his works by a great flood, "to the joy of many iron-masters whose works escaped the flood, and who had often disparaged the author's invention because he sold good iron cheaper than they could afford it, and which induced many of the iron-masters to complain to King JAMES, averring that the iron was not merchantable," proceeds to give the following account of the progress of the invention:—

"As soon as the author had repaired his works and inventions, to his no small charge, they so far prevailed with King James, that the author was commanded, with all speed possible, to send all sorts of bar iron up to the Tower of London, fit for making of muskets and carbines; and the iron being so tried by artists and smiths, that the iron-masters and ironmongers were all silenced until the 21st of King James. At the then Parliament all monopolies were made null, and divers of the iron-masters endeavoured to bring the invention of making iron with pit-coal, &c., within the compass of monopoly; but the Lord Dudley and the author did prevail; yet the patent was limited to continue but 14 years. After which Act, the author went on cheerfully, and made annually great store of iron, good and merchantable, and sold it unto divers men yet living at £12 per ton. I also made all sorts of cast-iron wares, as brewing cisterns, pots, mortars, and better and cheaper than any yet were made in these nations with charcoal; some of which are extant, to be seen by any (at the author's house in the city of Worcester) that desire to be satisfied of the truth in the said invention.

"Afterwards the author was ousted of his works and inventions before-mentioned by the iron-masters and others wrongfully—over long to relate; yet, being unwilling his inventions (having undergone much charge and pains therein) should fall to the ground and be buried in him, made him set forward his inventions again at a furnace called Himley Furnace, in the county of Stafford, where he made much iron with pit-coal; but, wanting a forge to make it into bars, was constrained, for want of stock, to sell the pig iron unto the charcoal iron-masters, who did him much prejudice, not only in detaining his stock, but also disparaging the iron—Himley Furnace being rented out unto charcoal iron-masters.

"The author erected a new large furnace on purpose, 27 feet square, all of stone, for his new invention, at a place called Hascobridge, in the parish of Sedgeley and county of Stafford, the bellows of which furnace were larger than ordinary bellows are, in which work he made seven tons of iron per week, the greatest quantity of pit-coal iron that ever yet was made in Great Britain. Near which furnace the author discovered many new coal-mines, ten yards thick, and iron-mine under it, according to other coal works; which coal works being brought into perfection, the author was by force thrown out of them, and the bellows of his new furnace and invention by riotous persons cut in pieces, to his no small prejudice and loss of his invention of making iron with pit-coal, &c., so that being, with law-suits and riots, wearied and disabled to prosecute his art and invention at present, even until the first patent was extinct."

In this outline of DUDLEY's career as the successful introducer of the manufacture of iron with pit-coal, may be traced the counterpart of the history of many an inventor struggling with the opposition of rival interests, and the difficulties which his own invention has called into existence. But, notwithstanding these discouragements, DUDLEY continued the manufacture with success, and on the expiry of his patent obtained a new patent (dated 2 May, 14 Car. I, A.D. 1639), in the working of which he became associated with some influential persons, and continued his manufacture notwithstanding the rivalry created by other grants, and amongst these, by an Act of the Commonwealth (A.D. 1651, c. 2) for 14 years to Jeremy Buck, for melting down iron and other metals with stone-coal and other coals without charking, and by the personal influence of favourites of CROMWELL, who attempted the smelting of iron in large clay pots, heated by the flame of pit-coal, like those used in the glass manufacture, and set in large furnaces, but the attempt failed, and DUDLEY, on the accession of CHARLES II., A.D. 1660, being then sixty-one years of age, renewed the application for the renewal of his patent, alleging amongst other things, that the mastery or mystery of the inventions of making iron with pit-coal was not effected and perfected by any man, and that no order having been made thereon, compelling necessity doth constrain him to desist from his inventions, in which he hath taken more pains, care, and charge than any man to perfect his new inventions in these kingdoms, and suffered much ever since the year 1618 for the general good, for the making of iron with pit-coal, and the preserva-

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tion of wood and timber of Great Britain; but his application was not successful.

No certain information exists as to the quantity of iron made by DUDLEY, but the following extract from the "Metallum Martis" of this working about the middle of the 17th century (A.D. 1650—1660), will be read with interest:—

"Although the author hath not as yet so fully perfected or raised his inventions to the quantity of charcoal iron furnaces, yet the author's quantity being but 7 tons per week at the most, together with the quality of his iron made with pit-coal and sea-coal, hath the most eminent triplicity of iron of all that can be desired in any new invention;—1, More sufficient: 2, More cheap; 3, More excellent—upon which triplicity the author might enlarge, but shall not be tedious, only give me leave to mention that there be three sorts of cast iron. 1, The first sort is grey iron; 2, The second sort is called motley iron, of which one part of the sows or pigs is grey, the other part is white intermixed; 3, The third sort is called white iron; this is almost as white as bell-metal, but in the furnace is least fined, and the most terrestrial.

"Of the three, the motley iron is somewhat more fined, but the grey iron is most fined in the furnace, and more malleable and tough than the other two sorts before mentioned, and of this sort is the iron made with pit-coal (sea-coal for the most part), and therefore more sufficiently to be preferred; 2, More cheap iron there cannot be made, for the author did sell pig or cast iron made with pit-coal at £4 per ton; many tons in the twentieth year of King James, with good profit. Also, the author did sell bar iron, good and merchantable, at £12 per ton and under; but bar iron hath been sold for the most part ever since at £15, £16, £17, and £18 per ton by charcoal iron-masters."

Notwithstanding the success of DUDLEY, the manufacture of iron by the use of pit-coal did not progress, and shortly after the period to which the preceding extract refers, appears to have been practically abandoned till the beginning the last century, when (A.D. 1713) the manufacture of iron with pit-coal was resumed by ABRAHAM DARBY, of Coalbrook Dale, but apparently with no great commercial success, The quantity of iron produced in England had diminished annually from about the middle of the 17th century, though every year witnessed an increased demand for the article, particularly in its manufactured state; recourse was necessarily had to foreign markets, and gave rise to the large annual importation from Russia and Sweden.

The 300 blast furnaces said to exist in the time of DUDLEY, and estimated to make 150,000 tons per annum, were reduced to 59, estimated as making, in 1740, a total amount of 17,350 tons per annum, or less than 300 tons per furnace. It may be inferred that the difficulty and temporary abandonment of the manufacture of iron from pit-coal was due mainly to two causes, the one the inadequate blast, the other the insufficient means of removing the injurious products peculiar to most descriptions of pit-coal. Up to the commencement of the 18th century the attention of enterprising men would appear to have been mainly directed, in consequence of the destruction of the forests and consumption of timber required for other purposes, to the discovery of a new fuel for the reduction of iron from the ore, but in the earlier part of the 18th century, attention was directed to the use of fluxes, and to the addition of ingredients which should render the iron less brittle; little, however, if anything, appears to have been done towards improvement in the subsequent stages as in the manufacture of bar-iron—that, as we may infer from DUDLEY'S account, was still practically in the hands of the charcoal iron-makers.

The erection of a new blast by SMEATON, at the subsequently celebrated Carron Works, led the way to other and further improvements on the introduction of the steam engine, and to a more powerful blast, by which the yield of iron for a given quantity of ore and pit-coal was greatly increased; but England, at the middle of the last century, was still mainly dependent on foreign countries for all the better qualities of bar or malleable iron.

The substitution of pit-coal for wood or charcoal as the fuel, and the improved blast consequent on the application of water and steam power to suitable blowing apparatus, have usually been referred to as two of the epochs in the reduction of iron from the ore, or the smelting of iron in the blast furnace, so as to produce that which has been commonly called crude or pig-iron; and the inventions of HENRY CORT must be regarded as the third epoch in the history of the British iron manufacture, and the first great change in the conversion of the pig into malleable or bar iron.

The dependence of England on foreign countries, consequent on the diminished manufacture of iron, and the increasing demand in this country, was a great stimulus to the inventive genius, and accordingly we find that early in the 18th century, the rendering the nation dependent on its own resources and independent of any supply from foreign parts, was put forward as a great object to be obtained; as, for instance, a patent was granted in 1728 to WILLIAM WOOD for making raw iron, or iron metal prepared in an air furnace with pit-coal, whereby, as suggested by the patentee, "the nation may be supplied with all the iron it requires. and prevent the buying of iron from foreign parts, which amounts to about 20,000 tons yearly, and is most paid for in ready money, to our great disadvantage and loss."

The produce of the blast furnace, commonly called pig iron or crude iron, is converted from cast into malleable iron by the refining furnace, in which the iron was heated and brought to nature or metallized, as it was called, and then worked down or forged by heavy hammers into bar iron. According to the estimate of DUDLEY, there were in his time 500 forges and mills for refining the crude iron and making it into malleable bars, but there are good grounds for supposing this, as well as his estimate of the number of blast furnaces, to be greatly in excess of the real number.

MACINTOSH'S SYSTEM OF NATIONAL DEFENCE.

A CURIOUS and bulky pamphlet, compiled especially for the delectation of "the Honourable the Members of the House of Commons," has just been placed in our hands. It is entitled "Macintosh's System of National Defence; also his Official Correspondence with the British Government, disclosing 'The True Cause' of the Continuation of the late War, from the clashing of the Naval and Military Departments; its Method; its Causes; and consequent Expenses."* This is not a very elegant or lucid title, but it is an ambitious one, and is likely just now to attract attention.

Mr. Macintosh's system of warfare—which mainly consists in creating an artificial fog in order to cover an attack upon a ship or fortress—is understood by most of our readers. On the 13th June, 1853, when we were fast "drifting" war-ward, he first introduced it to the notice of Lord Aberdeen, the Prime Minister, who referred him to Sir James Graham, First Lord of the Admiralty, whose Secretary curtly "thanked" him for his communication. Being a rapid, practical man, he received this rebuff unabashed, and started with a supply of materials to Constantinople, for the purpose of destroying the Russian Fleet at Sebastopol off-hand, for, and by aid of, the Turks. But as war was not declared, Lord Stratford de Redcliffe advised him to return to England, and entrusted him with official despatches to Lord Clarendon. He returned, and by Lord Clarendon's kindness, got an interview with Admiral Berkeley, at the Admiralty, who pronounced the system inglorious (since it was designed to cripple the enemy with little loss to ourselves!), and advised him to return to Turkey, promising to instruct Admiral Dundas to assist him. Off went Mr. Macintosh again, and after some trouble got a council of war called on board the British Admiral's ship in the Bay of Baltshik. Admiral Dundas, however—who was empowered by the articles of war, as Mr. Macintosh suggests to "burn, sink, and destroy,"—refused to employ the new mode of warfare without written instructions from the Admiralty, although not without confidence (according to Mr. Macintosh's statement) in the system. The inventor therefore returned again to England, and learned from Mr. Bernal Osborne that their Lordships were "not prepared to adopt" it.

Baffled thus at home, off goes Mr. Macintosh to Paris, only to find that the Emperor has just before started for Biarritz. The Minister of Marine, however, receives him graciously, and promises him an early trial on a large scale before the Emperor at Boulogne. Returning once more to England, he procures an interview with the Duke of Newcastle, who commends the matter to the Admiralty, who now agree to see the inventor at Portsmouth, and arrange for a trial. When the time for the trial arrives the two Lords are indisposed, and appoint Sir Thomas Maitland, and Mr. Hay, the Admiralty Chemist, to witness and report on the experiments.

"We proceeded on board the *Excellent*," says Mr. Macintosh, "and having shipped a sufficient quantity of the hydrocarbon in a six-oared gig, pushed off towards Porchester Creek, and there discharged on the water a sufficient quantity, which, floating on its surface, was propelled by the wind to about 200 yards, when Sir Thomas Maitland directed me to ignite it, which I did, by projecting a small ball of the metal potassium into it; this had the effect of generating an *impenetrable black suffocating fog*. We pulled up to the burning material and ignited a paper, clearly demonstrating that ships of war could follow up in its wake, without injury to the attacking party; thus enabling squadrons to form up in a line of battle under cover of the black smoke, and when within point-blank range of any land batteries, to disembark troops and take possession, or simultaneously open a concentrated fire and entirely destroy them. I may here mention that no animal can breathe within its folds: consequently, on the smoke entering the embrasures, it would naturally compel all the gunners to beat a quick retreat, thereby leaving the enemy's forts at the mercy of the attacking squadron."

What Sir Thomas Maitland reported, Mr. Macintosh could never find out. He was told that copies of the report had been forwarded to the Admirals in the Black and Baltic Seas, but these officers both deny that they were ever received by them. The Admiralty finally, in 1855, gave Mr. Macintosh £50 (!) to cover all expenses, and thus ended his *first* correspondence with them.

Other correspondence with both the Admiralty and the War Department followed, with a similar result, except that a cheque for £1,000 was obtained from Lord Panmure as a consideration for the unprecedented, and, as we think, unjustifiable seizure of Mr. Macintosh's patent—a poor remuneration for such an act. This seizure was made after the official experiments at Shoeburyness had, as we have a right to assume, proved the great value of the invention. But it is not our intention to trace Mr. Macintosh's efforts and obstructions further. It seems to us, however, that Admiralty Lords, and War Ministers, and Ordnance Officers have dealt with his system from the first without that sense of responsibility which we have a just right to expect in public servants, however exalted their positions may be. Their obstinate secresy and reticence leaves even their friends without the power of defending them.

We have now to notice a proposition of Mr. Macintosh's. He suggests that an Incendiary Steam Brigade should be at once established, and attached in part to each of our fleets, as an

* London: printed by W. Clowes and Sons, Stamford Street, and Charing-cross. 1859.

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auxiliary power of attack. This brigade is to consist of iron steamers, furnished with compartments or tanks filled with coal-tar naphtha. When sea-face batteries are to be attacked, he would start one of the small steamers, under the control of two or three men, towards the enemy's works. When nearly within range of their guns, they would light a time-fuse in connection with gunpowder, and abandon the vessel, leaving her to proceed towards the batteries. The explosion would disperse the combustible liquid over the surface of the water, and igniting it at the same time, would thus produce a dense black smoke or vapour. This would be carried by the wind—an on-shore wind being selected for the purpose—against the sea-faces, and through the embrasures of the batteries, driving the enemy out before it. Other modes of operation are suggested.

Now, there is surely sufficient reason in this proposal to gain for it a practical trial. Such a system of operation would unquestionably be cheap, and it might be effectual. We venture to assert that, as a mode of warfare, it commends itself more strongly to the unbiassed mind than the present plan of blowing little balls of iron against vast stone structures; and we see no reason why the one process should be considered less dignified than the other. With this system at our command the fortresses of Cherbourg and other continental ports, would be so far brought within the power of British fleets as to give us a better right to influence the councils of Imperial Courts than we now seem to possess.

For our part we would therefore ask urgently for a fair and full trial of Mr. Macintosh's system.

Parliamentary Proceedings.

CONDENSED FOR THE "MECHANICS' MAGAZINE."

THURSDAY, FEBRUARY 17.

HOUSE OF COMMONS.

THE DUTY ON WOOD.

Mr. MITCHELL gave notice that on Thursday, March 3, he should move the repeal of the duty on wood.

THE TELEGRAPH TO ALEXANDRIA.

Mr. CRAWFORD asked the Chancellor of the Exchequer whether Her Majesty's Government had concluded a convention with the Austrian Government for the establishment of a line of telegraphic communication with Alexandria, on the principle of a financial guarantee on the part of this country; and, if so, when a copy of the said convention would be laid on the table?

The CHANCELLOR of the EXCHEQUER said it was not true that Government had entered into a convention with the Austrian Government, but the terms on which such a convention would probably be concluded had been settled, and when the convention was concluded it would, of course, be laid on the table of the House. If it were carried out on the terms which had been agreed upon, it would include a financial guarantee, but not an unconditional guarantee.

LAND TRANSPORT CORPS.

General CODRINGTON asked the Secretary of State for War, whether the rank given, "pending Her Majesty's pleasure," to officers of the Land Transport Corps, by general orders in the Crimea, was to be confirmed to them; and, if so, from what date?

General PEEL said he had recommended the Treasury that it should be granted, and he was in correspondence with the Treasury on the subject.

FRIDAY, FEBRUARY 18.

HOUSE OF LORDS.

THE CLOCK IN THE CLOCK TOWER.

Lord CAMPBELL gave notice that he would take an early opportunity of asking the Government whether there was any prospect of the clock in the clock tower ever going. From the time of the Plantagenets there had been a clock tower in Palace-yard for the purpose of warning judges, counsel, and witnesses, and all persons concerned, to attend at the proper hour, and assist in the administration of justice. That clock tower had disappeared, and a noble one had arisen in its place, but as yet no clock struck the hours. He hoped something would be done to remedy this evil. He did not say it was a *striking* reproach so far as the administration of justice was concerned, but it certainly was a standing reproach.

HOUSE OF COMMONS.

THE POISONS BILL.

Sir G. PECHELL asked the Home Secretary whether he would be so good as to postpone the second reading of the Sale of Poisons Bill for a few days?

Mr. WALPOLE said, it would be convenient to take the second reading to-night unless the hon. and gallant member objected to the principle; but he would postpone the committee on the Bill until that day week.

SUPPLY OF GUANO.

Mr. CAIRD put some questions to the Government, with the view of urging them to aid in obtaining the consent of Peru to an open trade in guano.

NEW FOREIGN OFFICE.

A discussion on this subject was led off by Sir B. Hall, who was followed by Lord J. Manners, Sir G. C. Lewis, Mr. Tite, Mr. Coningham, and Lord Palmerston. They merely reiterated their well-known opinions.

SUPERANNUATION BILL.

On the motion that this Bill be read a second time,

Mr. J. WILSON said he intended to move an amendment in committee, to which he believed the Government would not object.

Sir H. WILLOUGHBY complained that a Bill of so much importance was pressed forward at so late an hour (near 12 o'clock). He believed that the Bill would throw an enormous burden upon the country.

After some remarks from Sir S. Northcote (for the Government), Mr. Serjeant Deasy, and the Attorney-General for Ireland,

General CODRINGTON expressed a hope that the Bill was so framed as to include within its scope artificers and labourers regularly employed in the Government establishments; and he asked if its operation was to be retrospective or otherwise?

Mr. GROGAN also hoped that the Bill would include the large class of supernumeraries employed in almost every department of the Government.

The Bill was read a second time.

SALE OF POISONS BILL.

This Bill was read a second time.

MONDAY, FEBRUARY 21.

HOUSE OF COMMONS.

THE NELSON MONUMENT.

Mr. LAURIE asked when the lions were expected to be placed on the Nelson Column, and why the execution of them was intrusted to Sir Edwin Landseer, instead of Mr. Lough, the sculptor originally appointed by the committee; also whether it was intended to continue the two water-spouts before the National Gallery.

Lord J. MANNERS said that Sir Edwin Landseer was at present engaged in modelling the lions, and it was hoped that they would be placed in their position at no distant day. Sir Edwin Landseer had been chosen because Her Majesty's Government were convinced that the task could not be intrusted to more skilful hands. With regard to the last question, the hon. gentleman had given him no notice of it, and the subject had not yet been brought under his consideration.

NAVAL ESTIMATES.

Sir J. PAKINGTON, who had given notice to introduce the Navy Estimates on Friday next, appealed (with but little effect) to the members for Montrose and Berwick, and to the member for Sandwich, all of whom had given notice of motions "on going into Committee of Supply," to yield their right of precedence upon that occasion, in order that he might make his statement. The duty of which he had given notice was an arduous and a difficult one, and it would be impossible to discharge it satisfactorily if he had to commence at a late hour, and after three important subjects had been discussed.

SUPERANNUATION BILL.

This Bill went through committee *pro forma*.

TUESDAY, FEBRUARY 22.

HOUSE OF COMMONS.

DIFFERENCES BETWEEN MASTERS AND OPERATIVES.

Mr. MACKINNON having presented a petition on the subject, said, as he believed that there was no opposition to the motion which he was about to make, he should reserve his observations until the second reading. He would simply express his belief that strikes, which were injurious alike to master and to man, could only be prevented by a system of equitable conciliation. He moved for leave to bring in a Bill to establish equitable councils of conciliation and arbitration to adjust differences between masters and operatives.

Leave was given to bring in the Bill, and at a later period of the evening it was brought in and read a first time.

ADULTERATION OF FOOD.

Mr. SCHOLEFIELD obtained leave to introduce a Bill to prevent the adulteration of articles of food or drink.

The Bill was subsequently read a first time.

PUBLIC RECREATION.

On the motion of Mr. SLANEY, leave was given to bring in a Bill to facilitate grants of land to be made near populous places for the use of regulated recreation of adults and as playgrounds for poor children.

The hon. member afterwards brought in the Bill, and it was read a first time.

THE EDUCATIONAL REPORTS.

After much discussion it was arranged that the Reports of the Examiners in the Educational Department should be published in full, the examiners being, however, instructed to make them brief and pertinent.

REPRESENTATION OF GREENWICH.—We have reason to believe that Sir John Pakington, the First Lord of the Admiralty, purposes standing for the Borough of Greenwich on the retirement of Sir W. Codrington. This step is to be taken in consequence of the proposed disfranchisement of Droitwich, which Sir John at present represents. If nothing particularly unfavourable to the present Government happens before April, the return of Sir John will be certain.

Literature.

A Manual of Applied Mechanics. By WM. JAS. MACQUORN RANKINE, LL.D., C.E., F.R.S.S., L. & E., President of the Institution of Engineers in Scotland, and Regius Professor of Civil Engineering and Mechanics to the University of Glasgow. London and Glasgow: Richard Griffin and Co. Publishers to the University of Glasgow. 1858.

(SECOND NOTICE.)

IT is now time to give some account of the contents of this work, and its method of treatment. We shall not dwell on the preface, which gives the substance of a discourse, read before the Senate of the University of Glasgow on the 10th December, 1852, and of an inaugural lecture, delivered to the class of Civil Engineering and Mechanics in that University on the 3rd January, 1856. It is needless to remark that its object is the settlement of the much vexed question of the real harmony between *theory* and *practice*. There is doubtless much misapprehension with respect to the limits of the realms of each of these, and much has been written ignorantly and in anger by the disputants on both sides. Theory in the higher departments of applied mechanics has frequently proved but an unsafe guide; and practice unaided by theory, has sometimes made miserable failures. Hence the practical man has been too prone to twit the theorist on the unsubstantiality of his labours, and the theorist, on the other hand, has made too much of the occasional failures of his opponents. Consequently both parties have been driven to adopt their several extremes—the one, that the study of the mathematical theory of mechanics is absolutely useless for practical purpose, and the other, that the sound practice of the mechanical arts is utterly impossible without theory. The truth, however, seems to be, that the sound mechanical practice long preceded a knowledge of the principles. The ancients, without one atom of sound theory, were conversant enough with the most effective mechanical appliances requisite for architectural and other structural purposes. A conception of the true nature of force and laws of motion, which, according to rigid theorists, ought to have preceded the invention of any machine, is of very modern growth. A most remarkable instance of this precedence of invention to sound theory is afforded by the history of the steam-engine, the discovery of which has entirely given a new complexion to the civilization of the nineteenth century. James Watt invented this machine, or at least invented all those contrivances which have given it its practical value—and no material improvement in its main parts has since been discovered—without the slightest knowledge of the true mechanical principles on which it depends. Nay more—the theoretical engineers of this country, as Tredgold, spent much useless ingenuity in inventing empirical quasi-scientific formula to reconcile the real with the theoretical work of the steam engine. It was reserved for a French officer of Engineers, the Comte de Pambour, within the last twenty-five years, to explain its true theory. The inventive genius often exists in a man entirely separate from the power of theoretical analysis, and it is no exaggeration to say that in almost all cases of great discoveries which have exerted marked influence on the state of mechanicalart, thediscovery has preceded the theoretical explanation, and that in very few instances has the discovery been the consequence a of precedent theory. The high vaunts of some exalted theorists are so manifestly contradicted by fact, that it is no wonder that practical men have been led to deny the value of their science altogether. But are we, then, to conclude that theory is of no value? To assert this would be, in our opinion, to commit as great an error as to insist on its exclusive importance. Each explanation of a practical result raises the whole fabric of applied science another stage; it raises the stand-point from which both theorists and practical men

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direct their future efforts. Without being aware of it, the man of practice becomes imbued with a goodly portion of the theoretical principles which it is the object of mathematics to supply; and he is saved from many a pitfall, and indirectly guided to many a highway in his professional career, by an unconscious following in the wake of those very theorists whom he professes so much to despise, and whose teaching he cannot practically set at naught without exposing himself to the risk, nay certainty, of failure.

In many extensive departments of applied science the failure of theory has arisen, not from any error in the principles (these have endured far too stringent tests to be capable of doubt), but from a want of accuracy in the experimental facts on which the theory has been based. To take a well-known example—the theory of fluid resistances. The mathematical application would be perfect if only the experimental law were satisfactorily established. From an insufficient induction, it was formerly considered proved that the resistance of fluids varies as the square of the velocity. Were this strictly true, the best form of a ship to overcome the resistance with least motive power would be as certainly established as the explanation of the motion of the heavenly bodies. This experimental law, however, has been discovered to be baseless, and no satisfactory substitute has been found; and hence theory, having no solid foundation on which to rest, cannot but fail in supplying a true interpretation of the motion of vessels in a fluid medium. The fault here clearly does not lie with the mathematical investigation, but with the experimental facts on which the theory has been based, and which have hitherto eluded the grasp of the observer. The same remark applies to most of the other cases in which theory is presumed to have failed. Yet surely it cannot be a disadvantage to a practical man—it cannot be other than a great advantage—that he should entertain clear and distinct ideas of force, of motion, and of their various combinations, and the mode in which the numerous facts which the exercise of his profession brings under his notice are theoretically explained. On the one hand, let the theorist abate somewhat of his exorbitant pretensions, and confine his promises within the region which experience has assigned them; and, on the other, let the man of practice cease to condemn everything beyond mere instinct, and allow that there is some use in understanding the rationale of ascertained facts, and there will soon cease to be that divergence in the view of these two classes of men which has long been felt to be amongst the most effective bars to the progress of applied science. A little mutual forbearance, a little abatement of the pretension of the exclusive importance of his own study which so frequently characterizes both, would soon smooth the way to a better appreciation of each other, and to harmonious co-operation.

Professor Rankine ought to speak with great weight on such a subject, as he has himself received the education of a Civil Engineer, and may, therefore, be supposed to combine in his own person the advantages of theory and practice. With many of his remarks we cordially agree, and especially we commend his THEORY of the mode in which "Applied Mechanics" should be taught; and we confess that after his admirable statement of the objects for which the Chair of Civil Engineering and Mechanics, which he fills, was designed, we entertained sanguine hopes that his work would offer the long-sought solution of the apparently hopeless problem of supplying the engineer with a sound and simple explanation of the principles of his craft. His appreciation of the desiderata for such a task is so just, that we cannot resist the temptation of laying before our readers the whole passage in which he treats this *in extenso*. After speaking of purely scientific and purely practical instruction, he goes on to say:—

"The third and intermediate kind of instruction which connects the first two, and for the promotion of which this chair was established, relates to the application of scientific principles to practical purposes. It qualifies the student to plan a structure or a machine for a given purpose, without the necessity of copying some existing example, and to adapt his designs to situations to which no existing example affords a parallel. It enables him to compile the theoretical limits of the strength and stability of a structure, or the efficiency of a machine of a particular kind—to ascertain how far an actual structure or machine fails to attain that limit—to discover the causes of such shortcomings—and to devise improvements for obviating such causes; and it enables him to judge how far established practical rule is founded on reason, how far on mere custom, and how far on error.

There are certain characteristics in the mode of treating the subjects by which this practical, scientific instruction ought to be distinguished from instruction for purely scientific purposes. In the first place, it will be universally admitted that, as far as is possible, *mathematical intricacy ought to be avoided.*

"In the original discovery of a proposition of practical utility, by deduction from general principles and from experimental data, a complex algebraical investigation is not merely useful, but indispensable; *but in expounding such a proposition as a part of practical science, and applying it to practical purposes, simplicity is of the* FIRST IMPORTANCE; and in fact, the more thoroughly a scientific man has studied the higher mathematics, the more fully does he become aware of this truth; and I may add, the better qualified does he become to free the exposition and application of scientific principles from mathematical intricacy.

"In fact, the symbols of algebra, when employed in abstruse and complex theoretical investigations, constitute a sort of thought-saving machine, by whose aid a person skilled in its use can solve problems respecting quantities, and dispense with the mental labour of thinking of those quantities denoted by the symbols, except at the beginning and end of the operation. *In treating of the practical application of scientific principles, an algebraical formula should only be employed when its shortness and simplicity are such as to render it a clearer expression of a proposition or rule than common language would be, and when there is no difficulty in keeping the thing represented by each symbol constantly before the mind.*"—Preliminary Dissertation, pp. 9 and 10.

We fully and cordially accept this definition of what ought to be the aims of a treatise on "Applied Mechanics," as also what the author states in the introduction with regard to such a treatise, viz., that it "must commence by setting forth these first principles which are common to all branches of mechanics, but it must contain only such consequences of those principles as are applicable to purposes of art."

We propose now to examine how far Professor Rankine has complied with his own canons in the work before us, and has studied simplicity, clearness of expression, abstinence from unnecessary algebraic symbols, and from pursuing theory into purely imaginary and unpractical results, in this manual which he proposes to place into the hands of the practical man as his *vade mecum*.

The general divisions of his subject are six, viz.:—

1. First Principles of Statics. 2. Theory of Structures. 3. First Principles of Cinematics, *i.e.*, geometrical comparison of motions with other, without reference to causes. 4. Theory of Mechanism, or the modification which *motion* undergoes by being transmitted through machines. 5. First Principles of Dynamics, and 6. Theory of Machines considered, *i.e.*, as transmitting and modifying *force*.

We shall first address ourselves to the treatment of the "first principles which are common to all branches of mechanics." Here it was the author's duty—for which, as an expert mathematician, he might be deemed especially qualified, according to his own showing—to be clear, precise, and as free as possible from *abstruse mathematical* investigation. In our opinion he is just the reverse of this: in his definitions he is often indistinct or illogical, and in his general expositions of principles he is more abstruse and confused than any author of repute with whose works we are acquainted.

For instance, to go no further than the first page of the Introduction, what could be more confused or illogical than his definition of matter? "Matter (considered mechanically) is that which fills space." The natural and logical meaning which this conveys is, that space is filled with a something, and that the something which fills it is matter. This, we know, is not what is meant; which is simply this,—that whatever so fills any portion of space as to exclude anything else from occupying the same portion of space at the same time is *matter*; but to bring this notion within our author's definition requires so many implied limitations and explanations as to render it, for the purposes of a definition, useless.

Take, again, the definition of direction and line of action of force. "The direction of a force is that of the motion which it tends to produce. A straight line drawn through the point of application of a single force, and *along its direction*, is the line of action of that force." Now, what difference could this definition convey to the mind of a learner between line of action and direction? The more simple idea to a tyro is that of the line of application—viz., that line in which the force applied to the point of application would tend to move that point—supposed material and separated from the rest of the body—if unresisted; and, when he has mastered this, he will be prepared to go on to the idea of any straight line parallel to the line of application as the *direction* of the force—the sense in which mechanical philosophers usually understand this term. This distinction is by no means conveyed by Professor Rankine's words.

Again, the definition of the resultant of any number of forces is open to grave objection, and is almost certain to mislead and confuse a learner.

We are told—"The resultant of any number of given forces, applied to *one body*, is a single force capable of balancing that single force which balances the given forces." This is true enough of the resultant of forces applied to *one point* of a body: but it may and does frequently happen that there is no single force capable of balancing all the forces applied to a body. Professor Rankine doubtless meant by the words 'one body,' one point; but, by such an implied limitation, he renders his definition inexact, and consequently useless.

We shall only instance one more definition, viz., that of *Specific Gravity*. According to our author "the Specific Gravity of a body is the *intensity of its weight*, or the weight of an unit of its volume; for example, the weight in pounds of a cubic foot of the volume of the body. The *pound per cubic foot* is the most convenient unit of specific gravity for practical purposes; but in tables of specific gravity, a special unit is SOMETIMES employed, viz., the weight at a fine temperature of unit of volume of water."

Now here our author is open to graver censure almost than in the peceding cases. In them he has probably been guilty of little more than carelessness; here there is an apparently conscious alteration of the usual meaning of a scientific term. The Professor could scarcely have been ignorant that the specific gravity of a body *always* has reference to the weight of a unit of volume of water, and is, in fact, the *ratio* which the weight of a unit of volume of the body bears to that of the unit of volume of water; and that by the term specific gravity is never implied the number of pounds weight per cubic foot. We cannot therefore acquit him of a deliberate intention of endeavouring to *amend* the received definition—an act of considerable presumption even in a scientific man of the highest repute, and sure to lead to nothing but confusion. It would doubtless be convenient to have a term for the number of pounds weight per cubic foot, and *specific weight* might be advantageously employed for the purpose; but it argues no small amount of self-esteem in an author to endeavour to wrest a term which has long been employed by the scientific world in a definite sense to serve another purpose. The habit of mind which this argues—aiming at originality at whatever cost—may probably account for many of the defects of the work before us, the further examination of which the limit of our space warns us must be put off to a future occasion.

LIST OF NEW BOOKS.

Agassiz's Essay on Classification, 12s.
Butler's Geog. of Globe, by Rowbotham, 11th edit., 4s. 6d.
Dalton on Human Physiology, 24s.
Dowing's Timber Merchant and Builder's Companion, 3s.
Isherwood's Engineering Precepts, 6s.
Letters to Benj. Franklin from Family and Friends, 12s.
Ottè's Landscape Photography, new edit., 2s. 6d.

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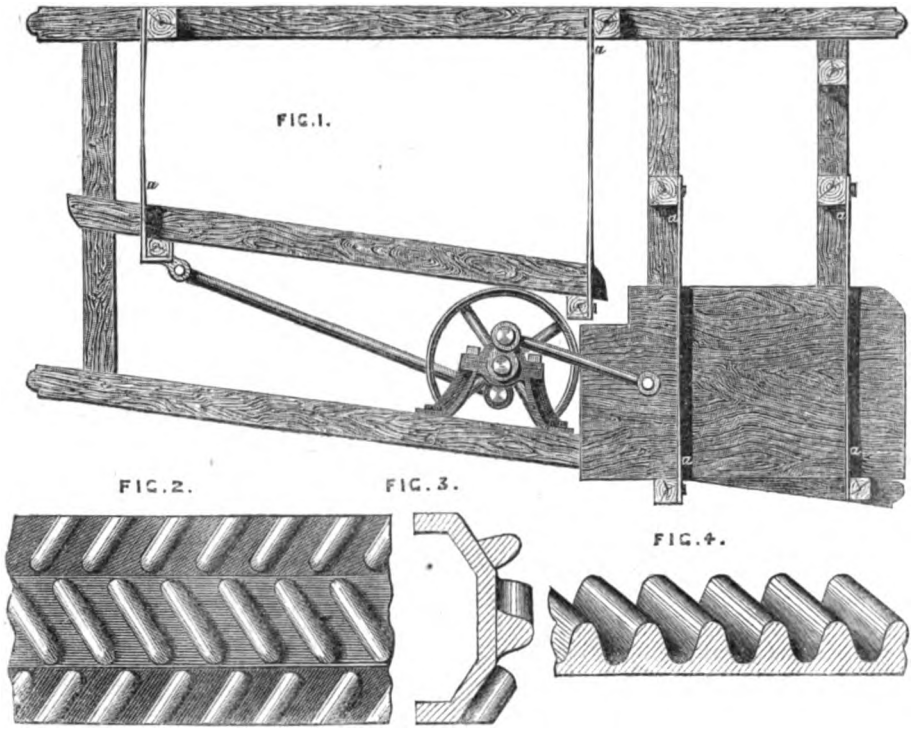
MIDWORTH'S IMPROVEMENTS IN THRESHING AND DRESSING MACHINES.



MESSRS. J. and W. MIDWORTH, Engineers, of Newark, have introduced the following improvements (the invention of Mr J. Coulson, of that firm) into the threshing and dressing machines patented and manufactured by them. The improvements consist first in forming the springs or bars by which the shoes, riddles, and shog-boards of the sifting or riddling apparatus of threshing and dressing machines are suspended, thicker at the ends than at the middle,—that is, tapering from the ends towards the middle,—whereby greater ease and freedom of motion are obtained in the moving parts of the apparatus. The said springs or bars may be formed of steel, wood, or any other suitable material. This improvement is illustrated in Fig. 1 of the annexed engravings, *a a* being the tapering springs. The second improvement consists in forming the beating surfaces of the beaters of the threshing machines of a half-octagon form in section, three of the sides being furnished with oblique ridges or projections, placed alternately in opposite directions. This improvement is illustrated in Figs. 2, 3, and 4, which need no explanation.

NORTON'S SUBMARINE CARTRIDGES.

CAPTAIN NORTON has this week submitted to us an invention of his for discharging shells, powder, caissons, and other like bodies beneath the water. It consists of one of his frictional igniters enclosed in a caoutchouc cover, so arranged that while no water can enter, the frictional rod of the igniter can be readily drawn between the igniting substances at any required moment, thus effecting the discharge. Such a contrivance would, we think, be more handy for blasting under water than either electrical appliances or Pickford's fuse.

CHROMO-LITHOGRAPHY.

THE line of demarcation which separates the results of art from those of mechanical ability must be always more or less capable of definition. We have but to know the means used to produce certain pictorial effects at once to determine the question. But a knowledge of the means is not always at hand, and many a mechanical production may pass current as a work of art in the absence of the requisite information. Under similar circumstances, prints, principally mezzotints very highly coloured in oil, deceived all but the best judges during the latter part of the last century; and although it may be questioned whether these combinations of the engravers' skill and the talent of the painter were not works of art after all, it must be admitted they were not what they were intended to represent, and as such, when discovered, were treated with considerable contempt, or incontinently destroyed. The works produced by the new process of chromo-lithography do not enter the world with any such deceitful purpose, but curious enough their very closeness or *vraisemblance* to the originals from which they are taken is the especial boast and pride of those to whom they owe their creation. How they fare, and whether they pass as the genuine coin after they get far beyond the guardianship or espionage of those who can distinguish the originals from the duplicates it is not for us to enquire, but that they are eminently capable of deceiving the many no one can have a doubt who has watched the progress of chromo-lithography during the last few months.

Messrs. Rowney, the artist colourmen of Rathbone-place, are responsible for this train of thought, which has been occasioned by an inspection of a large collection of chromo-lithographs at their establishment—so large, indeed, as to necessitate a tolerably sized gallery being devoted to their especial exhibition. Messrs. Rowney were amongst the first to recognise the capabilities of "chromo," and long and diligently have they exerted themselves to produce *fac-similes* of esteemed works of modern artists which should vie with the works themselves. Their success, we should imagine, has been almost beyond their own sanguine hopes, for surely they never could have been bold enough to anticipate a period when they could dare to place side by side the proofs of their presses with the "touch-endowed and genius-inspired" *chef-d'ouvres* of a Stanfield, a Roberts, a Cattermole, or even a Rowbotham or a Richardson. This, however, they are doing, and are not alone in their temerity—the Messrs. Hanharts, of Charlotte-street, Fitzroy-square, sharing in a practical challenge to art that would have been a few months since deemed a Quixotic impossibility.

Our praise of chromo-lithography—or rather its evidences—is not unqualified. It possesses a great mission for good or ill, as an educational power, and we fear from what we have seen in some of our art repositories, a positive pandering to bad taste is already prevalent in this new and most pleasing discovery. Attempts to copy Turner, in which we are reminded of the florid poll-parrot school of mantel-piece art—haply long since in its decadence—almost blind us with their meretricious absurdities, while in copies from other masters, "all trees are green, all waters are blue, and all roads are red," forcibly reminding us of Charles Lamb's admirable criticisms of the first attempts of his school-boy days to rival Gainsborough and Moreland.

LAYING-OFF;
OR,
THE GEOMETRY OF SHIP-BUILDING.
No. III.

HAVING briefly considered the general nature of the principle of projection, we shall proceed to its application to ship-drawings. On inspecting one of these, we shall see that although the different parts of the drawing bear the same relation to each other as do the corresponding parts of the ship represented, yet the whole is on a much smaller scale—generally 1-48th of the real dimensions: the drawing is therefore the projected outlines of a miniature ship, the proportion of the size of which, to that of the real vessel, is known. As the sheer drawing of a boat is of the same nature as that of a ship, and the former suits our present convenience, we have given it (page 140), but we shall speak of it generally as though it were that of a ship.

There will appear at first sight but little similarity between the diagrams of the preceding articles and the present drawing, but we shall see as we proceed how closely they are related. The drawing marked SHEER PLAN is a projection of the outlines of the ship upon the vertical plane which is supposed to pass quite through the middle of the ship, cutting her into two similar and equal portions; that marked HALF-BREADTH PLAN is a projection of the same outlines upon the horizontal plane, which is in this case taken, not parallel to the water-lines, but at right angles to the frames of the boat, and at the height of the upper edge of the rabbet of keel amidships. We shall recur to this hereafter. The line in which these two planes intersect is marked, in accordance with our previous practice, *L T*. But the horizontal plane of projection is displaced. The proper position of the half-breadth plan would be that in which the line *L T* in it coincided with the *L T* of the sheer plan; but for the sake of convenience, the two sets of projections are separated, and not only separated—the horizontal plane is turned completely over. It would be possible to record every point in the ship on these two planes, but in order to prevent confusion, a second vertical plane of projection in introduced at right angles to the former, and is called the BODY PLAN.

It is to be observed that any body may be said to be projected when such a number of points and lines in it have been projected as will completely determine its form. To make a projection drawing of a sphere, it is only necessary to project the centre on both the planes, and to describe a circle on each with the projection as centre, and with a radius equal to that of the sphere. These two circles will completely determine the position and dimensions of the solid. Similarly, a cone would be determined by projecting the apex and base; and a cube by the delineation of one of its faces on each of the planes. There is no such regularity in the form of a ship, yet it is sufficiently regular to make the number of points requiring to be projected comparatively small. It will be seen in the first place, that since both sides of the ship are similar and equal, it is only necessary to obtain projections from one of them. For the sheer plan the starboard side is generally taken for this purpose, and for the half-breadth plan the larboard side.

A number of planes are now chosen, cutting the ship into sections, and the shape of the outer surface of the ship being indicated on the planes of projection at each of these sections, the shape of the entire outer surface of the ship is assumed

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to be known, and if the directions of the sectional planes are well chosen, and they are sufficiently numerous, the shape of the ship is completely determined by them; for at all such sections the curvature of the surface of the ship is continuous and *fair;* and just as only one straight line can be drawn through two points, and only one circle through three points, so there can be but one *fair* curve drawn through each series of detached points selected by the shipbuilder from the surface of the ship, and that curve is found from the given series of points by laying a thin batten upon the paper, and bending it until it passes through all the points; or by selecting a thin piece of wood called a mould, the edge of which is curved, and is of such a curvature that it will unite four or more of the given points.

FIG. 12.

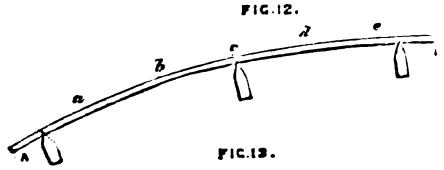


FIG. 13.

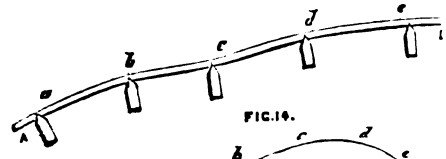
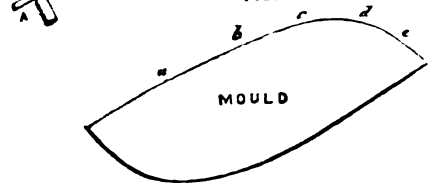


FIG. 14.



For example, suppose it were known that in one of the sections of the outer surface of the ship there were points occupying the relative positions *a, b, c, d, e*, and it were required to show the complete *line* of section of this surface. To obtain this it would only be necessary to bend the batten *A B*, Fig. 12, by means of lead nippers, until it passed through all these points, then, with a pen or pencil, to describe the curve *a b c d e*.

If one of the points should lie within the others, as in Fig. 13, making it necessary to bend the batten in a hollow, it may be concluded at once that the points have not been correctly determined, and that they cannot be points in one of the sections of the ship.

It requires a considerable degree of practice to be able to detect the least unfairness in the batten, but the draughtsman is always required to do this. If the points are disposed so that a batten could not be bent round them, as in Fig. 14, a mould is employed as represented in that Figure. Moulds are, however, less reliable than battens, as a batten of tolerable thickness will resist any attempt to force it to an unfair curve; whereas, unless the several lengths of a curve described by moulds are well scarphed together, there is great danger of getting in an unfair line. If this occurs in the design on the small scale, the consequence will be, that when it is enlarged on the mould loft floor, the unfairness will become apparent, and it will be necessary, in rectifying it, to depart from the design; on the other hand, should the lines on the floor have any unfairness, it will appear also in the ship, and will lessen her value.

The most obvious direction in which to cut the ship is horizontally, *i. e.*, by planes parallel to the surface of the water, and from one to three feet apart. The curves in which these planes cut the outer surface of the ship are called *water-lines*, and as they show the course which the water travel ing horizontally past the ship is compelled to take, they are generally the first lines drawn in by the architect after the form of the midship section is determined. *N O* (p. 140) is the trace upon the vertical plane of the plane of the water's surface when the boat is laden; it is also the vertical projection of the *load-water line*, or of the curve in which the outer surface of the vessel is cut by the plane of the water. The horizontal projection of this line is *e h*, which, it will be seen, is not the true shape of the line, because the plane of the water's surface is not parallel to the plane of projection; and whenever a ship is designed to draw more water aft than forward, or is not on an *even keel*, and the plane of projection is taken through the upper edge of the rabbet of the keel, then the *water-lines* are not projected in their true shape. What is true of the line (*e h*, *e' h'*) is true also of the parallel lines (*f i*, *f' i'*) (*g k*, *g' k'*). But it may be said, Why is not the horizontal plane taken parallel to the plane of the water, that we may see the true shapes? The answer is, that the frames or ribs of the ship are perpendicular to the keel, and it is convenient to make the transverse sectional planes coincident with the sides of these frames, and to take the third plane of projection for the body plan parallel to them, that they may be projected in their true shape for the purposes of laying-off: this renders it necessary to take the horizontal plane at right angles to these ribs, and inclined to the plane of the water. It will be seen that it is not only the shape of the water-lines which is affected by this choice of the planes of projection; but the transverse sections, including the midship section, although they give the shapes of the ribs, are not those which the *constructor* would like to see. He would wish to see, and to be able to measure, the greatest transverse section of the ship, *at right angles to the line of motion, i. e.*, at right angles to the surface of the water—and he would prefer that all the transverse sections should be vertical.

On this account, especially when the set by the stern is considerable, as is the case in yachts, the constructor has a drawing made on a peculiar principle. He takes his horizontal plane really horizontal or parallel to the surface of the water, and his transverse sections and third plane of projection perpendicular to it. By this means he obtains the true shapes of the water-lines, and of the vertical transverse sections. The number of square feet which he finds by calculating the area of the *projection* of the load-water section is then the real area of that section, and the calculated area of the midship section is not, as it would otherwise have been, the area of a surface oblique to the horizontal, but that of the greatest *vertical* transverse section. Such a drawing is called a construction drawing. But for the reasons we have stated above it cannot be placed in the hands of the draughtsman to be expanded on the floor, as the transverse sections do not give the forms of the ribs, and he would be unable to make the moulds. This drawing has therefore to be converted into a building drawing referred to the planes of projection shown in our figure. As the construction drawing has no immediate connexion with our subject, and as it is, moreover, very rarely made, we shall not describe it further.

The transverse sections of which we have spoken are marked "dead flat" (which is the midship or greatest transverse section), in the fore body *A, B*, and *C*, and in the after body 1, 2, and 3, together with the transom or terminal section of the boat. It will be seen that the ordinary vertical and horizontal projections of these sections are straight lines, because they lie in planes perpendicular to both these planes of projection; while on the third plane they are projected in their true shape. The line *X Y* in this plane is that in which the third plane intersects the vertical plane, and *Y Z*, that in which it intersects the horizontal plane. The transverse sections of the *fore* body are projected on this plane, but as those which lie abaft the midship section would fall upon the foremost sections and cause confusion, they are swung round and shown together with the midship section on the opposite side of the axis *X Y*.

The gunwale or upper boundary of the boat is a line of double curvature, *i. e.*, is curved both outwards and downwards; it is, however, determined by its projections (*a' l' b' d'*, *a l b d*), just as plane curves are. Such lines are called *sheer lines*. It may sometimes happen that all these curves are quite fair, and yet, in consequence of too great fulness in one or more of them, there would be an unfairness in the surface enveloping them. The only way of discovering whether this is so, is to cut across them all by new planes. Planes taken in this way parallel to the vertical plane, cut the surface in lines, the foremost portions of which are called *bow lines*, and the after portions *buttock lines;* for example, (*m b*, *m' b'*), (*n d*, *n' d'*) are bow lines, (*m a*, *m' a'*) (*n e*, *n' c'*), continuations of the same lines, buttock lines. Vertical projections of the same lines are shown in the body plan by vertical dotted lines. The ship is cut again by planes oblique to the vertical and horizontal planes, but at right angles to the plane of the body. The lines in which such planes cut the surface are called *diagonal lines;* *o p q* is the horizontal projection of one of these lines, and *p' q'* or *p' o'* its projection on the plane of the body. It frequently happens that the diagonal plane in the after body is taken for convenience with an obliquity, differing from that in the fore body. The double plane is made to enter both bodies at the point *p'*, so that the horizontal projection would be a continuous line, and the lines *p' q'*, *p' o'*, representing the vertical projection, would still be straight, but would be inclined at different angles to the axis, and would not, as now, meet it in the same point. To avoid confusion we have not shown the projection of this line on the vertical plane. The curved lines crossing the sections in the fore body, and marked *h' i'* and *k'*, are the projections on the plane of the body of the foremost portions of the water-lines, and those marked *e'*, *f'*, *g'* are the projections on this plane of the after portions of the same lines. The curved lines *l' d'* and *l' a'* on the plane of the body are the projections on that plane of the sheer line (*a l b d*, *a' l' b' d'*).

There is yet another kind of sectional line which we have not shown, that is, the *level* line. It is obtained by cutting the ship by planes at right angles to the planes of the ribs. The projections of these lines in the vertical plane and in the plane of the body are straight lines parallel to the axis, and in the horizontal plane curves of the true shape of the sections.

It will be seen from the nature of projections that the perpendicular distances from the axis of the projection of the points of intersection of the transverse sections with the water lines, sheer lines, and diagonal lines are respectively the same in both the body and half-breadth plans, so that with the aid of the sheer plan, the body plan can be constructed from the half-breadth plan, and *vice versâ*. The heights of the corresponding projections of these same points above the axis in the sheer and body plans are also equal, and the projections on one of these planes may be obtained from those on the other. So also the heights above the axis of the projections of the points of intersection of the several transverse sections, with the buttock and bow lines, are the same in both the body and the sheer plans; and further, the distances from the midship section of the projection of the points of intersection of the water-lines with the buttock and bow lines, are the same in the sheer and half-breadth plans: the curves in the sheer may, therefore, be obtained from the half-breadth. We have joined, for example, by dotted lines, two corresponding points on the two plans in the intersection of the load-water line with the outer bow and buttock lines.* In strict accordance with the doctrine of projections as we have expounded, it all corresponding points in the two plans should be so joined, but it is not found necessary in practice to do so, as all the points projected belong to some well-defined series, and can, therefore, be easily distinguished.

The operation of *fairing* the body consists in adjusting the shapes of all these projections, so that the relations between the distances which we have pointed out may hold throughout the ship. When this is the case, the drawing on the paper or on the floor is said to be *faired*.

* The blocks having been separated since the above was written, the four dotted lines in the sheer plan and half-breadth plan do not meet as they should. They must be supposed to meet.

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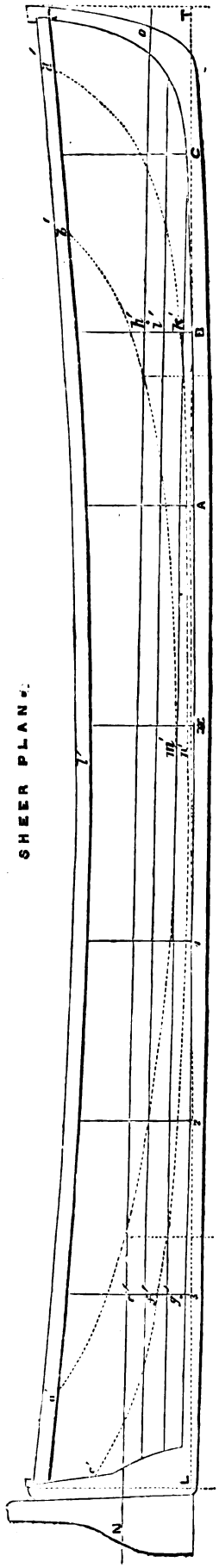
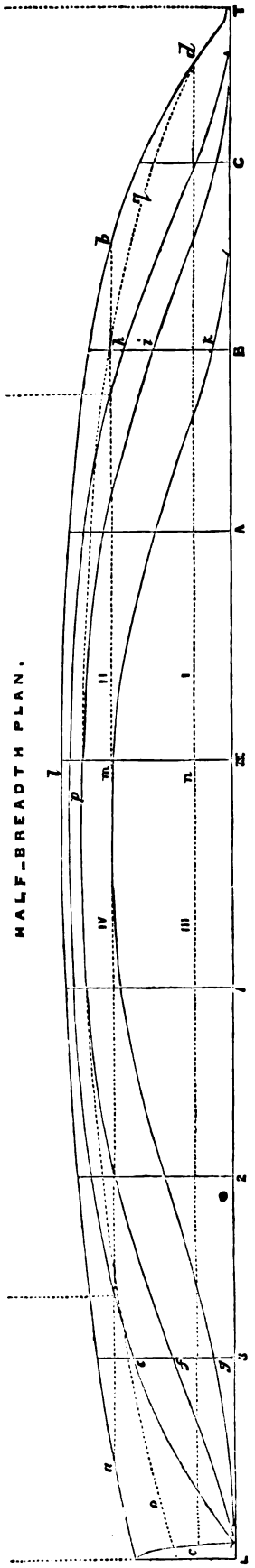
SHEER DRAWING OF THE ROYAL BARGE OF H. M. YACHT VICTORIA AND ALBERT.

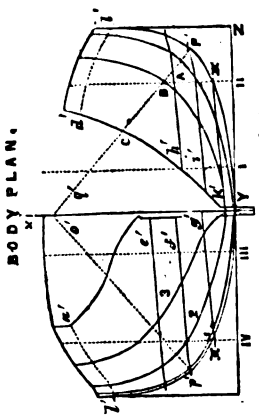




REFERENCES
TO BODY AND HALF-BREADTH PLANS.

XY and LT Middle Lines or Axes.

Fore Body.	After Body.	Projections of Transverse Sections.
A, B, C,	1, 2, 3	
h & h'	e & e'	Water Lines.
i & i'	f & f'	"
k & k'	g & g'	"
(p q, p' q')	(p o, p' o')	Diagonal Line.
(l d, l' d')	(l a, l' a')	a Sheer Line.
I and II	III and IV	Bow Lines, Buttock Lines,



REFERENCES
TO SHEER AND HALF-BREADTH PLANS.

LT, Axis through upper edge of rabbet of keel amidships.
NO, Load Water Line.
e h, e' h' } Projections of Water Lines.
f i, f' i' }
g k, g' k' }
m b, m' b' } Bow Lines.
n d, n' d' } "
m a, m' a' } Buttock Lines.
n c, n' d' } "
a l b d, a' l' b' d' a Sheer Line.

Scale ½ of an inch to a foot.

THE ARMSTRONG GUN.

THE Government are exercising unwonted care in keeping the nature of Mr. Armstrong's gun a secret. They have suppressed his application for a patent, and are about to bring a Bill into Parliament to justify that proceeding, the Patent Law Amendment Act of 1852 making no provision for it. If we believed it possible for them to prevent foreign governments from learning all about it we would support them in their course, and would willingly refrain from divulging what we know respecting it. But that is not possible. There is always plenty of French and Russian money to be had in this country for secrets of far less importance than this; and, if there were not, we know perfectly well that our own Governments often make great pretences of secresy to the British public, but at the same time are as communicative to foreigners as they can desire. Knowing these things, we view all official attempts to suppress information in this country as a challenge to the press; and we feel some pride now, as on all other such occasions, in showing that the British press can do as much for the British public, in the way of obtaining information, as bribery can do for foreigners. It was publicly stated last week, by a newspaper correspondent, that the secret of this gun is out, and has been for weeks. But we have as yet met with no public detailed description of the Armstrong gun; and if the writer himself had been in possession of it, he would not, we presume, have evaded it altogether. Judging from the refusals we have ourselves met with, we believe no unofficial person will have had easy access to the information in question. There are, however, means of penetrating all such barriers as a Government like ours can raise; and the following statement will show that the precautions taken in this case have proved insufficient. Before referring to our engravings of the gun, we will endeavour to give an intelligible verbal description of it. Instead of being cast like ordinary cannon—or formed of several longitudinal pieces like the Whitworth cannon—or of a hooped or wire-bound tube as proposed by Captain Blakely, Mr. Mallet, and others—the new gun is formed of an internal steel tube, bound over with strips of rolled iron laid on spirally, somewhat after the fashion of small-arm barrels, the alternate strips being laid in opposite directions, so that the joints may cross each other; or, in other words, so as to "break joint." This system of construction is of course expensive, but it gives great strength with a very small quantity of metal. The internal steel tube is rifled in a very peculiar manner. Instead of having two, three, or four grooves, like ordinary rifled guns—or being formed with an oval bore like that employed by Mr. Lancaster—or with a polygonal bore, as in the Whitworth system—it has a very large number of small grooves close to each other—no less than forty, we believe, in a gun of 2½ inches bore. The shot or shell Mr. Armstrong usually makes of cast iron, of about three diameters in length, and covers it entirely over with thin lead, so that it may readily conform itself to the rifled interior of the bore when forced forward by the explosion of the charge. Provision for loading the gun at the breech is made by cutting a slot near the breech end, down from the upper side into the bore, of a sufficient length to admit the elongated projectile and the charge of powder, and of a breadth slightly greater than the diameter of the bore. The bore itself is also slightly enlarged where it opens into the space formed by cutting out the slot, in order that the projectile and powder, after being lowered into the slot, may be easily pressed forward by hand or other means into the bore. In order to close the space formed by the slot, after the gun is charged, a moveable breech-piece is formed to fit into it, and is furnished with two handles, by means of which it may be lifted out and dropped into its place as required. This breech-piece has fitted to its front face a facet of copper, a portion of which projects slightly, so as to form a dis-

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THE ARMSTRONG GUN.

FIG. 1.

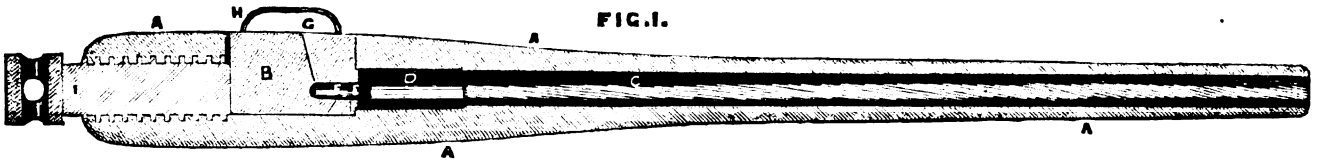


FIG. 2.

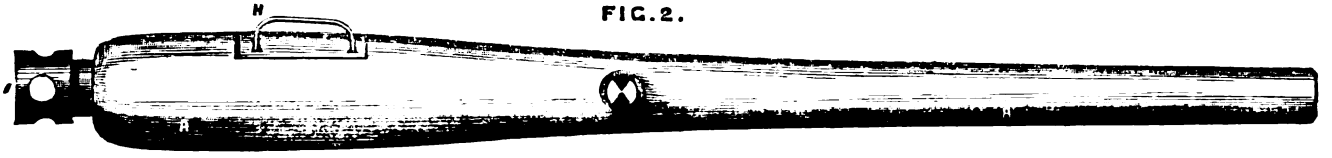
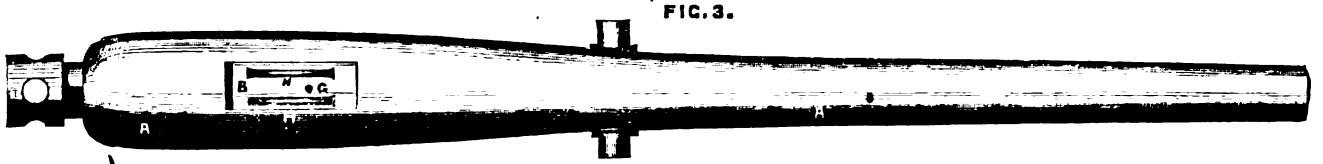


FIG. 3.



which, when the breech-piece is forced a little forward, will enter the bore behind the charge, and by its expansion at the moment of explosion prevent all escape of gas. The slight forcing forward of the breech-piece is effected by means of a strong screw passing in through the extreme breech end of the gun, and pressing against the rear end of the breech-piece. This screw is turned by a hand lever. The fore end of the breech-piece is bored out at the centre, the bore extending through the copper disc, and into this bore is placed, at the time of loading, a small discharging cartridge. The "touch-hole," or hole for the detonating plug, is formed in the breech-piece, passing down from its upper side into its bore; so that when the piece is to be discharged the detonating cap or plug is struck, the small discharging cartridge is thereby fired, and its fire is instantaneously communicated to the main cartridge in the bore of the gun itself. With his shells Mr. Armstrong uses a percussion fuze of his invention, for causing the shell to burst on striking an object, in case the striking takes place before the time-fuze has operated. This percussion fuze has been already described in our pages, but may fitly be again referred to here. In a cylindrical case within the shell Mr. Armstrong fixes a weight or striker, by means of a pin passing through it and the sides of the case. This pin is cut or broken by the shock which the projectile receives in the gun at the instant of firing, and the striker, being thus liberated, recedes to the rear end of the case, and there remains until the velocity of the shell is checked by coming into contact with some object. When this takes place, the striker, not participating in the retardation of the shell, advances in the case, and causes a patch of detonating composition to be carried suddenly against a fixed point, which fires the composition, and ignites the bursting charge in the shell.

Let us now glance at some of the effects which the introduction of the Armstrong gun is likely to produce. And as the advantages which a light long-range gun must possess as a military weapon will be pretty evident to every one, let us regard it more particularly in its relations to naval warfare. Experiments have already shown that a 32-pounder gun, constructed upon Mr. Armstrong's system, has a greater range, and fires with greater accuracy than any gun at present in use in the navy; and yet, while the former weighs but 26 cwt., the present 68-pounder weighs no less than 95 cwt. We may therefore at once reduce the weight of our naval guns by nearly three-fourths without impairing their range or aim. This would enormously increase the facility of handling them, and therefore leave us free to greatly reduce the number of men employed to work them. Again, with the breech-loading arm, it would probably be found possible to get rid of the running out and in of the gun while in action, by counteracting the recoil in some suitable way; and for this reason also the number of men required to work them might be very much below the present staff. Again, both the bore and the thickness of metal of the gun being greatly reduced, the external diameter of the gun will be so small that very small ports only would be necessary, and this would add materially to the safety of the gunners, especially in close action. Another advantage might be gained in the use of certain guns, particularly the bow-chase guns, on board ship. It is always a matter of great difficulty to give such a form to the ship that the muzzles of these may, when the guns are run out, project sufficiently far to carry the fire of the explosion clear of the vessel. With the long, slight Armstrong gun this difficulty would not be experienced. But, on the other hand, the Armstrong shell is not to be compared, for destructive effect, with the round shells now used in the navy. The charge of powder which it contains is far too small for this. Nor does the Armstrong projectile penetrate thick iron plates, as some suppose. It is found to have but little effect upon them, and this is probably one reason why both the French and English Governments are just now so anxious for the construction of iron-plated ships of war, if such can be successfully devised. That the Admiralty have the means of penetrating iron plates we are prepared confidently to state; but the Armstrong gun is not the gun they would use for the purpose.

And before we conclude we would explain that there is no magic about the peculiar combination of parts which we have explained in describing the gun. The success of the gun depends solely upon the efficient manner in which the projectile is caused to fill and fit the bore of the piece. This accuracy can never be obtained in muzzle-loading cannon. With breech-loaders, however, it is not difficult to secure. Any well-constructed breech-loading cannon would give good results; although Mr. Armstrong's lead-coated projectile has undoubtedly great advantages. Whether the contact of the two metals will deteriorate the projectiles if kept in store long has yet to be seen.

As for the Napoleon field-piece, of which the Emperor has 200 already completed for the Imperial Guard, we do not believe it will at all approach the Armstrong piece in merit of any kind. It is merely a two-grooved, 4-pounder-bore piece, with round shell made to fit the grooves.

We have not succeeded in obtaining exact drawings of any of Mr. Armstrong's guns; but in order to facilitate the comprehension of our description we have drawn out a rough representation of a gun constructed in the manner already explained. Fig. 1 is a vertical longitudinal section; Fig. 2 a side elevation; and Fig. 3 a plan. *A* is the gun itself, formed of a steel tube covered with ribbons of iron, as before described; *B* is the moveable breech-piece; *C* the rifled bore; *D* the enlarged portion of the same; *E* the copper plate on the front of the breech-piece *B*; *F* the bore of the breech-piece *B*; *G* the touch-hole; *H* the handles; and *I* the screw for forcing the breech-piece home. It must be understood that the figures are not engraved to any scale, nor has any attempt been made to give to the parts their exact relative proportions; our only object in giving the figures being to convey a more ready and definite sense of the new weapon than a verbal description alone can give.

NEW TELEGRAPH CABLES.

FIG. 2.

FIG. 3.

FIG. 1.

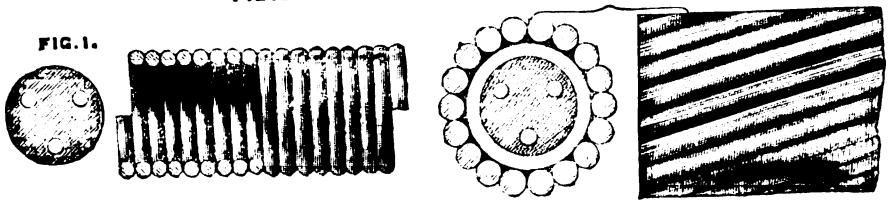
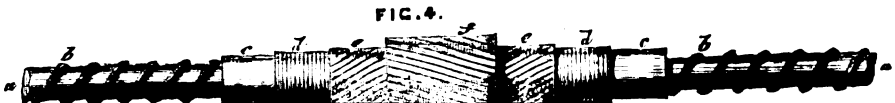


FIG. 4.



INGENIOUS men are still active in devising means for remedying the known defects of submarine electric telegraph cables. We have two new cables to lay before our readers this week.

The first is the invention of Mr. J. Walker, of the City-road, a very skilful engineer. The prime object of his improvements is to protect the insulated wires and the insulating material from compression by strains of any kind; and this he does by surrounding them with a flexible tube

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composed of wound wire. The manner in which he prefers to manufacture his telegraph cables is as follows:—He takes, say three copper conducting wires, and covers each wire separately with sheet caoutchouc, having finely-powdered glass on the surface, which is rolled against the wire; and he then applies coats of caoutchouc, either alone or stiffened with pulverised charcoal or fine glass, or he applies gutta percha over all the wires prepared as described, so as to unite them as shown in the transverse section, Fig. 1. Round these insulated wires he winds or coils iron, or other metal wire, so as to form a complete tube, as shown (partly in section) in Fig. 2. For many purposes a cable thus formed will be sufficient; but where great strength is required to prevent longitudinal extension, then he covers the flexible wire tube with strands of iron or steel wires laid spirally as in the section and elevation, Fig. 3, or with iron wires also laid spirally, or with a tube of some fibrous material made in a braiding machine, and protected by a tube of caoutchouc or gutta percha.

The next cable is the invention of Mr. C. Llewellyn Light, also a skillful engineer. The object of the first part of his invention is to enable the conducting wires of electric telegraph ropes or cables to yield without injury to any strain which the outer protecting wires may be capable of resisting, and the objects of the second part are to prevent the outer protecting wires from tending to unwind, and to increase the strength of the rope or cable. His invention consists, first, in winding the copper or other conducting wires of electric telegraph ropes or cables round a central core of gutta percha or other suitable material; and, secondly, in winding the outer protecting wires or strands of any suitable protecting material of such ropes or cables in two layers or sets, one layer or set being laid in a direction contrary to that of the other.

Fig. 4 illustrates this invention; *a* is a central core of gutta percha; *b b* are the conducting wires; *c* is a layer of insulating material covering the conducting wires; *d* is a casing or covering of tarred hemp or other like suitable material; *e* is a layer of wire covering the tarred hemp, and *f* is a second layer of wire running in the reverse direction to the first layer. The drawing shows two conducting wires, but there may be one, two, three, or more, all laid in a similar manner over and round a central core.

THE LATE DR. INMAN.

THE Rev. James Inman, D.D., many years Professor of Mathematics at the Royal Naval College, Portsmouth Dockyard, died on the 7th ult., aged 83. He was the oldest of Cambridge senior wranglers, and has long possessed a just celebrity in naval circles for his application of science to navigation and shipbuilding. He laboured very many years unobtrusively but zealously in his country's service. His degree dates as far back as 1800. He sailed round the world with Flinders, as astronomer, was wrecked with him, and took part with the late Sir John Franklin in that celebrated action in which a fleet of British merchantmen beat off the French Admiral Linois. While Professor of Mathematics at the Royal Naval College he reduced to system the previous ill-arranged methods of navigation, and published several valuable works now in general use in the naval service; but he was best known by his having been the first person in this country who built ships on scientific principles, and by his having educated a class of men by whose hands the "reconstruction" of the British navy *has been* effected. Dr. Inman's translation of *Chapman*, with his valuable annotations, is the text book on which subsequent writers on naval architecture have chiefly proceeded. His pupils, a long list of distinguished naval officers, will long remember him as a type of the high-minded truthful son of science, and the loyal, laborious, unobtrusive public servant. A high tribute to his abilities and worth was paid a few years since, in the MECHANICS' MAGAZINE, by the Rev. J. Woolley, LL.D., late Principal of the Training College for Naval Architects at Portsmouth—the worthy successor, in this office, of the deceased.

PATENT LAW REFORM.

National Patent Law Amendment Committee Room, (Holborn) Black Bull Hotel, Feb. 16th.

GENTLEMEN,—My attention has been directed to your Journal of the 5th inst., in which are some remarks that may be considered as intended to apply to the National Patent Law Amendment Association, of which I am secretary, and one of the original founders. This Association is not a new one, having been founded since 1850, and held many large and influential meetings prior to the Great Exhibition presided over by members of Parliament, &c., and, by frequent and influential deputations to the Government, assisted in carrying most of the important and beneficial changes embodied in the Act of 1852, as I can point out to you in our original prospectus and reports.

It is quite true a well-known patent agent has for a long time been one of its most prominent members, but allow me to state that he has never held any other office than that of patent law adviser, and that he was invited to join the association by a large committee who were all strangers to him, on account of his long and consistent advocacy of patent-law reform.

Asking that the usual courtesy of inserting this in your next number may be accorded,—I have the honour to be, your obedient servant,

JOHN D MAHON, Corresponding Secretary.

[With the above letter—which all persons having any intimate knowledge of patent affairs will know how to value—we have received a circular, the special object of which appears to be the solicitation of subscriptions. This circular contains a list of gentlemen who have allowed their names to appear in connection with Mr. Mahon's "N. P. L. A and I. P. R. Association," but we do not observe among them any of remarkable significance. There is a Mr. Cadby, and a Mr. Button, and a Mr. Sparkhall, and a Mr. Freebody, and a Mr Hussey, and a Mr. Savage—all doubtless gentlemen of eminent influence *among themselves*, but not known to us, nor, we presume, to the Lord Chancellor, or to Her Majesty's Law Officers, or anyone else whom it is absolutely necessary to influence before any Patent Law Reform is obtained. It is true that the names of General Evans, Sir John Shelley, Alderman Sydney, and Mr. Thomas Duncombe, appear prominently as Honorary Members of the Council; but it is not difficult to explain this fact when it is remembered that these gentlemen, although excellent men in their own spheres, are more likely than most men to know nothing whatever about the Patent Laws. But we have no desire to gratify anyone by discussing the pretensions of the Association in defence of which Mr. Mahon writes. If that long-named body be not the mere *alter ego* of a self-seeking individual or two, there is no need for considering that our remarks were "intended to apply" to it. But as Mr. Mahon has chosen publicly to suggest that application, we must refuse to aid him in repudiating it. It has not, however, been made by us.—EDS. M.M.]

TELEGRAPHIC CABLES.

MR WALTER HALL, part-proprietor of the India-rubber works, Southwark, requests us to publish the following remarks:—"I am inclined to think that some of your correspondents are making some grave errors as to the construction of telegraph cables in general. In the first place, I beg to state that I have had about 25 years' experience in the manufacture of India-rubber, including that of gutta percha. I flatter myself, therefore, I have some practical knowledge of the above materials, upon which I beg to make a few remarks. Mr. Hearder says that gutta percha has a tendency to "*retain the electric charge*;" it is my firm opinion that this is in consequence of the *natural* impurities of gutta percha, in the shape of sand and such like ingredients, which cannot be removed by any mechanical means or otherwise. I maintain, therefore, that India-rubber used in its *proper form* is the BEST insulating material for submarine purposes; in fact, for insulating telegraphic wires in general. I stated a few weeks back, that a cable should be constructed in such a manner as to take all strain off the conducting wire or wires, and I am happy to find Mr. Hearder confirms my opinion upon this particular point, which I so strongly advocated at that time. I am also of opinion that all submarine cables should have only one conducting wire, the same as used in the Atlantic cable; samples of cable that I have in my possession fully confirms me upon this point, for cables made with three or more wires are only suitable for laying on sand, or in a horizontal position; as it is quite certain when a cable of this description is bent in any form whatever, that some of the wires have a tendency to stretch, while the other wires are being forced into the insulating material, which would ultimately break all the wires, more especially if gutta percha is used for insulation. A "Telegraphic Engineer" says, "I cannot think the present form of the existing cable can be improved with any advantages;" this I impute to a want of mechanical knowledge on his part, as to the construction of submarine cables; at any rate, time will prove whether a cable can be constructed to suit all the purposes required. I am of opinion the time is not far distant when such will be the case. It is my firm opinion that Mr. Allan's cable will never answer the purpose for which it is intended, as the construction is not in accordance with the strain it will be subject to; therefore, I consider it will be perfectly useless when it is laid, and I have no doubt it would share the same fate as the Atlantic cable."—Would it not have been well for Mr. Hall to have given some *definite* reasons for his condemnation of the Allan cable, and for his prophecy of evil?

THE RAILWAY WORK OF THE SESSION.

IT appears from an official report issued by the Board of Trade that 192 railway and canal bills are now before Parliament. Of this number 129 bills authorise new works. In England 61 bills have been introduced by new companies seeking powers to construct 638 miles of railway; in Scotland five bills, referring to 53 miles, are brought forward by new companies; and in Ireland four bills, referring to 77 miles are introduced in a similar manner. As regards the movements of existing companies, they have introduced 43 bills for 154 miles of new line in England, six bill, for 78 miles of new line in Scotland, and ten bills for 129 miles of new line in Ireland. The total length of new line proposed is, therefore, 1,129 miles, and there are besides 95 miles of deviation lines, and twelve projects for the enlargement of stations.

NEW DOCK AT PORT LOUIS, MAURITIUS.

(Extract from "The Overland Commercial Gazette," Port Louis, Mauritius, 27th December, 1858.)

WE have much satisfaction in announcing that, to facilitate the recently-established mail service between this port, Australia, and the mother-country, the Mauritius Dock Company have commenced the excavations for a vast dry dock, to afford every facility for repairing such noble vessels as we shall shortly have calling at our port (Port Louis). The size of the dock is to be 350 feet long; 80 extreme breadth; 60 mean, and 40 minimum breadth; depth, 23 feet: in fact, capable of easily taking in such magnificent vessels as the *Duke of Wellington*, of 3,755 tons; length, 278 ft.; length of keel, for tonnage, 202 ft.; depth of hold, 24 ft.; breadth, 62 ft. Her Majesty's steam-frigate *Mersey*, length, 366½ ft.; length of keel for tonnage, 254 ft.; breadth, 52 ft.; burthen, 3,726 tons. Her Majesty's ship *Boscawen*, which was lately here, is 2,212 tons; length, 213 feet. Such a vessel would appear like a long-boat in the new dock. The most important fact is, that merchant ships of all sizes can be taken into dock and immediately repaired.

The pumping machinery is being constructed by Messrs Gwynne and Co., engineers, London, whose names stand so favourably before the public. Engines of 100 horse-power will work three centrifugal pumps, each discharging 12,000 gallons of water per minute; and the dock when full, containing 13,000 tons of water, will be entirely emptied in 2½ hours. Besides these pumps, a smaller one, worked by a separate engine, will keep the dock dry during repairs to vessels. The Company have, in addition, a forge, and every appliance for the repairs of iron vessels—this fact cannot possibly be too widely known.

The contractors have engaged to finish the excavations in a year, but nine months will probably suffice for the reception of vessels.

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THE ADMIRALTY TABLES.

DURING the passage through the press of the Admiralty Tables published in our Supplement of last week, the small and fine figure type representing the fraction $\frac{3}{4}$, became damaged in two or three places. The defect was remedied as soon as discovered, so that a small portion only of our issue appeared without the fraction mentioned in its proper place above the word "Displacement," —sometimes written "Dispt." Wherever this word appears (either in its full or in its contracted form) in the headings on pages ix., xiii., and xv., the fraction $\frac{3}{4}$ should appear above it on the right (thus, Dispt.$^{3}/_{4}$), meaning the cube root of the square of the displacement.

THE ROYAL MINT.

AN unexampled amount of activity, we are told, exists at the Mint, in consequence of the great demand for silver coin. Seven presses are constantly engaged in stamping, and they throw off nearly a million of pieces per week. Foreign mints are as busily employed in the creation of small monies, whilst the mints of Bombay, Bengal, and Madras are being enlarged to double their original sizes, in order to meet the strain which is likely, under the new organisation of things in those presidencies, to come upon them. The enlarged Calcutta Mint will boast twenty-four coining presses—three times as many as the Royal Mint possesses—and will be capable of producing 600,000 coins per day! This may give some faint notion of the gigantic scale upon which things must be arranged to meet the requirements of the Indian Empire.

PATENT COUCHES, &c., FOR INDIA.

MOHAH RAJAH, of Burdwan, one of the wealthiest Princes of India, whose adherence to British rule during the late rebellion was so conspicuous for its unqualified loyalty and active co-operation, has showed his faith in our prolonged supremacy in a very simple, although unintentional manner. He gave orders somewhat extensively and liberally to several of the English manufacturers, and amongst them, he entrusted his body's repose—for with all his treasures he possesses not an immunity from "the ills which flesh is heir to"—to the consideration and skill of Mr. Alderman, of Soho Square, who has just shipped for India some very ingeniously-constructed couches and chairs to be carried by attendants and others, of the latter, for perambulatory purposes. The couches are patented, and singular and pre-eminent as works combining varied mechanical resources. For instance, a child can noiselessly elevate and depress a patient to any and every position the recumbent is capable of assuming. All this is done without touching the invalid, whose glance may be all the while resting upon a book, a desk being so arranged as to keep one unvarying inclination to the eyes of the reader. The mattresses of these couches are likewise worthy of especial mention, as they possess the capabilities of a free ventilation and a perfect elasticity. Herein the physician will at once recognise excellences of the highest order, as the absence of any solid pressure places the creation of "bed sores" upon the uttermost verge of possibility.

FRENCH FLOATING BATTERIES.—"The intended transformation of the steam line-of-battle ship *Jemmappes* into a floating battery is," says a letter from Toulon, "the commencement of a new and important application of the system of floating-batteries. The French Government has it in contemplation to fit out several of these steam fortresses, destined for the defence of the different naval ports, which they will shelter from all aggression. These enormous naval constructions will be, like the floating batteries which were used with such formidable effect against the fort of Kinburn, covered with a sheathing of wrought iron."

NOTICES.

The demand for Mr. E. J. Reed's paper on the Ships of the Royal Navy has been so great that the Journal of the Society of Arts, the MECHANICS' MAGAZINE, and all other Scientific Journals in which it appeared in December last, are now out of print. The demand still continuing, it has been deemed desirable to reprint it in a separate form. An 8vo. edition of it, in large type, and on fine paper, has, therefore, been prepared, and may now be had at the Office of this Magazine, price 1s.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

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All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of insertions less than 13; for 13 insertions, 4d. per line; and for 52 insertions, 3d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 6 o'clock on Thursday evening each week. None can be received after 5 o'clock on Thursday evening for the ensuing number.

CORRESPONDENTS' QUERIES.

GENTLEMEN,—The writer would be glad to receive information on the following points, or to be informed where he may obtain it. 1st. What are the advantages to be obtained by rotary steam-engines? 2nd. What has proved the hindrance to their introduction? 3rd. What is the best rotary engine which has been made? 4th. What is the best treatise on the subject? C. P.

January 18, 1859.

GENTLEMEN,—I should be glad to learn of a rule to discover the quantity of air passing through a pipe of a given size per minute, the fanners making a certain number of revolutions per minute. C. G. P.

18 Kingston Place, Glasgow, Feb. 11, 1859.

GENTLEMEN,—Wishing to pass for a Chief Engineer on board one of Her Majesty's Ships, I shall be glad to learn from any of your correspondents what examinations, &c., are required. G. HOGBEN.

CORRESPONDENT'S REPLY.

ELECTRO-MAGNETISM.

GENTLEMEN,—I think I can answer the very important question of your correspondent, T. C. H. The phenomenon which he observed is not new, although it is perhaps a novelty in its connection with the induction-coil, and may lead to a considerable augmentation of power in that very interesting apparatus. If T. C. H. has access to the *Cosmos*, edited by the Abbé Moigno, he will find, in vol. xi., p. 71 (July 1857), the following passage:—"M. du Moncel adresse de son chateau de Libesey, des experiences destinées à mettre en évidence les propriétés et les avantages des electro-aimants en fer à cheval, dont une seule branche est entourée d'une helice magnétisante, et qu'en raison de cette dissymétrie il appelle *électro-aimants boiteaux*. (Lame electro-magnets.) Ces electro-aimants sont remarquables à ce point de vue que leur puissance attractive, sous certaines conditions, est tres peu inferieur à celle des electro-aimants de même forme et de meme volume, armés sur leurs deux branches de bobines ou hélices magnétisantes." And in the same volume, pp. 215-16, M. Nickles shows that the fact claimed by M. du Moncel as a discovery has been long known—namely, that the attractive power of an electro-magnet is increased by extending (within certain limits) the length of the core. Now, this was precisely the effect produced when T. C. H. touched the top of the core with a pair of pliers or any other piece of iron. It became more powerfully electro-magnetic under the influence of the current, and hence the accelerated vibration of the hammer. I should be glad if T. C. H. would try an extended core of different lengths, and communicate the result through the columns of the MECHANICS' MAGAZINE. GEORGE BLAIR.

Glasgow, Feb. 19, 1859.

P.S.—DuMoncel states that he found the energy of the helix-covered leg of his *electro-aimant boiteux*—or, in other words, that of a straight electro-magnet like the core of T. C. H.'s induction-coil (including its primary wire)—greatly increased when he merely approached the naked leg and cross-piece to that end of the covered bar which did not act upon the armature. Perhaps T. C. H. will verify this result by bringing a piece of soft iron near to, but not into absolute contact with the upper end of his core. I should say, also, that with a *single* cell of Callan's battery he will find the effect which he observed less visible, because with two or three cells there is a surplus of intensity in the current, which is capable of saturating with magnetism a larger and longer core than that of his instrument. It would be interesting if, in stating the effects produced, he would specify the exact dimensions of his apparatus—especially the length and diameter of the core or cores, and the size of the elements of his battery. I have one or two induction-coils, but they are not fitted by their form for these experiments, which may lead to useful results. G. B.

CURRENT EVENTS

IN THE CENTRES OF THE IRON, COAL, MACHINE, AND SHIPPING TRADES.

[COMPILED BY OUR OWN CORRESPONDENT.]

The Shipowners' Movement—Petition against the Timber Dues—Dock and River Interests at Sunderland—Explosion on Shipboard—Petition against proposed Railway at Liverpool—Increased Protection to "Registrations"—Bootmakers and Machinery—Drinking Fountains—Stained Glass Window—Ventilating Ships—Colliery Furnace Regulator—New Mechanics' Institute—Nineveh Marble for Newcastle—Engines and Carriages for the Egyptian Viceroy—The Largest Hammer in England—Factories in the Midlands—Proposed Extension of the Factories Act—Steam Boiler Explosions—Commencement of the Eden Valley Railway—Collision of Steamers in the North Sea.

A SHIPOWNERS' grievance meeting has been held at Newcastle-upon-Tyne, presided over by the Mayor. The shipowners of the Tyne were urged to unite with those of other ports in seeking to obtain from Government and the country something like a practical acknowledgment of their just position, by the removal of those burdens. Resolutions were unanimously adopted, calling for a repeal of the timber duty, and the abolition of the light dues, passing tolls, and other unfair imposts and restrictions; a petition to Parliament, based on these demands, being also agreed to.——The Sunderland Town Council have agreed, without discussion, that the Corporation seal should be attached to a petition against the timber dues.——A great effort is being made in Sunderland to secure the amalgamation of the dock and river interests.——From an unknown cause a ship laden with coals has exploded at the South Dock, Sunderland.——The Toxteth Board of Health have adopted a petition against the bill by which it is proposed to connect Liverpool with Garston by railway, and thus, *viâ* the Great Northern, afford another railway route to London. This route is at present considerably used, but passengers now have to travel by omnibus from Liverpool to Garston, a distance of seven miles.——The Birmingham manufacturers propose to secure protection for six years instead of three, under the Registration of Designs Act, to articles in metal; articles of minor importance paying a smaller fee for registration to retain the present term of three years.——Messrs. Boote, of Burslem, are using a new machine process for making tesselated tiles, whereby it is said that tiles of "an excellent quality and tasteful design" can be produced at little more than half the cost necessitated by the former process.——The bootmakers of Stafford have met, 2,000 strong, to hear deputations from Northampton, and with much enthusiasm have passed the following resolution in particular:—"That inasmuch as the manufacturers of Stafford have entered into a combination with the manufacturers of Northampton for the purpose of forcing the machines on the people of both towns, we, the people of Stafford, feel called upon in self-defence to unite with the men of Northampton to resist it in every way in our power."——Alderman George Higginbottom gives four drinking fountains to the town of Ashton-under-Lyne, and the corporation engages to supply them with water.——A second stained-glass window has been placed in the south chancel of Manchester cathedral, both being given "to the honour and glory of God, by a citizen of Manchester, once a chorister in this church."——Mr. Jordan, shipbuilder, of Liverpool, has invented a means of ventilating ships by the use of hollow iron masts, which collect the foul air at their base, and discharge it into the general atmosphere through various perforations near the summit. Models illustrative of this invention have been exhibited in Liverpool.——Mr. Burton, the underviewer of the Springwell colliery, Staveley Works, Derbyshire, has arranged a simple apparatus, worked by a small feeder of water, called a "furnace regulator," by which constant attention to the ventilating furnace in a pit is secured. Since its first use the ventilation of the pit has been increased 30 per cent. if kept constant. The "regulator" has been introduced into the South Yorkshire colliery, Barnsley.——The new building for the Mechanics' Institute at South Shields is about to be commenced. The committee have accepted the plans of Mr. Wardle, to embrace a hall for 1,000 people; a library room, a news room, 4 class rooms, a museum, a kitchen and kitchen range, and apartments for librarian.——Four Nineveh marbles, weighing together seven tons, have arrived at the Literary and Philosophical Institute at Newcastle-upon-Tyne. They are the gift of Mr. W. K. Loftus, who is intimately associated with that town, and a recent explorer among the Nineveh remains.——The series of locomotives and carriages to be used by his Highness Said Mahommed, Viceroy of Egypt, in his state excursions on the railway between Alexandria and Cairo, which have for some time been under construction by Messrs. R. Stephenson and Co., of Newcastle, are now nearly completed. The locomotives are two in number. One is an enormous military engine which may be worked up to a thousand horse power; while the other, though a small one, and quite a toy compared to the other, is of an entirely novel construction, owing to its being a locomotive and carriage combined, so that the Viceroy may occasionally take his place as amateur engineer. These elegant and noble specimens of engineering art and of British manufacture, have been finished and ornamented in the highest style of Oriental splendour and magnificence.——There has been sent from the works of Messrs. R. Morrison and Co., of Newcastle-on-Tyne, the largest steam hammer in England. It is for the Mersey Steel and Forge Company, Liverpool. The total height is 21 feet, and the width between the frames 14ft. 6in. The hammer bar is 15 inches diameter, and 19 feet long, and is made of steel, with the piston, which is 36 inches diameter, forged in one solid piece—the hammer bar forming a solid mass of steel, weighing above 7 tons in the finished state, with a stroke or clear fall of 6 feet. The cylinder is 36 inches diameter, and weighs, finished, above 8 tons; the two frames weigh 15 tons. The hammer, when in its place, will stand upon an anvil

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mass of cast-iron, wood, and stone, 32 feet long, 18 feet wide, and 9 feet deep. It is intended for preparing the steel for being rolled into plates, which are now much used for shipbuilding and other purposes.——The report for the half-year ending with October of Mr. Baker, the new inspector of factories for the Midlands, states that the 30 per cent. of the year's accidents arose from unfenced gearing wheels; 43 per cent. arose from carlessness on the part of the sufferers or their fellows; and 18 per cent. were unavoidable. Prominent mention is made of "an outrage committed by the refusal of the millowner to pay the injured person's wages during his absence for cure," in a case which did not involve carelessness.——On Thursday Mr. Crook, M.P., will move to introduce a Bill, to place the employment of women, young persons, and children in bleaching and dyeing works, under the Factories Act.——At the monthly meeting in Manchester, on Tuesday, of the Association for the Prevention of Steam Boiler Explosions, the chief inspector reported:—"We have at this date 480 mills and other works and 1,327 boilers under inspection. Since the 28th ultimo we have visited 177 members, and examined 427 boilers and 371 engines. The number of boilers found defective were 114, and 13 dangerous. 12 boilers were also without blow-off cocks, eight without glass gauges, and eight fusible plugs were inoperative from being placed on the wrong place, one from being coated with hard scale."——A colliery engine boiler at Willenhall, near Wolverhampton, blew up on Saturday last. Some old and worn plates were to have been soon replaced. One person slightly injured.——Mr. Torton, the contractor for the Eden Valley Railway, has made a commencement with the works at the Julian Bower Farm, Whinfell.——The steamers *Lapwing* and *Isleman* have came into collision off the Mull of Kintyre. The *Lapwing* sank within four minutes, taking down with her a woman and a boy. The *Isleman*, though much injured, escaped by having extra water-tight compartments.

NOTES FROM THE SOUTH WEST.

[FROM OUR OWN CORRESPONDENT.]

Foreign Trade of the Port of Plymouth—New Line of Telegraph from Salisbury to Exeter—The Committee on Dockyard Economy—South Wales Railway Rails—The Narrow Guage—Private Telegraphs—Mr. Mechi in Devonshire—New Works—Death of Mr. Stutchbury—Bristol and Forest of Dean Coal Company—Departure of Workmen for the Nicaraguan Railway—Southampton Docks—Lights at Sea: Carelessness shown on the Subject—Lowering Ships' Boats in Rough Weather—Appointments—Landslip at Polruan—Town Mortality—Conversion of Ships of War into Screw-steamers.

THE foreign trade of the port of Plymouth increased satisfactorily in 1858 over the previous year.——The Electric Telegraph Company have resolved to erect a new line of telegraph from Salisbury to Exeter, *viâ* Yeovil.——The committee appointed to consider the question of dockyard economy has completed its labours. All the naval establishments—Pembroke, Plymouth, Portsmouth, Devonport, Sheerness, Chatham, Woolwich, and Deptford—have been visited in succession.——At the half-yearly meeting of the South Wales Railway Company, on Friday, it was stated that £5,000 had been expended in replacing the Barlow rails for seven miles to the west of Loughor. As the Barlow rails wear out, they are being replaced with bridge rails.——Messrs. W. D. and H. O. Wells, tobacconists and snuff-manufacturers, of Bristol, have laid down telegraphic wires between their warehouses in Maryport-street and their manufactory in Redcliff-street. The wires were laid under the direction of Mr. J. R. Saunders, telegraphic engineer and contractor. In the course of a lecture delivered in the town, a day or two since, it was stated that the Bristol Gas Company had also connected their depôts by means of a private telegraph, and that Messrs. Waterlow, the metropolitan law-stationers, had established telegraphic communication between their various departments.——Mr. Mechi, of Tiptree Hall fame, has been visiting Earl Fortescue at Castle Hill, Devonshire, for the purpose of inspecting his lordship's agricultural operations in that locality.——The death is announced at Bristol of Mr. S. Stutchbury, curator of the local Philosophical Institution. The deceased, who was born in London in 1798, was in 1825 appointed naturalist of an expedition fitted out by the Pacific Pearl Fishery Company to New South Wales and the Polynesian Isles. This expedition occupied several years, and on his return to England Mr. Stutchbury was appointed curator of the Bristol Philosophical Institution. He afterwards went out as geological and mineral surveyor to the colony of New South Wales, returning to England two and a-half years since. Mr. Stutchbury was a member of the Geological, Linnæan, and several other societies.——The prospects of the Bristol and Forest of Dean Coal Company are stated to have considerably improved, in consequence of recent success in winning the Yorkley seam, a valuable house coal more than three feet thick. A new engine is about to be erected. The seam just won is estimated to contain 500,000 tons of coal, and two other seams are expected to be reached in a few months containing upwards of 2,000,000 tons.——The *Parana* which left Southampton yesterday week with the West India and Pacific mails took out a party of workmen for the Nicaraguan railway.——The north wall of the inner dock, Southampton, has been reconstructed and strengthened, and the works of the inner dock generally are in such a state of forwardness as to lead to the expectation that it may be opened for the reception of vessels in the course of next month. The accident to the north wall has, together with the unsatisfactory state of the grounds on the south side of the dock, induced the engineer, as a matter of precaution, to give greater strength and depth of foundation to the south wall and to adopt other measures in carrying on the works, which have involved some additional expense. The construction also of four new jetties and of two iron caissons to admit, in case of need, of the repair or renewal of the gates without interruption of the working of the inner dock, will involve a further increased outlay. These extra charges will make the cost of the completion of the dock altogether amount to £50,000.——The *Pera*, recently arrived at Southampton, reports having passed off Cape de Gatte a large fleet of vessels, none of which exhibited the regulation lights. This is a point which ought to be looked to. During the *Pera's* homeward voyage, when about 40 miles north of Cape St. Vincent, a French schooner was observed with her colours half-mast high as a signal of distress. With the concurrence of the Admiralty agent the *Pera* bore down to the schooner and a boat was sent in charge of the third officer to see what was wanted. The boat was lowered with six men in her by Captain Guthrie's plan, with ease and safety, although the *Pera* was rolling heavily in a rough sea.——At Lymington a railway pier—constructed so as to admit the passage of a train to the end of it—is now finished.——Mr. Greensell has been appointed harbour master of Lymington for the next seven years.——The Portsmouth commissioners have elected Mr. Pines as their surveyor.——A landslip has taken place in the new building yard of Messrs. N. and J. Butson, at Polruan, in which was a vessel almost complete in frame. The earth fell against the shores supporting the vessel, started her three feet from her original position, and disunited the whole structure. The damage done was consequently serious, but happily no loss of life took place.——A pamphlet has recently been issued by Mr. E. Bishop, M.D., on the "Mortality of Devonport, viewed with reference to the preventible causes of disease." In the course of his pamphlet the doctor says, at the period of the last visitation of cholera there were 276 inmates in the Taunton workhouse, the breathing space in some of the rooms not being more than 68 cubic feet per head, and 60 of the poor people died in less than a week. In the county gaol of the same town, the breathing space allowed to each prisoner ranges from 819 to 925 cubic feet, and while the poor were being destroyed in the workhouse, not a single case of cholera or diarrhœa occurred among the prisoners.——The *Rodney*, 90, is ordered to Chatham for the purpose of being altered to a screw steamer. The *Trafalgar*, 120, which is being converted into a screw steamer (of 90 guns) will be undocked next month. A third vessel, the *Severn*, 50, is also to undergo a transformation of a similar character; and it is stated that she will be cut in two and lengthened, with this object.

NOTES FROM THE EASTERN DISTRICTS.

[FROM OUR OWN CORRESPONDENT.]

Building Operations at Ipswich Borough Gaol—Railway Extension—Terra Cotta Works at Stamford—Colne Valley and Halstead Railway—Lengthening the "Pacific" Steamer—Telegraphic Communication between the North of England and the Continent viâ the Cambridge—Coal for Locomotives—Lynn and Bury St. Edmund's Navigation—Railway Differences in the East—Eastern Counties Railway: Way, Works, and Plant.

A WEEK or two since a little episode in the Ipswich Town Council with reference to the quality of the bricks used in some works in progress at the borough gaol was noticed under this head. Mr. C. Humphreys, surveyor, of 61 Leadenhall Street, has been down to Ipswich, and reported that the materials and workmanship were not such as the corporation surveyor ought in fairness to condemn; but that the contractor (Mr. H. Luff), by reason of the insufficiency of the concrete works, ought to indemnify the council from any loss by failure of works on payment of contract. The council have resolved, after a good deal of discussion, to adopt and act on Mr. Humphrey's report.——The Boston extension of the Sleaford and Midland Counties Railway is expected to be opened throughout in April.——Terra cotta works have been opened at Stamford by Mr. J. M. Blashfield; and it is considered that the establishment may lead to important results, as the district is found to be rich in deposits. The clays are pronounced excellent.——The Colne Valley and Halstead Railway (from Chappel to Blue-bridge) has been formally handed over to the company by the contractor, Mr. Munro, that gentleman having completed the works within twelve months.——The lengthening the *Pacific*, one of the Galway line of steamers, was lately undertaken by Messrs. Samuelson of Hull, and it is stated that the vessel will have to be taken by them to Grimsby, in order to admit of the execution of the work.——The British and Irish Magnetic Telegraph Company are erecting wires from Cambridge to join their lines at Doncaster, with the view of bringing Liverpool, Manchester, Hull, Leeds, Bradford, and other important centres of industry into direct communication with the north of Europe by means of the cable lately submerged from the eastern coast.——The Eastern Counties Railway Company are, it is understood, increasing the consumption of coal in their locomotives, and the furnaces are being slightly altered with a view to the consumption of the smoke. Some of the engines are now run, it is said, for 6d per train mile.——Allusion was made recently in this Magazine to the reopening of the River Lark navigation between Bury St. Edmund's and King's Lynn. The object is now accomplished.——Reference was made recently to the attitude assumed towards the Eastern Counties Railway Company by the subsidiary companies provisionally amalgamated with it—the Norfolk and Eastern Union. The points in dispute are the powers and functions of the joint committee of management, the alleged omission of traffic receipts in the joint half-yearly balance sheets, and deductions alleged to be unduly made from the proportion of nett traffic awarded to the Norfolk and Eastern Union shareholders. These differences are of long standing, having been increasing in magnitude since the provisional amalgamation in 1854, and they have now resulted in a bill in Chancery being filed by the Norfolk and Eastern Union Companies. Of course the end is not yet.——The way and works on the Eastern Counties lines are now officially reported to be greatly improved, all important renewals of bridges having been completed. New plant and carriages have also been provided to some extent, the cost being charged to revenue account.

NOTES FROM SCOTLAND.

[FROM OUR OWN CORRESPONDENT.]

Engineering Works in the Glasgow District—New Clipper for the Indian Trade—Gas and Water Supply of St. Petersburg—Scottish Manufactories—The Clyde Trust: Election of Engineer—Proposed Mining School in Glasgow—Grangemouth Railway—New Buildings at Leith—Death of Mr. Cowan—The Pig Iron and Coal Trades—Destructive Fire—Death of Mr. Mackain, C.E.

MESSRS. ROBERT STEELE and Co. have contracted to build an iron screw-steamer, of 2,500 tons (for Messrs. J. and A. Allan, of Glasgow) for the Liverpool and Canadian trade. Messrs. Steele and Co. have also two barges to build for the navigation of the Ganges. The machinery for the new Canadian steamer is to be furnished by Messrs. Macnab and Co., Shaw's Water Foundry. The works lately occupied by Messrs. Scott, Sinclair, and Co., and now by the Greenock Foundry Company have been re-opened. It is stated that contracts for iron shipbuilding have been entered into by Messrs. J. Reid and Co., Port Glasgow, and that Messrs. J. and T. Thomson, of Glasgow, are about to lay down a large steamer for the Mediterranean trade.——On Saturday a handsome clipper ship of 947 tons, intended for the East Indian trade, and built for Mr. J. Kerr, of Greenock, was launched from the yard of Mr. J. M'Millan, of Dumbarton. She is referred to as a fine specimen of marine architecture, and is the fifteenth vessel built for Mr. Kerr at the yard. The clipper, which was named the *Bombay*, is 185 ft. long, 21 ft. 10 in. deep, and 34 ft. 6 in. beam——Mr. R. Laidlaw, of the firm of Messrs. R. Laidlaw and Son, of Glasgow, has just returned from St. Petersburg, having obtained a contract for supplying and erecting the whole of the apparatus and pipes required for the new gas and water works in that city.——Some interesting facts with reference to Scottish manufactories are stated in the 28th half-yearly report of Sir John Kincaid, Government Inspector. It appears that 159 cotton mills were at work in 1835, and employed 32,580 persons, of whom 10,529 were males and 22,051 females. In 1857, the number of mills at work was 152, and 34,698 persons were employed in them, 7,609 being males and 27,089 females. The number of woollen mills at work in 1835 was 90, employing 1,712 males and 1,793 females; in 1857, the number of mills had increased to 196, employing 4,942 males and 4,338 females. In 1835 the number of flax mills was 170, employing 3,392 males and 10,017 females; in 1857, although the number of mills was only 168, the number of persons employed had increased to 8,331 males and 23,391 females. The number of silk mills—six—remained stationary. The increase in the number of persons employed is worthy of note, as the adoption of improved machinery would, it was thought, diminish the demand for manual labour.——The Clyde Trust have come to a decision in regard to the appointment of an engineer to succeed Mr. Ure, who lately transferred his services to the River Tyne Commissioners. Five gentlemen had been selected for the choice of the trustees from a considerable number of applicants: and Mr. Dreghorn proposed that Mr. Ower (who has had the superintendence of harbours and piers at Dundee) should be appointed Mr. Ure's successor. Mr. Allan Gilmour proposed an amendment to the effect that, in the existing state of the works, it was not expedient to appoint a permanent engineer, but that Mr. Duncan—who, for the last nine years, had acted as assistant-engineer to the trust—be appointed engineer *ad interim*, to co-operate with the committee of works at a salary to be agreed upon. Mr. Duncan's salary as assistant-engineer has been £150 per annum, and an advance to £600 was hinted at. Mr. Duncan was elected by 12 to 10——A meeting of gentlemen connected with the coal and iron mining districts of the west of Scotland has adopted resolutions recognising the necessity for a mining school in Glasgow.——The permanent way of the Grangemouth Railway is being laid as fast as possible, and the line is expected to be ready for traffic in April.——Some extensive buildings are in progress at Leith; among them is a steam flour mill (estimated to cost about £20,000) for Messrs. Tod, "presently"—so runs the idiom—of Stockbridge Mills. A large wool store has also been built for Messrs. Adam and Macgregor.——Mr. Alexander Cowan, head of the important firm of Cowan and Co., paper manufacturers, has just died at the patriarchal age of 84.——The pig iron market had on Monday again become dull, and prices were reported the turn lower. Last week's shipments were—foreign 2,268 tons, and coastwise, 4,958 tons; total, 7,226 tons against 10,490 tons in the corresponding week of 1858. Coals have continued dull, both for home use and shipping. No change, however, is reported in prices.——The Glasgow papers report a destructive fire at the establishment of Messrs. Randolph, Elder, and Co., engineers and millwrights, Centre-street, Tradeston. The premises were full of machinery of various kinds.——The death is announced, at Dalmarnock, of Mr. D. Mackain, engineer of the Glasgow Waterworks.

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated January 1, 1859.

14. M. Wigzell, of Exeter. An improved form of nail or driving article.

Dated January 5, 1859.

42. W. Corfield, jun., of Charlton-Adam, Somerset. Improvements in chains for coupling, cranes, cables, mining purposes, hoisting, and all other purposes where chains are used.

Dated January 8, 1859.

66. W. Delany, of Chicago, United States. Improvements in submarine boats or vessels, and in apparatus used for

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working under water. A communication from L. D. Phillips.

70. W. E. Newton, of Chancery-lane. Improvements in steam engines and steam generators. A communication from L. Arnier, of Marseilles.

Dated January 19, 1859.

169. W. Clark, of Chancery-lane. Certain improvements in boots and shoes, and in the machinery, apparatus, and means employed in such manufacture. A communication from C. J. Desnos, of Paris.

Dated January 21, 1859.

196. W. H. Morrison, of Nottingham, Manufacturer, and H. Kinsey, of the same place, Machinist. Improvements in means or apparatus employed in the manufacture of bonnet-fronts, ruches, ribbon trimmings, and other goffered or plated articles.

Dated January, 31, 1859.

273. D. Bentley, of Accrington, Millwright. Improvements in self-acting apparatus, applicable to letter-press printing-machines, for supplying and removing the paper.

275. T. Wilson, of Birmingham, Engineer. Improvements in breech-loading and other fire-arms.

277. H J. Newcombe, of Shenley, Herts. An improved apparatus for heating or warming buildings.

279. A. V. Newton, of Chancery-lane. An improved method of extracting gold and silver from their ores. A communication from L. Solomon.

Dated February 1, 1859.

281. L. Rigolier, Engineer, of Rhône, France. A new brake for railway carriages.

283. S. B. Eveleigh, of Salford, Hat Manufacturer. An improved form or construction of hats or covering for the head.

285. S. Plimsoll, of Hatton-garden, Coal Merchant. Mining apparatus for use in mining coal and other minerals, and also for separating the small coal and crushed ores from the shale, dirt, and other matters with which it may be in combination, and for drying the same.

287. R. Gormully, of Grafton-st., Fitzroy-sq. Improvement of pianofortes with upright frames.

289. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in sewing machines. A communication.

291. M. Loam, of Truro. Improvements in machinery for raising sewage and other waters and matters.

293. M. Henry, of Fleet-st. The manufacture and useful applications of certain bituminous products and compounds of bitumen with other matters, and treating and applying certain natural bitumen or bitumens for such purposes. A communication from Moisant and Co.

295. W. E. Newton, of Chancery-lane. An improved blowing machine. A communication from A. L. H. F. de Sauville, of Paris.

Dated February 2, 1859.

297. E. Wilkins, of Camberwell, Gentleman. Improvements in drain pipes and tiles for draining and liquid manuring land.

299. F. F. Rateau, of Paris, Practical Engineer. An improved steam-engine actuated by regenerated steam.

301. S. Tearne, of Birmingham, Japanner. Improvements in ornamenting surfaces.

303. I. Clements, of Birmingham, Warehouse Clerk. A new or improved method of manufacturing curtain rings.

305. G. Leach, of Leeds, Yarn Spinner. Improvements in dressing yarn or thread in the hank, and in machinery for winding off the same.

Dated February 3, 1859.

307. T. Storer, of Birmingham, Undertaker. A new or improved funeral carriage.

308. J. Woodrow, of Oldham, Hat Manufacturer. Improvements in the manufacture of hats or coverings for the head.

309. W. Clayton and J. Goodfellow, of Blackburn, Engineers. Certain improvements in metallic pistons.

310. H. C. Jennings, of Great Tower-st., Practical Chemist. Improvements in the manufacture of paper and artificial parchment, and of gelatine applicable to the sizing of the same, and other purposes.

311. J. Petrie, jun., of Rochdale, Machinist, and T. Wrigley, of Heap Bridge, Paper Maker. Improvements in machinery or apparatus for washing rags and other materials for the manufacture of paper.

312. S. D. Davison, of Leith, Engineer. Improvements in locomotive steam-engines.

313. A. G. Pooley, of Rotherhithe, Agricultural Chemist. Improvements in preparing fish for manure, and in apparatus for the same.

Dated February 4, 1859.

315. H. Greaves, of Victoria-st., Westminster, Civil Engineer. Improvements in the preparation of iron bars, of the various forms or sections used in the construction of sheet-iron structures, and in machinery employed for the same.

316. W. Thompson, of Paris. An improved printing telegraph.

317. A. Allan, of Perth, Engineer. Improvements in locomotive steam engines, in part applicable for retarding and stopping railway trains.

319. S. L. Trotman, of Liverpool, Merchant. Improvements for the more effectually securing or fastening envelopes or other like receptacles, and the more securely affixing postage-stamps or other adhesive labels.

320. R. A. Brooman, of 166 Fleet-st., London, Editor of the MECHANICS' MAGAZINE and Patent Agent. An improvement in cooling worts and beer. A communication from Madame Jolibois, of Dijon, France.

321. R. A. Brooman, of 166 Fleet-st., London, Editor of the MECHANICS' MAGAZINE and Patent Agent. Improvements in shirts. A communication from L. Levy Neyman, of Paris.

322. G. H. Baylis, of Lambeth, and F. Robinson, of Salisbury-street, Lisson-grove. An improved indicator for registering the withdrawal of liquids from vessels.

323. F. H. Maberly, of Stowmarket, Master of Arts. Improvements in obtaining spring power, and in its application to various purposes.

324. L. Bonneau, of Paris, Civil Engineer. Improvements in apparatus for registering the time carriages are employed in conveying persons from place to place, and also in moving from place to place when unoccupied.

326. P. Adie, of the Strand, Mathematical Instrument Maker. Improvements in apparatus for taking levels and measuring angles.

327. W. R. J. Packer, of Dublin, Dyer. Improvements in the plough or plough-share, for the purpose of more effectually pulverizing, breaking up, or cutting into small particles the earth or sod separated from the ground by the plough-share.

329. A. Barclay, of Kilmarnock, Engineer. Improvements in electric, magnetic or electro-magnetic telegraph ropes or conductors, and in machinery or apparatus to be used on board ship for laying or paying out the same.

Dated February 5, 1859.

331. F. H. Maberly, of Stowmarket, Master of Arts. Improvements in apparatus for corking, for drawing corks, in taps, in the necks of bottles, in the bung-holes of barrels, and in similar articles.

332. N. Greenhalgh, of Bolton, Cotton Spinner, W. Shaw, of the same place, Cotton Spinner, and J. Mallison, jun., of the same place, Yarn Agent. Certain improvements in the treatment and preparation of yarns or threads previously to dyeing.

333. R. Tinker, of Penrith, Cumberland, Churn Maker. Improvements in churns.

334. H. Anderson, of Liverpool, Mechanic. An improved construction of apparatus for winding window blinds, sun shades, and similar articles on their rollers.

335. T. Sykes, of Cleckheaton, York, Manufacturing Chemist, and B. C. Sykes, of the same place, M.D. Improvements in obtaining or separating oily, fatty, greasy, tarry, waxy, and resinous substances, from oleaginous seeds, nuts and fruits, wool, silk, hair, cotton, flax, line, hemp, furs, skins, leather, bones, fish, and other animal matters and refuse, woollen and cotton waste and refuse, also textile fabrics and refuse grease, produced in various branches of industry, indigo, lac, lac dye, and other dyes.

337. M. Booth, of Manchester, Finisher, and J. Farmer, of Salford, Machinist. Improvements in sizing or stiffening woven fabrics.

Dated February 7, 1859.

338. G. F. Chantrell, of Liverpool, Furnace Engineer. Improvements in the treatment of charcoal after its manufacture or revivification.

340. A. Lyons, of Chancery-lane. A pocket protector.

342. M. Curtis, of Manchester, Machinist, and J. Miller, of Staley-bridge, Manager. Improvements in certain mules for spinning cotton and other fibrous substances.

344. T. Sims, of Conduit-st., Regent-st. Improvements in the application of photography to engraving and printing.

346. J. Smith, of Bradford, Machine Maker. Improvements in machinery, or apparatus for preparing and combing wool, and other fibrous substances.

Dated February 8, 1859.

348. T. Moss, of Fleet-st. Improvements in the manufacture of paper and printing ink, suitable for bank-notes, bills of exchange, and other documents requiring like security against being copied.

352. E. Bagnicki, of New York. An improved syringing apparatus, for curing leucorrhea, and similar sexual diseases.

354. R. R. Rowntree, of Hull. A portable tea-testing apparatus.

356. J. B. Redman, of New Palace-yard, Westminster, Civil Engineer. An improvement in the construction of carriage ways.

358. W. Clark, of Chancery-lane. Improved protectors for tobacco plants. A communication from J. Romiguière, of Paris.

360. J. Juckes, of Dane-st., City-road. Improvements in stoves or fire-places.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(From the London Gazette, Feb. 22, 1859.)

2248. A. E. Galliard. Portable fountains.
2251. L. Hope. Telegraph cables. A communication.
2257. C. F. Vasserot. Reflectors. A communication.
2266. T. Riddell. Window sashes.
2274. G. Beadon. Ships, boats, and vessels.
2288. C. Cowper. India rubber and gutta percha articles. A communication.
2293. S. Perkes. Extracting oil.
2295 G. Baxter. Colouring photographs.
2296. T. Archer, jun. Preventing boiler explosions.
2297. S. Diggle. Looms.
2302. G. Davies. Gloves. A communication.
2307. G. F. Wilson. Destroying blight, &c.
2309. F. J. Coulon and S. G. Giraud. Ornamenting leather.
2316. A. Dunn. Marking compounds.
2327. J. Smith. Rough-shoeing.
2329. J. Whitworth. Guns, carriages, and ammunition.
2330. W. F. Batho and E. M. Bauer. Screws, worms, and wheels.
2345. J. Wainwright. Ventilating.
2346. S. T. Clarke. Crossing cheques.
2372. W. E. Newton. Pumps. A communication.
2376. J. J. Welch and J. S. Margetson. Scarfs.
2379. T. and J. Ashworth. Power looms.
2383. S. R. Parkhurst. Cotton gins.
2396. A. Heywood. Drying fabrics. A communication.
2409. W. Monro. Capsules.
2436. W. Palmer. Fire-arms.
2439. M. A. F. Mennons. Voltaic electricity. A communication.
2477. L. Schwartzkorf and C. Philippson. Boring holes.
2620. E. A. Pontifex. External surface condensers.
2740. R. Laming. Purifying gas, &c.
2774. J. B. and J. Fisher, and J. Bird, jun. Furnace doors and dampers.
2788. J. G. Arnold. Envelopes.
2879. W. Morgan. Iron.
2987. T. Bell. Purifying gas.
104. C. N. May. Heat indicator.
147. W. Newman. Blinds.
148. J. Foster. Spinning and roving frames.
218. J. G. Proger and D. Davies. Signal lanterns.
230. H. Brecknell and J. Dyer. Cocks and valves.
249. H. Rawson. Preparing wool, &c.
266. J. Mac Kenzie. Operating ventilating valves.
267. J. Marino. Inodorous closet.
282. J. Hosking and T. Cock. Furnaces.
286. M. A. and R. Walker. Percussion caps.
302. J. Buncher. Eyes for stair rods.
326. P. Adie. Taking levels and measuring angles.
333. R. Tinkler. Churns.
352. D. E. Bagnicki. Syringing apparatus.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed February 18, 1859.

1880. A. V. Pinta.
1887. W. F. Padwick.
1890. W. Smith.
1891. W. Pearce.
1896. P. Spence.
1897. J. L. Piggott.
1905. W. Henson.
2035. J. U. Faessler-Petzi
2109. A. Turner.
2381. G. Kent.
2883. R. Mushet.
2921. R. Mushet.
2935. J. Broom.
2941. J. W. Child.

Sealed February 22, 1859.

1909. F. Puls.
1910. F. Puls.
1913. L. Higgins and A. Brown.
1917. J. H. Robinson.
1923. H. Wilson.
1927. T. Hill.
1933. J. Black.
1935. S. N. Rodier.
1938. T. Trotman.
1939. J. Ellisdon.
1943. H. W. Hart.
1995. J. T. Pitman.
2026. L. Pellissier, and J. Puytorac.
2052. J. Knowles.
2061. L. Hill.
2089. W. E. Cochrane.
2222. J. Ridsdale.
2868. D. Rowan.
2897. J. Clegg.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

391. E. Oldfield.
420. W. G. Merrett.
426. W. Muir.
431. J. Freer.
434. J. H. Johnson.
438. J. Barsham.
440. I. Moll.
442. J. H. M. Maissiat.
479. C. Iles.
514. C. A. de Fonbonne.
538. R. Maynard.

LIST OF SPECIFICATIONS, &c.

Published during the week ending February 18, 1859.

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1557	0 3	1573	0 3	1585	0 6	1595	0 9	1605	0 7	1616	0 3
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1569	0 3	1582	0 3	1592	0 7	1602	0 3	1612	0 7		
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NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

ABRIDGED SPECIFICATIONS OF PATENTS

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement :—

STEAM ENGINES, &c., 1422, 1424.
BOILERS AND THEIR FURNACES, 1419.
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1430, 1434, 1373.
SHIPS AND BOATS, including their fittings, 1427, 1437, 1452, 1456, 1475.
CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 1429, 1431, 1138, 1140, 1443, 1446, 1453, 1469.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 1412.
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1414, 1417, 1421, 1423, 1426, 1433, 1442, 1447, 1454, 1461, 1474.

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BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c. *None.*
LIGHTING, HEATING, AND VENTILATING, 1418.
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1416, 1455, 1462, 1477.
METALS, including apparatus for their manufacture, 1415, 1429, 1436, 1458, 1468.
CHEMISTRY AND PHOTOGRAPHY, 1411.
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MISCELLANEOUS, 1413, 1421, 1425, 1428, 1434, 1439, 1441, 1444, 1445, 1448, 1450, 1457, 1460, 1463, 1464, 1465, 1466, 1467, 1470, 1471, 1472, 1476.

1411. P. BROWN and B. YOUNG. *Improvements in the manufacture of white lead.* Dated June 22, 1858.

According to this invention, nitrate of lead, however obtained, is placed in solution in a vessel, and submitted, until saturated, to the action of streams of carbonic acid gas, obtained, by preference, from the calcination of chalk, or carbonate of lime, in a closed retort. A coil of pierced pipe may be employed for effecting the distribution of the acid through the liquor. To the saturated solution the patentees next add an excess of caustic alkali, say caustic soda, which immediately enters into combination with a portion of the nitric acid that was before combined with the lead, and forms nitrate of soda. The metal thus liberated combines in its turn with the carbonic acid in the solution, and becomes converted into a carbonate of lead, which, being insoluble, immediately precipitates and falls to the bottom. The chemical action thus set up is continued until the nitrate has been converted into carbonate of lead. The supernatent liquor is then run off from the vessel, and the carbonate of lead is subjected to lixiviation in a strong solution of lime, assisted by the action of a stirrer, by means of which all the free acid remaining in the carbonate will be taken up or neutralised. After the carbonate of lead has been allowed to settle, the lime-water is drawn off. The precipitate, which is the pure white lead of commerce, is next to be removed from the vessel and dried either by natural or artificial means, after which it will be ready for the market. *Patent completed.*

1412. E., H. and F. C. COCKEY. *Improvements in apparatus employed in the manufacture of cheese.* Dated June 22, 1858.

This consists, 1, of a vessel (for cooling and draining the curd before it is ground or put into the vats) composed of a shallow perforated metal tray made to fit over a cheese tub, milk tin, &c., and fitted with metal feet or ledges for raising it slightly above the edge of the vessel beneath, thus allowing a free passage of air between the two. 2. Of a shovel or scoop, which consists of a perforated metal plate in a metal frame, with or without handles. This plate is by preference concave on the upper side. *Patent abandoned.*

1413. J. ROBERTSON. *Improvements in apparatus for regulating the flow or passage of fluids.* (A communication). Dated June 22, 1858.

As applied to regulating the supply of water to water-closets, this invention consists under one modification of a short cylindrical chamber of large diameter, having a top and bottom cover screwed on. The bottom cover forms the actual shallow shell or chamber through which the supply of water from the main is brought to the apparatus. This portion is cast in one piece on the supply pipe, being disposed horizontally, that is, with its plane parallel to the axial line of the main pipe which runs along it beneath. In the centre of this end disc or shell is an aperture communicating with the inlet section of the main pipe, whilst a second aperture slightly eccentrically disposed, communicates with the opposite or outflow section of the main pipe leading to the closet pan, the two apertures being of course completely separated by a sectional portion of metal cast in for the purpose. Upon this perforated disc shell face is fitted a circular disc of caoutchouc or other flexible material, arranged to bear upon an external annular face all round the shell. This flexible disc has screwed upon each face a button or small disc piece of metal, the under small disc having fitted to it a soft or flexible face piece of leather or other material to form a valvular fit upon an elevated annular working face round the central hole in the shell. The central or barrel portion of the operating chamber has attached to it a lateral water pipe of narrow bore, and fitted with a stop cock for setting the flow. The top cover or end of the disc of the chamber has passed through its centre a vertical spindle, fitted with a helical spring to keep it up. The lower end of this spindle which is passed through the cover has upon it a holding collar or button, to carry a second large flexible disc of caoutchouc, which, like the one already described, is of the same diameter as the cylinder's bore. The upper cover is dished on its inner face for the elastic disc to settle into, and leave more space beneath. The action of this apparatus is this:—When the closet is about to be used, the pressure upon the seat causes the main upper spindle to be depressed, and this spindle then forces down the upper flexible disc so as to contract the space for water in the cylinder beneath it, and thus force the contained water back through the lateral stop cock into the main, the water way through the stop cock being purposely adjusted to pass the water slowly through. Then, on the release of the operating spindle from pressure, the water in the main pipe beneath, meeting little or no pressure from above the disc to intefere with its upward force, lifts the bottom flexible disc, and flows through from the inlet section of the main by the apertures already diseribed into the outlet section, thus reaching the pan of the closet. This flow continues until the upper internal pressure between the two flexible discs in the cylinis made up by an inward flow of water again through the lateral stop cock, when the lower flexible disc will resume its seat, and cut off the supply of water to the basin or pan. The apparatus is then again fit for use. *Patent abandoned.*

1414. S. BARLOW. *Improvements in machinery or apparatus for bleaching or cleansing textile fabrics or materials.* Dated June 23, 1858.

The object here is to obtain a quick and perfect circulation of the bleaching or cleansing liquor through piece goods, yarns of linen, &c. A pipe or pipes is or are placed in a vessel fastened on a plate of iron, resting on the bottom; the pipes are perforated nearly to the bottom of the vessel, the plate also has holes round the outer edge. It can be used when the vessels works in pair or when a liquor vessel is attached to, or forms part of a single vessel. When the vessels are filled with goods and the liquor runs in, this apparatus causes it to circulate through the whole of the goods simultaneously. *Patent completed.*

1415. T. SPENCER. *Improvements in the treatment of iron ores, and ferruginous sands, and certain applications arising therefrom.* Dated June 23, 1858.

This consists in a method of treating iron ores and ferruginous sands so as to produce a new compound substance which may be applied to a variety of purposes. *Patent completed.*

1416. C. VERO and J. EVERITT. *Improvements in the manufacture of hats.* Dated June 23, 1858.

This consists, 1, in applying brims of felt or of gossamer covered with flock to hats, the bodies of which are made of straw, chip, palm leaf, grass, &c., plaited like straw. 2. In making hats with such bodies, having tops and brims made of felt or gossamer, and the whole having a covering of silk or woven fabric. Before this covering is put on, the body of the hat is covered with a flexible proofing which secures the silk and preserves the elasticity of the hat. *Patent completed.*

1417. P. J. LIVSEY and F. L. STOTT. *Improvements applicable to machinery for warping yarns or threads.* Dated June 23, 1858.

The object here is the stopping of warping machinery, or giving notice by self-acting means when a warp thread breaks, or is absent from its proper place, by arrangements in connection with that mechanism for dividing the threads or forming the lease in warping machinery, known as the "heck." It consists in arrangements combined with the ordinary heck, by which it is modified so that it performs its common office, and also serves the above purposes. The invention is not clearly described apart from the drawings. *Patent completed.*

1418. W. and J. CLIBRAN. *Improvements in apparatus or arrangements for distributing, governing the pressure of, and lighting gas.* Dated June 23, 1858.

This relates 1, to a mode of joining pipes used for the distribution of gas, the object being to preserve a perfect joint, and allow for the settlement or movement which takes place after pipes are newly laid out, and consists in employing the ball and socket arrangement to form the junction between the pipes. 2. To gas governors and stop taps, and consists in a peculiar combination of the two in one. 3. To small gas governors intended for single lights, and are particularly applicable to street lamps, and consist in a peculiar arrangement of the valve and passages intended to provide principally against the stoppage of such passages by the entrance of the mercury used as a seal to the gas holder. 4. To arrangements for lighting gas lamps, especially street lamps, the object being to light such lamps externally without removing or opening the parts protecting the light from the weather, and consists in the employment of a pipe, the orifice of one end of which is placed so as to come directly opposite and over the gas burner, the orifice of the other end of the pipe being brought to the outside of the lamp or protecting cover. *Patent completed.*

1419. R. ARMSTRONG. *Improvements in steam boilers and furnaces.* (Partly a communication.) Dated June 23, 1858.

The specification of this invention describes various modifications of methods of constructing steam boilers and furnaces, which we cannot give in detail; but the main object appears to be the production of an increased quantity of steam from a boiler of given dimensions, and with a given quantity of fuel, which object is effected by supplying the fire box with a number of peculiarly-shaped hollow vessels, or retorts, fixed across the furnace, and crossing each other from side to side. Within and through these the water is permitted to circulate, communicating freely with the surrounding water spaces at their ends. *Patent completed.*

1420. SIR J. PAXTON. *Improvements in the manufacture of horticultural buildings or glazed structures for horticultural and other purposes.* Dated June 23, 1858.

This invention was described and illustrated in the MECHANICS' MAGAZINE for January 7th, No. 2 (new series). *Patent completed.*

1421. R. RUMNEY, J. MELLOR, and W. S. MACDONALD. *Improvements in dyeing and printing cottons, wool, silk, and other materials and fabrics.* Dated June 23, 1858.

This refers to dyeing or printing with matters derived from uric acid, and consists in preparing cloth, &c., for the reception of the matter, so that it may become fast. The inventors employ salts of metals dissolved in caustic alkali, as for instance a solution of carbonate of lead in soda or potash; or they apply the salts of metals and alkalites separately. They also pass the material through dilute of sulphuric or other acid, and then treat it with an alkali or alkaline salt as silicate or plumbate of soda, to neutralize remaining acid. The matter is then applied as in ordinary printing or dyeing, and subsequently they apply a coating of some oleaginous substance. *Patent abandoned.*

1422. W. E. NEWTON. *Certain improvements in centrifugal governors for steam engines, and other motors.* (A communication.) Dated June 23, 1858.

Here a centrifugal governor, constructed on any of the usual plans with balls aud arms, but made lighter than usual, is employed, and driven at a high velocity. To the slide of the governor which connects it with the regulator, a counterpoise is employed, of a weight much greater than the aggregate weight of the balls and arms, and sufficient to balance the centrifugal force developed by the rapid revolution of the latter, and it is in this latter feature the invention principally consists. It also consists in so applying the counterpoise to the governor that its effective load on the governor shall be lessened in proportion as the balls and arms of the latter expand, so as to render its action constant, or as nearly so as may be desired. It further consists in the employment of the counterpoise as a means of controlling the exact speed of the engine or motor. *Patent completed.*

1423. C. BORDAS. *Improvements in the mode or method of producing embroidery.* Dated June 24, 1858.

Here a pattern being produced on the required material by stamping, tracing, or printing, the braid, &c., is worked over the pattern by any suitable stitch. *Patent abandoned.*

1424. J. BATES, J. YORK, and W. PARKIN. *Improvements in pistons and plungers.* Dated June 24, 1858.

The patentees place in the interior of ordinary metallic packing rings, a ring of metal made elastic by slotting it from the interior to within a short distance from the exterior, and from the exterior to within a short distance from the interior, the number and width of the slots being proportioned to the diameter of the piston or plunger and pressure that is to be resisted. In the elastic ring there is also transverse slot or key way, in which they insert a wedge or key which expands the ring to the necessary degree of strength, which wedge or key is replaced by a larger one when the packing rings require more expansion, on account of wear and tear. If the piston or plunger be of great depth, two or more elastic rings may be employed. *Patent completed.*

1425. P. GRIFFITHS. *Improvements in the manufacture of shaft couplings.* Dated June 24, 1858.

This consists in casting shaft couplings in iron moulds; the moulds have a core or mandril the same size as the shaft, the core being furnished with the form of key by which the coupling is fixed, and forms the key-way in the coupling. These can be at once removed from the mould, and fitted to shafts. *Patent completed.*

1426. G. COLLIER. *Improvements in means or apparatus for the stretching and drying of woven fabrics.* Dated June, 24, 1858.

Here the fabric is fed on to a cylinder heated by steam, the surface of which is roughened to hold the fabric distended till dried. Various means of feeding the fabric to the cylinder may be adopted. *Patent completed.*

1427. J. ROBINSON. *Improvements in applying and adapting water-closets to ships, so as to ensure the safety and more perfect ventilation of the same.* Dated June 24, 1858.

The pipe from each closet is connected to a main sewer pipe, which leads to an exhaust pump, which pump maintains a partial exhaustion of the sewer pipe, and thereby cleanses the closets, ventilates the ship, and ensures its safety, there being but one outlet for all the closets. *Patent abandoned.*

1428. W. E. NEWTON. *Improved machinery for manufacturing friction matches.* (A communication.) Dated June 24, 1858.

This consists, 1, in a cutting tool having a circular or convex and concave rollers, by which the match sticks are cut smoothly and easily from the bolt or block, after which they are presented to an endless chain of clamps, by which they are conveyed to the sulphur and igniting compounds. 2. In an endless chain of clamps operated so as to effect the object above-named, and also to allow of the discharge of the matches at the proper time and place. 3. In a discharging device arranged for discharging the finished matches from the clamps. This invention is not described apart from the drawings. *Patent completed.*

1429. J. H. JOHNSON. *Improvements in machinery or apparatus for making bolts and rivets.* (A communication.) Dated June 24, 1858.

This relates to machinery for pressing bolts and rivets, either hot or cold, and to a peculiar safety apparatus for throwing the machine out of gear when the strain upon it becomes excessive. *Patent completed.*

1430. R. PICKERING. *Improvements in apparatus for communicating signals from one part of a railway train to another.* Dated June 24, 1858.

Here a flexible tube is carried along beneath the bottom of all the carriages in the train, and terminates in a whistle at the part where the engine driver stands. This tube is in separate lengths for each carriage, provision being made for coupling the ends when the train is made up. Each carriage has extended into it a branch tube from the main line of tubing with a mouthpiece for blowing into. Each branch tube is brought up at one end of the carriage, and then turned into the carriage, beneath the roof, along which it passes, being fitted with a sub-branch, with a mouth piece and tap or valve for each compartment. *Patent abandoned.*

1431. C. W. CAHOON. *An improved machine for sowing seed or fertilising material or other substances broadcast.* Dated June 24, 1858.

A complete specification of this invention was filed with the application, and an abridgement of it was published at page 620, No. 1846, of the MECHANICS' MAGAZINE (old series). *Patent completed.*

1432. J. BETTS. *Improvements in obtaining surfaces on which to print maps and other designs.* Dated June 25, 1858.

The inventor applies to the foundation fabric a coating of pigment combined with boiled linseed oil, diluting the oil, if necessary, either with alcoholic or resinous spirit. After this coating is laid on it is scraped or rubbed until a smooth and absorbing surface is obtained; heat may be used if required. *Patent abandoned.*

1433. C. NIGHTINGALE. *Improvements in apparatus applicable to curling and spinning machines for horse-hair and other materials.* Dated June 25, 1858.

This consists in applying to machines for curling, spining, or twisting horse-hair, &c., conical speed pulleys for imparting to the reel or bobbin a rotary motion, slightly less rapid than that imparted to the flyer, so as to preserve the required relation between the speeds of the flyer and the reel or bobbin without retarding the motion of the latter by mechanical means. By driving both the flyer and the reel or bobbin independently but at the required

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relative speeds the latter is carried round without depending for its required rotary motion on the pull of the hair, &c., the only strain on which being that due to the difference between the respective velocities of the flyer and the reel or bobbin. One of the conical pulleys is fixed on the driving shaft and the other on the spindle or axis to which the reel or bobbin is fixed, a cross strap or band communicating motion from one to the other. The slight variation in the speed of the reel or bobbin as it becomes filled with the material is produced by shifting the strap or band a short distance along the pulleys. *Patent completed.*

1434. T. BOOTH. *Improvements in mounting and fitting wheels and axles to carriages, which improvements are also applicable to pulleys and other parts moving on axes.* Dated June 25, 1858.

This consists, 1, in so fitting the axle to its bearings that the friction is distributed on many bearing surfaces, and the bearing surfaces so disposed that the weight of a carriage when traction force is applied thereto produces a tendency to onward motion. The inventor fixes the axles loose in their bearings, these bearings consisting of a number of rings placed one within the other. The smaller ring is fitted somewhat closely to the axle. The next ring is somewhat larger than the small one so that it has considerable play within it; the third ring is similarly adapted to the outer diameter of the second ring, and so on are the several rings disposed and fitted within each other; the outer ring constitutes a fixed bearing surface fixed to the carriage frame. The fixed bearing has annular plates fixed to it which partially enclose the sides of the several rings and keeps them in position; two other annular plates are secured to the axle which enclose the sides of the smaller rings and embrace the larger annular plates, thereby keeping the whole of the bearing rings in position. Stop collars, &c., are affixed to the axle for securing the several parts in position. The weight of the carriage resting on its bearings presses all the rings in contact with each other in a vertical line upward from the axle, and in a position eccentric to each other. When tractive force is applied to the carriage it throws this line of contact out of the vertical position, and the weight resting on the several rings in this line of contact now out of the upright gives the carriage a tendency to onward motion, and at the same time any rotary motion of the axle is distributed throughout the number of bearing rings. The improvements in mounting and fitting wheels to axles consist of a similar arrangement of rings placed one within the other, the axle being free to rotate within the smaller ring or bearing surface, which is of considerable thickness; a series of rings surround this bearing surface, which are all received and enclosed within annular plates fixed to each side of the wheels; between the annular plates and these rings he disposes annular surfaces of India-rubber as cushions to receive any side shocks; a plate of metal is interposed between the India-rubber and the rings as a friction surface; other annular plates are secured to the axle, which embrace the annular plates fixed to the wheel, which is thereby kept in position laterally with regard to the axle. *Patent abandoned.*

1435. P. R. SMITH. *Improvements in fire-arms and ordnance, and in the projectiles to be used therewith.* Dated June 25, 1858.

This consists, 1, in means of constructing the barrels of fire-arms which will make them last longer, and prevent them from bursting; 2, in the use of certain pieces which, added to the projectiles, will give to the fire-arms when smooth inside the same advantages as the rifled ones. Under one modification, the inside part of the barrels are of iron or steel, and a long conical cylinder composed of several metals is mounted upon it, and occupies nearly the whole length of the barrel. Upon this cylinder are placed rings of two thicknesses, screwed one with the others, and placed so that the joints of the rings of the first thickness are covered by the centre of those of the second. The outside ring, which corresponds to the place where the pivots are to be, is made with the same pivots. The touch-hole is formed by a pin screwed in the two pieces, and in the centre of which two holes are made, one in a straight line and the other obliquely, and the nipple which is to receive the percussion-cap is placed upon one of the said holes. To do away with the helical rifling inside the fire-arms, the inventor makes use of directing-pieces, which are composed of one bottom and some inclined branches. The projectiles are furnished with grooves inclined towards the axis. The said grooves are destined to receive the branches of the directing-pieces. *Patent abandoned.*

1436. J. MAUDSLAY. *An improvement in the construction of furnaces for melting iron, steel, and other metals.* Dated June 25, 1858.

This invention was described and illustrated at page 29, No. 2, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

1437. J. WESTWOOD. *Improvements in the plating of ships and floating and other batteries, to render the same shot-proof.* Dated June 25, 1858.

The object here is to cover the exposed parts of the hulls of ships, and also of batteries, with plates of iron or steel of sufficient thickness to resist heavy shot. This the inventor proposes to do by the use of rebated plates, which will form some lap-joints. In covering the exposed parts of the hulls of wooden ships with these plates, he uses screw-bolts for securing them in place; but for iron ships he prefers the use of rivets. By rebating the adjoining plates and getting a good lap, one row of screw-bolts or rivets will suffice. To prevent the shot from striking the bolt-heads, he proposes to sink them in the bolt-holes in the plates. Instead of bolting the plates directly to the planking or plates of the ship, he proposes to bolt or secure thereto parallel lines or nearly so, ⌊, or ⊨ shaped angle iron to receive the lines of rebated plates, and by means of their flanges form with the plates overlapping joints and hold the plates securely in position. *Patent abandoned.*

1438. J. TAYLOR. *An improvement in the construction of horse-hoes, applicable also to drills.* Dated June 25, 1858.

This consists in mounting the hoes on independent levers, which are severally jointed to the forward end of a balance frame capable of rocking and sliding upon its fulcrum, and can therefore be moved vertically and horizontally by the same guiding shaft or lever. *Patent completed.*

1439. P. M. CRANE. *Improvements in the manufacture of fuel from peat.* Dated June 26, 1858.

Having cut the peat (as it is found in the bog) in suitable pieces or sods the inventor covers them with cloths of woven textile fabrics. He then subjects these pieces or sods to hydraulic pressure. The hydraulic press the inventor prefers to be of about 200 tons power. The pieces or sods are next removed from the press and dried in the open air or otherwise. *Patent completed.*

1440. T. LEMON. *Improving Cartwright's original patent chain harrow.* Dated June 26, 1858.

A complete specification of this invention was filed with the application. The invention is not described apart from the drawings. *Patent abandoned.*

1441. W. L. TIZARD. *An improved method of treating brewers' and distillers' malt or grist.* Dated June 26, 1858.

This consists in subjecting malt or grist, after it has undergone the usual processes of grinding and saturating with water, to trituration or mastication. This may be effected in a variety of ways, of which the following will serve for an example:—A series of open floors or discs may be made (of either wire gauze or wire cloth, wood or metal) to occupy nearly one half of the diameter of, say, a mash-tun or vessel, each fixed to a frame carried round the central shaft of the mashing gear; on each floor is placed a similar disc, through each of which a shaft passes, and on motion being communicated to the shaft the upper discs revolve on the floors, macerating the grain or grist between their surfaces. The immediate consequences of this trituration or mastication are to convert the whole of the farinaceous matter, together with the hordein (hitherto considered inconvertible) into valuable wort or wash. *Patents completed.*

1442. S. WHITEHALL. *Certain improvements in finishing lace and other fabrics.* Dated June 26, 1858.

This consists in using a glass roller in the pressing of lace or other fabrics after the "dressing," by which a more cleanly appearance and lustre are given to the goods. A reel may be attached to the roller on which the fabric can be wound. *Patent completed.*

1443. W. WOOFE. *Improvements in implements for paring, hoeing out, and clearing land, and for depositing seed.* Dated June 26, 1858.

This consists in improvements in an implement for which a patent was granted to the inventor 27th Nov., 1856. In the specification of his former patent the inventor shows the turnfurrows fixed to the stem by a bar rising from the stem. Now, for such purposes as raising turnips from the row, it is necessary to remove the turnfurrow, and that there may be no impediment, he removes the bar rising from the stem, and connects the turnfurrow to the stem by a bolt carried from the back of the turnfurrow down through the stem. Thus, when the turnfurrow has to be removed, there will be no parts to interfere with the proper action of the implement as a parer, or hoer out, or cleaner of turnips, &c. To make the implement act as a drill he fits on to the axle of the hind wheel, which is prolonged for the purpose, one or more sheaves, over which a band is passed communicating with a revolving wheel or dropper fixed under a seed hopper placed at the rear of the beam of the implement. For some purposes he fits a revolving pulveriser or harrow in the shape of a boss with radiating arms or tines upon the axle of the hind wheel of the implement, the axle being prolonged for its reception. Lastly, he fits a tip of steel upon the share or stem, and makes a notch in the turnfurrow at bottom for its reception. *Patent abandoned.*

1444. J. A. MANNING. *An improved mode of intercepting and treating the sewage of London, and towns and cities similarly situated.* Dated June 26, 1858.

Here the inventor proposes to connect (by a closed tubular drain or pipe) the mouth of each sewer emptying itself into the Thames to a building erected at low-water mark, and containing two tanks of a sufficient capacity to receive the flow from such sewer for one or more hours. In cases where two or more small sewers can be conveniently combined they may all be made to discharge into one set of tanks. The several tubular connecting drains, and the depositing tanks with which they are connected, are entirely shut off from all communication with the river. In the lower levels the tanks will be of such an increased depth as to insure the constant flow of the sewage, whilst the connecting tubular drains will be so supported above the surface of the river strand as to prevent the tilting of the mud against its sides. The tubular connecting pipes are made with forked branches, one leading to each of the depositing tanks, and each of these branches has a sluice or other stop valve so that one tank being filled the flow of sewage will be directed to the second tank. During the time occupied by the filling of the second tank the precipitating all the animal and vegetable organic matters held in suspension in the sewage contained in the first tank, as well as the deodorization both of the solid and liquid portions of the sewerage and the clarification of the water, together with the discharge of such clarified water into the Thames, are accomplished, such operations being carried on continuously from each tank in rotation, so that at no time is the regular flow of the sewage impeded. The operations of precipitating, deodorizing, and clarifying may be effected by any suitable method. *Patent abandoned.*

1445. T. V. FLINN. *Improvements in sash-bars for the purpose of drainage.* Dated June 26, 1858.

This invention is for collecting the leakage through glazed frames into gutters to be formed in each sash-bar, under the rebate for the reception of the glass; the bars are widened on the under-side to allow the gutter to be formed; a similar channel is made in the sides of the frame. The water thus collected may be run off by other gutters, or by holes cut in those already made. *Patent abandoned.*

1446. D. CAMPBELL. *A new grubbing and harrowing land-roller.* Dated June 26, 1858.

The object here is to do the work of both grubbing and harrowing in one machine; for this purpose it is proposed to use a strong framing having shafts attached for the horse or horses. At the bottom and between the sides of the framing is placed a roller, having fixed upon its surface, alternately rows of metal spikes and spade-shaped pieces of the same length as the spikes. As this roller revolves, it will both grub and harrow at the same time, and save labour in cross ploughing. For easy conveyance, a pair of wheels are placed on the ends of the rollers. *Patent abandoned.*

1447. E. PINCHON and W. R. HARRIS. *Improvements in machinery for manufacturing healds or harness used in looms for weaving.* Dated June 26, 1858.

This consists in manufacturing healds or harness by self-acting machinery or apparatus; counting the healds as they are made, marking the tokens, stopping the machine when any given number of healds are made, or when the heald's twine spools become empty, or when the twine becomes too slack on the spools, or when it breaks, thus making the machine so perfect as to require little attention on the part of the operative, and enable one person to work several machines at the same time. The inventors use two centre or foundation cords, proceeding from stationary spools, upon which the cords are so arranged as to pass in a vertical manner between the take-up cylinders at any required distance apart, for making any depth of heald or harness desired; the ends of the said cords are so arranged as to allow a twine or yarn to be carried around them, and in contact with hooks and needles, operating so as to form the tress to hold the healds firmly to the cords. They employ two fixed wires descending between the aforesaid cords in a parallel direction, and between the cord cylinder shafts to receive the healds as delivered by the take-up motion or cylinders, and they employ a fixed centre-piece, round the lower part of which are formed the heald eyes or loops, through which the warp threads in the loom are intended to pass. They also use a moving frame for carrying two heald twine boxes, and a peculiar arrangement of mechanism to catch and hold properly the said twine boxes as they are driven forward and backward upon the frame. *Patent completed.*

1448. E. E. D'HERELLE. *Improvements in boxes for keeping and measuring coffee, tea, and other substances requiring to be preserved from contact of the air.* Dated June 26, 1858.

This consists in providing boxes or vessels in which tea, coffee, &c., are kept with a top-piece forming a measuring chamber connected to the box by a register cock for either closing the box or allowing of communication between the same and the measuring chamber. To fill the measuring chamber the box must, of course, be turned upside down. *Patent completed.*

1449. W. H. PEECE and J. L. CLARK. *Improvements in electric telegraphs.* Dated June 26, 1858.

The ends of the line wires are each, as heretofore, bound round or fixed to an insulator fixed to a terminal arm on a post or upright; a leading-in wire coated with gutta percha is attached to the end of each line wire near where it is fixed to the insulator, and such coated leading-in wire passes up through a tubular insulator which is fixed at its upper part into a hollow cast-iron arm. The coated leading-in wire having passed into the hollow arm from the tubular insulator is conducted down in a hollow in the post or upright to which the arms are fixed. The hollow interior of the insulator and the arm where the coated wire passes are filled up with cement. By these means the portions of the leading-in wire which are within the insulator and the arm will be protected, and the insulation insured. The leading-in wires are attached to the line wires by binding screws, intermediate of the tubular insulators and the line wires. It is preferred that the tubular insulators through which the coated leading-in wires pass into the hollow arms should have an inverted insulating cup surrounding the hollows or tubular central part. *Patent completed.*

1450. C. ERHARD. *Improvements in apparatus for boring wells.* (A communication.) Dated June 26, 1858.

To keep up a constant flow of water past the boring tool, to remove the earth, &c., cut away thereby, the tool is connected to the end of a tube of less diameter than the diameter of the boring tool, which tube passes up to the top of the well, and to which a to and fro motion is given. Water is supplied to the space between the exterior of the tubes and the sides of the well, and the water is caused to rise constantly up the tube by a piston in which there is a valve opening downwards, being attached to the exterior of the tube near its top, which piston works in a cylinder through which the tube passes. The bottom of the cylinder is open, and at the top of the cylinder there is a valve opening downwards, which allows the water to pass downwards, but will not allow it to return back. By these means the piston in its downward stroke forces the water down the space between the sides of the well and the tube, and up through the tube, carrying with it the matters removed by the cutter, and the tube being open at the top allows the water containing the earth and matters removed by the boring tool to pass away freely. In place of the boring tool being permanently attached to the tube which passes up to the top of the well, the boring tool is attached to a short tube which slides on its end, and on the tube which passes up to the top of the well there are two levers which turn on tentees, the levers having notches formed in them, which take into projections formed on the tube to which the tool is attached, and so raise the tool when the tube which passes up to the top of the well is raised, but when the tube is raised to its highest point the catches are released and allow the tool to fall. *Patent completed.*

1451. I. HAMMOND. *Drawing the cartridge case from the barrel of a breech-loading gun.* Dated June 28, 1858.

According to this invention the barrels are secured by a tumbler seated in the breech in the front of a lump on the barrels at the breech end, and connected by a pin in the fore part of the breech; a lever attached to the tumbler under the gun in front of the trigger guard, by being turned a quarter of a circle, causes the barrels to fall down

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in a position for loading, at the same time the empty cartridge cases are withdrawn from the barrels by a self-acting spring lever sliding through the lump under and between the barrels, one end clipping the brass end of the cartridge, the other end being acted upon by an inner pin attached to the breech. *Patent completed.*

1452. J. LUIS. *An apparatus permitting the different parts of machinery working in the water of screw vessels with wells to be examined and mended.* (A communication.) Dated June 28, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1453. J. LUIS. *An improved machine for reaping corn.* (A communication.) Dated June 28, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

1454. J. MORGAN. *Improvements in machinery or apparatus for manufacturing or spinning rope yarns or other yarns.* Dated June 28, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1455. G. MORRIS. *An improvement in shirt and other collars.* Dated June 28, 1858.

This consists in making the band of the collar longer so as to project at both ends beyond the flap or fold, and in cutting a slit in the direction of the length of the band in each of the projecting ends of the band. When on the neck these slits come opposite to each other, and serve for the reception of a tie. The tie is passed through the slits and made into a bow, without being passed round the neck. *Patent abandoned.*

1456. J. C. COOMBE. *Improvements in the method of, and apparatus for, manufacturing manures from fecal and other matters.* Dated June 28, 1858.

The inventor prepares a retort with a large amount of evaporating surface, and fixes with it a fan to be thrown into action at will; he also arranges the head or cover with compartments which permit of vessels being suspended or enclosed for containing deodorizing or disinfecting chemicals. He places fecal matters in the retort, and mixes with them magnesian limestone or other salt, and by the agitator renders the mixture homegeneous. He heats the retort by steam and continues to dessicate the mass till nearly deodorized, which he effects by chlorine gas, &c., which he generates and liberates at will from the chambers in the head of the retort, and which absorbs or decomposes the noxious gases set free from the mass. To the compound now found he adds soluble super-phosphate of silicates and then continues the dessication in the retort until the mass becomes nearly dry. It may then be ground up and mixed with blood, peat, charcoal, &c., as required. *Patent abandoned.*

1457. C. W. SIEMENS. *Improvements in cleansing tidal rivers.* Dated June 28, 1858.

This consists in procuring an influx of pure sea water at any desired point, whereby a rapid discharge of the sewage matter flowing in the river towards the sea is effected, and putrefaction of the sewage, owing to the salt in the water, is prevented. The inventor constructs a partition wall or dam longitudinally in the bed of the river from a point at or near the mouth of the river to a point at or above the populous district, dividing the river into separate channels. One of the channels has a trap-door, or valve, or gates, to allow of the influx of water from the sea, but which prevents the water from receding with the tide toward the sea. The water thus trapped is allowed to move forward and discharge itself into the unobstructed channel at a point where its purification is required. *Patent abandoned.*

1458. W. E. NEWTON. *An improved mode of, and apparatus for, making nails.* (A communication.) Dated June 28, 1858.

This machine is so constructed that by a simple change of cutters it will make nails of different sizes and forms, inasmuch as a heading apparatus need not be used, whilst it will cut a nail having a shoulder at all four of its sides. The invention relates to that class of nail machines in which a rotary disc cutter and vibrating anvil are used. The apparatus is not described apart from the drawings. *Patent completed.*

1459. W. E. NEWTON. *A new mode of applying engraved plates, or electrotype or other substitutes for such plates, to the cylinders of printing presses, and of applying other parts of such presses in combination with the cylinders to enable perfect impressions to be taken from the cylindrical surfaces of the plates.* (A communication.) Dated June 28, 1858.

The object here is to print very rapidly from engraved plates, &c. The surface of the plate to be printed from has a cylindrical form, so that it may be made to rotate and produce the impression on the paper, &c., as the latter moves between it and another rotating surface. The invention consists, 1, in backing the plates with a flexible but inelastic metal, and winding them upon the periphery of the printing cylinder, by drawing and bending them between the latter and the periphery of the feeding and impression cylinder, so as to make them bear evenly and solidly upon every part of the first-named cylinder, and securing them firmly thereto. It also consists in a mode of applying a clearing roller in combination with the printing cylinder and the inking roller, for removing the superfluous ink from the surface of the plates after the inking operation. Also in a method of appyling an endless band to clear and polish the surface of the plates between the engraved lines or sunk portions which produce the impression. *Patent completed.*

1460. B. YOUNG and P. BROWN. *An improved method of collecting and disposing of the sewage of towns and cities.* Dated June 28, 1858.

This consists in collecting sewage in covered tanks, and in allowing the liquid to drain off, while the solid portions are preserved. The noxious fumes are drawn off by an exhausting apparatus and consumed in a furnace. *Patent completed.*

1461. F. A. CALVERT. *Improvements in machinery for cleaning and preparing cotton, wool, and other fibrous materials.* Dated June 29, 1858.

This invention consists, 1, in applying collars at the ends of the wire-toothed cylinders, for which a patent was granted to the inventor in 1849, to prevent the cylinders coming in contact when in combination; 2, in so constructing the teeth of cylinders working in contact with a doffer that the fibrous material is not carried past the doffer, thus keeping the teeth clear: this is accomplished by weaving steel wire into a warp of cotton, the wire projecting beyond one selvage; this wire web is then folded together and secured in clamps to the surface of the cylinder, thus forming what is termed a wire brush; 3, in a combination of toothed wire rollers and upright grids forming a carding engine. *Patent abandoned.*

1462. E. STEVENS. *An improved cooking utensil.* Dated June 29, 1858.

This relates to baking dishes, and consists in combining a stand upon which meat may be roasted or baked; it serves as a pudding or pie dish, and a stew pan, and vegetables may also be cooked in it. *Patent abandoned.*

1463. J. SHAW. *A machine to manufacture square paper and other bags.* Dated June 29, 1858.

This invention is not sufficiently described apart from the drawings to render the various operations of the machine intelligible. The machine is of a rectangular shape, and partly made of iron. *Patent completed.*

1464. J. SHAW. *A machine to manufacture conical paper and other bags.* Dated June 29, 1858.

This invention is not sufficiently described apart from the drawings to render the various operations of the machine intelligible in an abstract. The machine is of a square or oblong form, and made partly of iron. *Patent completed.*

1465. J. HARCOURT. *An improved adjustable spindle for locks and latches.* Dated June 29, 1858.

This consists in forming the spindle with a deep lengthway groove on one side, in which a small piece of metal slides, which piece of metal is flat on the top, but made to taper from the ends on the under-side to an angle, so that looking at it sideways it assumes the form somewhat of a double wedge, that as the handle is put on the spindle and the double wedge so placed that the screw-hole of the knob shall be over the inner end of the double wedge, when it is in a position to be secured simply by turning in the small screw in the neck of the knob in the ordinary way, when it will depress the inner end of the double wedge and elevate the outer one, or the part that is within the knob, so as to make it impossible for it to be pulled off; thus, the meeting of the two inclines forming the wedges forms the fulcrum on which it acts. *Patent abandoned.*

1466. H. N. NISSEN. *A method of preparing paper for receiving stains or copies from letters and other writings.* Dated June 29, 1858.

This applies to that description of paper used in a damp state for taking press copies of letters, &c. It consists in preparing the paper by impregnating it with a solution of catechunic acid and iodine, whereby the paper upon being damped with clear water, will receive a stain from ordinary writing ink. *Patent abandoned.*

1467. W. BAKER. *Improvements in constructing covered ways for the passage of sewage on the banks of rivers.* Dated June 29, 1858.

A covered way is constructed along the sides of a river by cast iron plates; piles are driven parallel with the bank, which is either protected by a wall or by cast iron plates. On the piles a top or bearing plate is fixed, on which the lower ends of the cast iron plates are fixed. The upper part of the channel or way is covered over with cast iron plates which rest on the bank and on the upright cast iron plate. Where the width is considerable, a row of cast iron pillars are employed to support the covering plates of the covered way. Near the upper part of the upright plates are doors to admit of an overflow, and other doors to admit of the flow of water from the river into the covered way at high tide when it is desired so to do. The ends of the several sewers along the banks enter the covered way, and the sewage therefrom passes from the sewers into, and flows off by the covered ways. Provision is made for passing the ends of canal docks and other navigable places. *Patent abandoned.*

1468. H. GREAVES. *Improvements in apparatus for moulding, casting, and coating metal articles.* Dated June 29, 1858.

For moulding and casting, the inventor makes use of a horizontal frame, supported, and capable of revolving upon, a vertical axis. This frame is situated above a corresponding bench, upon which the moulding boxes or flasks employed rest when required. The moulding boxes or flasks are suspended at intervals to the circumference of the frame, and have gudgeons which rest in corresponding bearings suspended from the frame, and thus allow of the boxes or flasks being turned over. The pattern of the article to be moulded is placed upon a moulding board which rests upon the bench before-mentioned. The moulding box is then lowered down upon and attached to the board and the sand rammed in. The box is next raised clear of the bench, and turned over so that the moulding board comes uppermost. The box is then again lowered so as to rest upon the bench, and the moulding board removed. A second box or flask is then placed upon the first and rammed up; after which the top box may be taken off, the pattern removed, and the top box replaced in the ordinary manner. The frame is placed so that one side is near to the mouth of the cupola from which the articles are to be cast. In using the apparatus, the boxes after being filled are raised clear of the bench, and the frame swung round so as to bring them successively opposite to the cupola where the metal is run in. They are subsequently emptied, and by the rotation of the frame again pass into the moulder's hands to be refilled. The frame is caused to rotate by manual or other power. *Patent abandoned.*

1469. P. P. C. and J. B. BARRAT. *Improvements in machinery for digging, reaping, mowing, and performing certain agricultural operations, and for cutting drains and excavating, partly applicable to arrangements for communicating motion for other purposes.* Dated June 30 1858.

This invention is not intelligibly described apart from the drawings. *Patent completed.*

1470. W. S. WHEATCROFT and J. N. SMITH. *Improvements in locks, fastenings, or safe-guards, making them self-acting, or partially self-acting.* Dated June 30, 1858.

This consists in placing in the interior of the safe, &c., in connection with the inner side of the door, an apparatus acted upon by an elastic spring or other similar power, worked in the same manner as the movements of a time-piece, the working parts of which the inventors connect to the bolts of locks, or to simple catch-bolts alone. They apply a series of levers and notches fixed in such positions as to be in connection with the fastenings or bolts; and they also fix a dial or indicator to be acted upon by the said apparatus, the winding up and setting of which will indicate the exact or desired time of liberating the bolts or fastenings. *Patent abandoned.*

1471. S. FATTORINI. *An universal meridian applicable to mathematical, geometrical, and precise instruments.* Dated June 30, 1858.

This invention consists in dividing the circumference into 384°, and in the application of the said division to any instrument of precision used in mathematical, geometrical, astronomical, nautical, or other operations or calculations for measuring time and distance, &c. *Patent abandoned.*

1472. B. NICOLL. *Improvements in circular knives and saws.* Dated June 30, 1858.

This consists: 1st. In the use of cutters or knives and saws of a circular form, but perforated or open instead of being plain discs as heretofore. 2nd. In certain mechanism for actuating these cutters and saws, and which vary according to the purposes for which they are intended. These cutters, or knives and saws, are used in either a horizontal or vertical position, and may be applied to any cutting or sawing purposes. The invention is not described in detail apart from the drawings. *Patent completed.*

1473. W. CAPSTICK. *Improvements in wheels for carts or vehicles to run on common roads.* Dated June 30, 1858.

This relates to constructing cast or wrought iron naves and combining them with wrought iron spokes and wrought iron rims or treads. The naves are fitted with a bush of cast or wrought iron, brass, &c., which, when placed in the nave, is secured therein by keys or wedges. Instead of an ordinary linch-pin, a round head or cop peice is placed on the end of the axle, and prevented from turning round by a feather or cross bar on the under-side of the cap piece, which is fitted in a groove cut out of the end of the axle, on which it is secured by a stud screw, which passes through the cop piece, and enters the end of the axle. *Patent abandoned.*

1474. J. PETRIE, jun. *Improvements in machinery or apparatus for drying warps of yarn or thread and woven fabrics.* Dated June 30, 1858.

This consists in an arrangement in which the apparatus which conveys heat and the chamber in which the articles to be dried are caused to travel, and also the necessary apparatus for effecting such motion, are combined together so as to constitute a machine complete in itself. Thus the patentee constructs a chamber provided with rollers over which the yarn or cloth is caused to travel in a vertical direction. Beneath he places a steam pipe or other source of heat, and under that a revolving fan for driving the heated air upward, the whole being connected together by suitable framework. *Patent completed.*

1475. H. G. PEARCE. *Improvements in reefing the sails of navigable vessels.* Dated July 1, 1858.

To apply this invention to (say) top-sails, a horizontal supplementary bar is fitted across the sail equidistant between the head of the sail and the close reef. This supplmentary spar is attached to the sail, and is suspended at the ends on axles by ropes or chains, which reeve through blocks or chocks on the top-sail yard arms, and are carried to the centre of the yard, where they are passed through blocks or chocks for convenience of working. The centre of this supplementary yard, which revolves, is fitted with a boss to receive a "parbuckle" or "semi-parbuckle," one end of which is attached to the supplementary revolving yard, and is passed several times round it, and from thence to a hole or block at the top-mast head, and down to the deck, where it is made fast, thereby causing the sail when dropped down to roll itself up both from above and below, and when twisted to unrol itself as the sail is elevated. The supplementary revolving yard is connected to the mast by two hoops, which are connected together and encompass the yard on each side of the parbuckle rest, and are secured to a "parrall" or hoop that works on the mast. The sail is split in the middle from the upper yard to a little below the close-reef, to admit the centre gear to work through it. *Patent abandoned.*

1476. T. WHITELEY. *Improvements in the manufacture of millboard, and in machinery or apparatus for cutting millboard and paper.* Dated July 1, 1858.

This invention was described and illustrated at page 76, No. 5, of the Mechanics' Magazine (New Series.) *Patent completed.*

1477. W. CLARK. *Improvements in grid irons.* (A communication) Dated July 1, 1858.

This relates to new and economical gridirons, the bars of which are over-lapped and raised one above another, and forming a surface impassable in a line perpendicular to the general plane of the bars, whatever form the gridiron possesses. The bars may be single or double, and form, with the cross pieces, a flat, curvilinear or angular surface, at any degree of inclination. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, MARCH 4, 1859.

HIGH SCIENCE.

MODERN science never, we presume, rises higher than when Dr. FARADAY expounds it to a brilliant audience presided over by the Prince Consort. This we say mainly, of course, in a worldly sense; for who would limit the absolute flight of so pure and transcendent a thing as scientific truth to the region of earthly royalty? But speaking, we say, in a worldly sense, the FARADAY evening at the Royal Institution, brightened by the presence of the husband of our Queen, and the father of our future kings, is *the* period when the star of science culminates. Such a period was last Friday evening.

Although somewhat less at ease, and less fluent than usual, Professor FARADAY on that occasion ably brought before his crowded and, for the most part, distinguished audience, a subject of much interest and significance, viz., the discoveries of Messrs. BRODIE and SCHONBEIN in relation to those forms of oxygen known as "ozone" and "antozone." By numerous and varied experiments, he showed the capability which oxygen has of being transformed into two opposite states, in which it is known by these names, and also the facility with which the ozone and antozone may be combined, and made to take the form of pure oxygen. Philosophers at present content themselves with performing these experiments, and explaining the facts; but it is easy to see that our theories of ultimate elements, definite proportions, and so forth, are not a little loosened and shaken by such discoveries; and when (as Dr. FARADAY remarked) it is remembered that oxygen constitutes more than one-half of our entire globe, the light which is likely to be thrown by them upon terrestrial phenomena may prove to be indeed wonderful.

Our prime object, however, in referring to the proceedings of last Friday evening, is a much more humble one than that of considering an exalted question of chemistry, or even that of noticing the princes, and bishops, and earls, and duchesses, and other illustrious amateur friends of science who took that question into their polite consideration! We desire simply to direct attention to the claim which Professor FARADAY, on that occasion, as on former occasions, most earnestly and impressively made on behalf of experimental science, viz., that it exerts an immediate and powerful influence upon the welfare and progress of society. It has been fashionable for persons of all classes to consider the devotees of experimental science as a class who feel no interest in, and have no care for, the practical arts and industries of life. But this shallow and fanciful habit is heartily denounced by Professor FARADAY—a man who has the best right to speak upon it. It is not alone, he tells us, for the educational benefits which arise from the study of physical phenomena and laws that he and others pursue their inquiries. These benefits are undoubtedly valued, and are felt to be of themselves worth far more labour than is bestowed upon their acquisition. But in addition to these, the experimentalist looks with pride upon those practical fruits which his devotion has fostered, and with confidence anticipates like harvests in the future. The steam-engine, the electric telegraph, and other world-transforming and world-bettering agencies declare his honour, and it is folly to suppose him insensible to the fact.

Although the practical rather than the abstract is our domain, we cordially recognise the claim thus put forth, and feel assured that practical men everywhere will assent to it. Did we not, we should blush for them. It is in the nature of things that the facts discovered by the experimental philosopher should be caught up by eager commercial men, and turned to their own pecuniary advantage. But let it not be said, or even thought, that those wide-spread classes who extract convenience and profit from the philosopher's labours are unmindful of his claims. He does not ask for fortune, or even for large material benefit of any kind; but let him not be denied what he does require—the acknowledgement of his generous exertions in furtherance of both the material and the mental prosperity of his country and the world.

MINERAL DISCOVERIES IN FRANCE.

IT has long been known to men of science that France contained a far greater amount of mineral wealth than the importance of her mining operations would lead one to suppose, and M. Michel Chevalier—whose intimate acquaintance with English trade and commerce has made him one of the most valuable advocates of the freedom of commerce in France, and whose appointment as a Member of the Council of the New Minister for Algeria and the Colonies, Prince Napoleon, holds out some promise of the application of sound economical principles in the future administration of the colonial possessions in France—gave his countrymen a hint, in his "Letters on the London Exhibition of 1851," that what had been done in Scotland and Wales with respect to the production of cheap iron, might be done, if not quite so extensively, still largely in France, where the natural vicinity of fuel and mineral was less uncommon than generally supposed.

Scientific men have lately been busily engaged in examining the sources of mineral wealth, and amongst these M. THEODORE LAGRANGE is one of the most conspicuous. The results of his researches have been submitted to analysis by M. M. PAYEN, PONISOT, VILLAIN, and DUMOULIN, and are just now published.

The districts examined by M. LAGRANGE are described as being the most sterile portions of the south of France, and as having been previously considered destitute of any mineral wealth of importance. It would have been more satisfactory had M. LAGRANGE given us the names of the localities, but, at the same time, the high respectability of the names attached to the report brings the latter before the public with great prestige.

The minerals in question consist of galena, described as rich and containing more or less silver and antimony; sulphuret of lead, very rich; iron ores, containing 84 to 86 *per cent.* of metal; iron pyrites; schists, both aluminous and bituminous; alimites, or "mountain butter;" copper ores; mineral bitumen; crystallized and amorphous sulphates of lime; sulphate and carbonate of barytes.

The reports of the chemists describe these minerals as very rich, and as deserving the serious attention of capitalists, who are advised to make an attempt to develope this industry, and thus produce for French manufacturers, from the soil of France, what at present they purchase in large quantities from foreign countries at a high price.

The specimens of galena analysed are reported to contain from 70·20 to 77·80 *per cent.* of lead, and from 0·030 to 0·05 *per cent.* of silver, which latter proportions are considered by Messrs. PAYEN and POINSOT to be sufficient to pay for the separation of the metals.

The bituminous minerals are reported to yield 80 to 82·20 per cent. of bitumen.

The analysts report also indications of strontium, zinc, manganese, tin, arsenic, chromium, antimony, magnesium, cobalt, and nickel. It is further remarked by these gentlemen that the presence of pyrites in nodules, fossil shells, and bituminous schist are the precursors of great coal-beds.

M. LAGRANGE is a man of large means, and he has given a long time, and expended much money, in his mineralogical investigations; but practical men will, at present, regard the subject as scarcely yet come within their circle. Besides, the possession of the means of wealth is not always allied with the habit or the talent for its development; and many may think that an impetus given to the mining industry of France would be even more important than the discovery of new mineral sources. However, the discovery of such important elements of material civilization can never be uninteresting, and must now, or at some future period, be useful and profitable also. The exhaustion of the coal-beds of England seems to recede from our minds as we advance, but *when* that event occurs it will be well to have a rich carboniferous neighbour.

THE ROYAL NAVY.

THE elaborate speech of Sir JOHN PAKINGTON on the navy (parts of which unfortunately got out of their places in the *Times'* report), claims some consideration from us. Much of it lies beyond our sphere; and even those portions of it with which we are more immediately concerned are too lengthy to be reported in full in our columns. We shall content ourselves, therefore, with glancing at the leading points brought under discussion.

Sir JOHN'S great work was, of course, to explain the causes which have led to the enormous magnitude of the next year's naval expenses. Let us notice some of them. The great advance in the cost of ships, occasioned by the introduction of steam, is the most serious. The cost of the hull of the *Indefatigable*, a 50-gun sailing frigate, in 1852-3, was £51,836; but the hull of the *Shannon*, a 50-gun steam frigate, four years later, cost £71,112; and that of the *Orlando*, a new frigate launched last summer, no less than £99,375.

"I can give," said Sir John, "another proof of the same thing in a different way. The construction of the *Britannia*, 120 guns, required 4,550 loads of rough timber and 218 shipwrights, while the *Marlborough*, the same class of vessel, recently built, required 6,068 loads of timber and 334 shipwrights. So that here, again, you have a proof of how much more costly it is to build ships in these days than it was a few years ago. The *Rodney*, again, required 3,610 loads of timber and 219 shipwrights, while the *Renown*, a vessel of the same class, but lately built, required 4,680 loads of timber and 277 shipwrights."

The increase in the size of our ships has also led to a great augmentation in the votes for new works. The costly slips and docks, which were of ample dimensions in times past, have now to undergo enlargement in every dockyard possessed by the Queen.

"We have in the whole of Her Majesty's yards 42 building slips, and at this moment only nine of them are large enough for the construction of first-rate ships. We are increasing the size of those slips, and, of course, a large amount of money is required for this purpose. Then, again, we have 33 docks, of which four only, in Her Majesty's yards, will hold our largest ships. We are obliged to alter those docks, and five of them are now being increased in size; but we cannot accomplish that without expending an immense amount of money."

After noticing these things, Sir JOHN informs us that the committee appointed to examine the state of the machinery in our dockyards, consisting of Admiral RAMSDEN, Mr. JOHN WARD, and Mr. JAMES NASMYTH—not an exceedingly well-selected committee, as we could show—reports favourably upon its condition, and con-

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siders that the public money has been well expended in that respect.

"That committee has issued," said Sir John, "a most able report, containing several recommendations which it is the intention of the Admiralty to adopt, as we believe that they will tend to the advantage of the public service. One of those recommendations is that we should apply for tenders for the supply of engines much more largely than has hitherto been the case, and in pursuance of this recommendation we have thought it our duty to invite tenders from Liverpool, Scotland, and most of the eminent houses engaged in this particular business."

All this looks very well upon the face of it; but we are not quite sure that we shall not have occasion hereafter to give our readers a glimpse of something beyond the outward aspect of this matter. And we must say the same of the next committee to which Sir JOHN referred :—

"That committee was headed by Admiral Smart, and it has been engaged in the investigation down to the present time. The report is not yet finished, but I understand," said Sir John, "from the chairman, that the result of the inquiry will be the recommendation of very considerable changes, which, in his opinion, will lead to a much more economical and judicious expenditure in the dockyards in future. I mention this to show the desire that there is on the part of the Government to secure the most advantageous expenditure of the large sums intrusted to their care; and I trust that the comparisons which I have instituted between 1858 and 1852, will lead to the impression that in the expenditure of these sums we have been influenced solely by a sense of duty, and by a desire to exercise the utmost practicable economy."

We confess to some want of confidence in these plausible proceedings of the present First Lord. Will Sir JOHN give the proceedings and report of this latter committee to the public before he takes action upon it? We hope he will. If not he will run a great risk of doing vital injury to the public service, whatever his intentions may be. When small secret committees meet and investigate important affairs, great danger always exists, unless their counsels are unanimous. We shall watch the results in the present instance.

We must not enter here upon the proposals made by Sir JOHN PAKINGTON for increasing the Channel Fleet, and for replacing the sailing flag-ships on foreign stations with steam-ships, although we heartily approve of both. We hasten to notice his comparison between our steam navy and that of France :—

"We took means of ascertaining what were the facts, and we found that the line-of-battle ships of France were exactly the same in number as our own—viz., 29. The French had fewer three-deckers, first-rates, than we had, but of our 29 ships there were nine which were inferior to any of the French ones. Therefore, we must make up our mind to this, that in July last the screw line-of-battle ships of France were 29, and those of England also 29 in number; but that in point of power and efficiency the line-of-battle ships of England were, to the best of my knowledge and belief, inferior to those of France. The nine ships to which I have referred are sailing 80-gun ships, which have been converted into screw eighties, and consequently have not room for their engines, and are generally inferior ships."

We are strongly inclined to doubt the inferiority of the English line-of-battle ships to those of France. Numerically we were undoubtedly no stronger, to say the least, than the French. But, notwithstanding all that Sir JOHN states respecting our old 80-gun ships, we believe that "in point of power and efficiency" we were the stronger of the two. At any rate, we know perfectly well that many of the French steam line-of-battle ships are lumbering old craft, converted from sailing vessels of a very antique type, and deficient of many of the qualities essential to their general value and efficiency. But the question is scarcely worth discussing, for the bare approach to equality with us on the part of the French ought to incite us to renewed exertions. Sir BALDWIN WALKER, the Surveyor of the Navy, has always, it appears, been alive to our deficiency of line-of-battle ships, and has frequently made corresponding "submissions" to the Admiralty; but the demand for small vessels during the Russian war prevented the carrying out of his designs.

With regard to frigates, we are told, the case is still stronger against us. During the last ten years proposals were made for adding 37 frigates; the actual number built was only 23, so that there was a deficiency of 14 frigates in that interval.

"In the course of the autumn, I found" says Sir John, "that instead of being upon a par in point of numbers, as was the case with regard to line-of-battle ships, we were in a positive numerical inferiority of 12 frigates. The English navy comprises 17 screw frigates and nine paddle frigates, two receiving their engines and six building, making a total of 34. The French navy reckons 15 screws, 19 paddle-wheels, three receiving their engines, one converting, and eight building, making an aggregate of 46."

And with respect to block-ships, we learn that they are wholly useless. "They are good for nothing as sea-going men-of-war; they may be useful perhaps as floating batteries; but as men-of-war they are perfectly useless. Most of them are rotten, and they are very nearly worn out."

We now come to what the Admiralty are about to do towards the "re-construction" of the navy. And first let us note what our prospects were in 1859 :—

"We had four ships receiving engines, and during the year 1859 there were two new ships to be launched and one to be converted, which would have raised the number of our line-of-battle ships to 36. We found that the progress of the French navy was not to be at all in the same ratio. At the end of 1859, on the contrary, the comparison would have stood—England, 36 line-of-battle ships, with 3,400 guns, and 19,750-horse power, none of these ships being the inferior ones to which I have referred; France, 40 line-of-battle ships, with 3,706 guns, and 27,510-horse power."

To prevent our fleets occupying such relative positions as this, the Admiralty asked the Surveyor of the Navy what arrangements could be made to enable them, with the labour at their disposal, and without exceeding the estimates to which they were pledged, to increase the number of our line-of-battle ships. The result was, that they determined to withdraw from the ordinary building and repair of ships a force sufficient to enable them at once to commence the conversion of four three-deck line-of-battle ships —viz., the *Neptune*, the *St. George*, the *Trafalgar*, and the *Queen* into two-deck screw-ships, with 90 guns and 500 horse-power each.

"That was all we could then accomplish. Those orders were given in the month of August last; during the course of the winter these ships have been rapidly advancing to completion, and in the course of the spring they will be launched, and added to the strength of the British navy. In addition to these four ships we now propose to convert five others—viz., the *Lion* (which was ordered to be converted by the right hon. baronet opposite, Sir C. Wood, but with which no progress has been made), the *Nelson*, the *Royal William*, the *Waterloo*, and the *Rodney*. The *Nelson*, the *Royal William*, and the *Waterloo*, three-deckers, will, in the course of the ensuing year, be converted into ships of 90 guns, and the *Rodney*, at present a 90-gun ship, will be converted into a screw line-of-battle ship of the same class. I should have hesitated about the expediency of converting the *Rodney*, had not a sister ship of hers, the *London*, lately been so treated with great success."

Had no extraordinary exertions been made, only two ships would have been launched in the course of the year 1859, viz., the *Hood* and the *Revenge*, both of 91 guns; the *Hood* having 600, and the *Revenge* 800-horse power. Those who look at the returns of the navy, will see that there are included in them ten ships as in course of building. These would have been launched at different periods during the next few years, but the Admiralty have selected those which were the most forward, and therefore could be operated upon most easily, and with the least expense, and propose to launch four of them during the ensuing year. In all, therefore, there will be launched during the year six screw line-of-battle ships—viz., the *Hood*, 91 guns, and 600-horse power; the *Revenge*, 91, 800-horse power; the *Victoria*, 121, 1,000-horse power; the *Howe*, 121, 1,000-horse power; the *Duncan*, 101, 800-horse power; and the *Prince of Wales*, 131, 800-horse power.

We next come to frigates, the proposals with respect to which we will give in Sir JOHN's own words :—

"Our proposal is, as to frigates, instead of launching three, which is the usual number, each year, to hurry on two which are building, and so launch five this year. They will be the *Galatea*, of 26 guns and 800-horse power; the *Ariadne*, of 32 guns and 800-horse power; the *Bacchante*, of 50 guns and 600-horse power; the *Narcissus*, of 50 guns and 400-horse power; and the *Immortalité*, of 50 guns and 600-horse power. In addition to these we propose to convert four of the sailing frigates to which I have adverted—the *Phaeton*, *Severn*, *Sutlej*, and the *Phœbe*—to lengthen them amidships, at the bows, and at the stern. I believe these ships will become as efficient and as valuable as it is possible for converted ships to be. I fear they will be very costly ships, but still most valuable and effective, carrying the same armament they now bear—50 guns. The cost will be for the labour of conversion £42,000 for each ship, and the cost of engines of 500-horse power £30,000, so that each ship will cost about £72,000. If, however, we were to construct new ships of the same size they would cost at least each £40,000 more; and, moreover, these converted frigates can be added to our navy in a much less time than it would take to build new ones. We thus propose to add nine frigates in the course of the year."

On coming to the question of iron-cased vessels, Sir JOHN, naturally enough, became unusually serious. He spoke as follows :—

"I now have to beg the attention of the committee to a portion of this subject which is the most difficult, but upon which I am bound to be candid—I allude to the subject of iron-cased ships. In referring to the French navy I made no mention of what they were going to do in respect to those ships, but it appears that they have laid down at Toulon two vessels upon that plan, which are far advanced towards completion. They are to be about the size and tonnage of the vessel which they consider to be their finest line-of-battle ship, the *Napoleon*, upon which I understand they have been modelled. They are only to carry 30 guns, but those guns are to be of the heaviest calibre, and the vessels are to be coated with 4½-inch plates of iron or steel, it not being yet decided which metal shall be adopted. In this state of things the Government felt it to be their duty in the course of last summer to institute experiments as to the power of certain metal sheathing to resist shot. The committee will perceive that it would not be proper in me to enter into detail at present upon that subject and I can only say that the experiments were most carefully made with all varieties of metal and in all ways. In the course of the autumn, as every gentleman who reads the newspapers must know, some wonderful inventions were made in artillery, and it then appeared to me to be my duty to ascertain how far the previous experiments would be affected by the recent discoveries in artillery arms. The House will not expect me to give in detail the result of these experiments, but I am bound to say that it has convinced the Admiralty that, whatever be the cost, we have no option in the discharge of our duty but to commence the construction of these iron-cased ships. I shall not conceal from the House that they will be the most costly ships ever built for the British navy; but still, assuming—that of which I have no doubt—that our plans will receive the sanction of Parliament, we have resolved that it is our duty to lose no time in building at least two of these vessels. I am bound to say, also, that we feel it to be no less our duty to throw away no chance whatever in endeavouring to make these ships as effective and successful as possible. We have called upon the most competent parties in different parts of England connected with private trade to give us their designs and counsel. We have likewise called upon our officials in the dockyards—upon our able master shipwrights, of whom, I am glad to say, we have a considerable number—to furnish us with designs. The determination of the Admiralty is to leave nothing undone, to take every precaution that prudence and caution can suggest, in order that the large sums which these ships will cost shall not be thrown away. We are equally resolved at the same time to lose not a moment in bringing these ships into existence. They are the ships which appeared in our estimates under the head of ships to be built by contract. We have not room to build them in our dockyards. From the mode of construction which we propose we have no hesitation in confiding their construction, under our own superintendence, to those who will build them by contract; and by the close of the year upon which we are now entering, I hope these two ships may also be added to the strength of the British navy."

Our space is now exhausted, and we must therefore defer further observations until next week, only adding that the designs for the iron-cased vessels have this week been submitted to the Admiralty, and are now under examination. They are very varied in their character, and some of them are for vessels of extraordinary dimensions.

ROYAL NAVAL ENGINEERS.

IN reading through the lucid statement of Sir J. PAKINGTON, made to the House of Commons on Friday last, we were somewhat surprised that not even a passing notice in the reforms there shadowed forth has been accorded to the Naval Engineers, although we believe that a memorial from that valuable portion of our scientific branch of the navy has been some time in the hands of the authorities. We should have imagined that, with eyes now open to the strides made by our friends on the opposite side of the channel, where the Emperor has seen the imperative necessity of giving to those officers their proper status, some such course would have

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been adopted by our enlightened First Lord. We are not unaware of the prejudices existing in the minds of some few, high in authority, who, looking with aversion on that power which has now become universal, would commit the Naval Engineer to the doom of Frankenstein—who created a monster but for his own annihilation. But we will not pause to oppose such prejudices. Ours is now about to become wholly a steam navy, and the naval engineer *must* have ceded to him, however unwillingly, a position becoming the man who has to preserve and control those complex and expensive giants over which it is his business to preside.

In the earlier volumes of this Magazine (Vol. 37, p. 201, for 27th August, 1842, for example), we were the first to initiate a movement for the improvement of the naval engineers. Our remarks were then approved by our contemporaries, and obtained extensive publicity in the journals of the day. The royal steam navy at that period (1842), was but the germ of that which has now attained a monster growth, and is about to have a new era inaugurated. The steam vessel in those days was the exception; now it has gone forth that the entire navy, in its "reconstruction," is to be independent of that changeable element, the wind, and will, as Homer prefigured, be "self-moved instinct with mind."*

In November, 1846 (vol. 45, p. 503), we were enabled to announce to our readers that the naval engineer had commenced to move towards his proper position, their lordships "having decided on promoting several of this valuable class of officers to ward-room rank." On the 27th of February of the succeeding year, an Order in Council was obtained upon which was based the circular dated 1st April, 1847 (given entire at p. 597, vol. 46), constituting the naval engineer, or chief engineer of the new establishment, a commissioned officer, ranking with lieutenants and masters, whilst to the "assistant engineer" was offered a rank co-equal with second masters. Ere ten years had elapsed, it was found that these partial and grudging recognitions of the claims of the naval engineer did not give satisfaction, and at the breaking out of the Russian war our force of "naval engineers" was so low that labourers and others from our various railway establishments were inducted at once into the service of Her Majesty, and that at a higher rate of remuneration than had been assigned to many of the most intelligent of the chief engineers—men of many years' servitude and of great experience. To remedy a defect so glaring, on the 4th of April, 1856, another Order in Council was laid before Her Majesty, and graciously approved of, in which full-pay, half-pay, pensions, and allowances were to be accorded to the naval engineer; and he, being admitted to "now form a most important class in Her Majesty's navy," was to be placed in every respect upon a footing with masters of the fleet, masters, and second masters respectively. A proviso was also therein introduced for the settlement of the claims of those who "were not considered qualified for promotion to a higher class from want of education," the same document proceeding afterwards to take such from serving under a chief engineer—to keep down the number of which class (the chief engineers) is stated to be "in every point of view most desirable." Upon this document was based the last circular, ceding half-pay, and giving full-pay according to servitude, as given to masters.

The extra time, however, allowed to count for full-pay when served as second masters in the last-mentioned class, has never been accorded to the naval engineer, whose time served as first-class assistant (if not his entire time) should also count. Neither has he any allowance for the charge of stores, as has the master, with whom it was stated to be desirable to assimilate him. We would, however, urge on Sir JOHN PAKINGTON, in his contemplated changes, the necessity of placing of the naval engineer on a similar footing to the surgeon, the whole of whose time of servitude counts. The engineer and the surgeon should be co-equal, as they now are in the French navy. They should be equal in education, of course, as well as in position, and if they are not the fault lies with the Admiralty, who admit those of so low a standard. The assistant engineer also, as the assistant surgeon, enters the service after the study of his profession has been obtained, each wanting but the requisite experience procurable by practice alone, whilst the other branches of the service are initiated into their duties at the expense of the public purse. We do hope that in the changes contemplated the naval engineer will have such a position given him as will show that class interests are not unfairly studied, and as will put an end to those idle bickerings which stay the progress of improvement, and prevent the attainment of that efficiency which our great naval reformer, Sir JOHN PAKINGTON, professes so earnestly to desire.

* In Pope's translation of Homer's Odyssey, Eighth Book, in the description of the Fleet of King Alcinous, occurs the following:—

"So shalt thou instant reach the realm assigned
In wondrous ships, self-moved, instinct with mind."
* * * * * *
Though clouds and darkness veil the encumbered sky,
Fearless through darkness and through clouds they fly.
Tho' tempests rage—tho' roll the swelling main—
The seas may roll, the tempests swell in vain.
Eley the stern god that o'er the waves preside,
Safe as they pass, and safe re-pass, the tide),
With fury burns; while careless they convey
Promiscuous ev'ry guest to ev'ry bay."

OUR STEAM NAVY.

THE return to the order of the House of Commons, setting forth the progress and present condition of our steam navy, strikingly confirms the figures given in the paper read at the Society of Arts in December last. The total number of line-of-battle ships is there stated to be 49. In the paper mentioned the number given was 51. The small discrepancy probably arises from the official return excluding two ships, the conversion of which into screws has been decided upon, and perhaps commenced, but not far advanced. Of frigates the return gives 25; whereas the paper gave 28. We account for this difference by supposing that in the return the *Ariadne*, *Galatea*, and some other vessel have been set down as corvettes. This seems certain when the next classes of vessels are compared, viz., corvettes, sloops, and "small vessels;" for while the official paper gives 50 of these, the Society of Arts paper gave but 48. Taking frigates, corvettes, sloops, and small vessels together, we get a total of 75 from the one paper, and 76 from the other. The number of gunboats is 161 in the official paper, and 163 in the other. Precisely the same numbers of block ships, mortar vessels, floating batteries, and gun vessels, are given in both papers. Taking the whole of the screw fighting vessels of all classes (from which tenders, troop ships, store ships and yachts are excluded) we get the number 333 from the official return, while the number given in December was 331. These discrepancies are not worth mentioning, except as they illustrate the general correctness of the figures. Such as they are they very likely arise from the indisposition of Sir CHARLES WOOD to appear even to exaggerate the number of ships provided during his term of office. In dealing with the official table (next page), care must be taken to add the numbers in the first and third numerical columns, in order to get the total number of screw ships afloat, building, and undergoing conversion; and *Fighting-vessels* only are to be considered.

ANOTHER NOVELTY IN ARTILLERY.

ARTILLERY, which is already a very powerful arm of the service, seems destined to altogether supersede and overwhelm the minor missiles of the sister service. Last week we gave some account of a gun apparently unparalleled in range, lightness, and application to ships and sea-coast garrisons. This week, we have to notice a perfectly novel LIGHT FIELD PIECE, with carriage and ammunition waggon; the whole being the invention of a young officer of the Bengal Artillery now in England. If it succeed—and we at present see no valid reason why it should not—it will be likely not only to supersede the whole present system of field-guns, and especially that of the horse artillery, but also to reduce the *cost* of that most expensive branch to little more than one-half of what it is at present, while making it even more efficient.

We are in a position to say much regarding this invention, but must refrain from doing so, because the inventor has already submitted his proposal, first to the Commander-in-Chief in India, where a 9-pounder was given him by Lord CLYDE for experimental purposes (the report of the success of which, we believe, he now has with him), and recently, to Lord STANLEY, the head of Indian affairs, to whom of course he was bound to refer it, and who, we doubt not, will give it that attention for which he is so justly celebrated, and which it well deserves. We must not, therefore, anticipate the inventor's statement to the Government, by giving publicity to a description of the new weapon, which he, as a dutiful servant, is bound to submit to them in the first instance. But we may, as some exemplification of the *tendency* of this invention, ask our professional—and especially military—readers, what they would think of half-a-dozen weapons throwing 9-lb. shot, or 24-lb. howitzer-shell and canister, in the hands of a regiment of our dragoons, and advancing with them at a gallop to the *very feet* of a square or line of infantry, throwing their deadly missiles into them without cessation from their line of advance, and without checking for an instant the headlong gallop which is shortly to convert their murderous fire into an actual charge, and leave the cavalry which accompanies them nothing more to do than to ride into the gaps which they have made!

A gun with which this might be done, and an ammunition box, apparently impenetrable by antagonistic round-shot of extreme simplicity of construction, and holding no less than five times the number of rounds of the present complicated boxes, constitute the principal points of this officer's invention, of which he has a model in London. We hope before long to give our readers a full description with illustrations.

NEW COMMITTEE ON NAVAL ORDNANCE.—Captain Caffin, C.B., Naval Director-General of Artillery, on Tuesday visited Woolwich Arsenal for the purpose, it is said, of making arrangements with the officers of the select committee for investigating and carrying out the new principle proposed for the armament of the fleet. A special committee of some of the most able and scientific officers of Her Majesty's service has been appointed, of which the following names have transpired, namely:—Rear-Admiral Sir Thomas Hastings, K.C.B., as chairman; Sir John Burgoyne, Bart., G.C.B., Royal Engineers, Inspector-General of Fortifications; and General Sir Howard Douglas, Bart., G.C.B., G. C. M. G., 15th Foot. Captain Caffin to act as secretary to the committee.

CAPTAIN NORTON'S INVENTIONS.—At the request of several of the officers of the Royal Engineers at Brompton Barracks, Captain Norton has just completed another series of experiments at Chatham, for the purpose of subjecting some of his inventions to a severe test, in order to prove their practical utility, his former experiments having attracted a high degree of interest among scientific persons, and the officers of the Royal Artillery and Royal Engineers. The experiments were quite successful.

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OUR STEAM NAVY.

Return to an Order of the Honourable the House of Commons, dated 11th Feb., 1859.

Returns of the number of Steam Ships and Vessels, added to the Navy in the year 1848, and each subsequent year, divided into Ships of the Line, Frigates, and other classes of vessels, and distinguishing those which have been built, converted, and purchased; with the total of each class in each year, and grand total in all the years.

And of the number of Steam Ships and Vessels in the Navy afloat, and building or converting, on the 1st Jan., 1859, divided into Ships of the Line, Frigates, and other classes of vessels, and distinguishing screw and paddle-wheel vessels.

STATEMENT SHOWING the NUMBER of STEAM VESSELS ADDED to the NAVY in the FOLLOWING YEARS:—

		Grand Total.	Ships of the Line	Frigates	Block Ships	Mortar Ships	Corvettes and Sloops.	Floating Batteries.	Gun Vessels	Gun Boats	Troop and Store Ships.	Tenders, &c.	Totals
1858.	Total.	15	8	4	...	...	3	...	...	...	...	...	15
	Purchased.	...	...	...	...	...	...	...	...	...	...	...	...
	Converted.	4	...	...	...	...	...	...	...	...	...	...	...
	Built.	11	8	4	...	...	3	...	...	...	...	...	11
1857.	Total.	15	2	2	...	...	5	...	6	...	...	...	15
	Purchased.	6	...	...	...	...	...	...	6	...	...	...	6
	Converted.	...	...	...	...	...	...	...	...	...	...	...	...
	Built.	9	2	2	...	...	5	...	...	...	...	...	9
1856.	Total.	148	2	3	...	...	6	4	15	...	1	6	148
	Purchased.	123	...	...	...	...	3	1	100	108	...	6	123
	Converted.	6	2	...	...	...	3	...	1	...	1	...	6
	Built.	19	...	3	...	...	6	1	1	8	...	...	19
1855.	Total.	87	4	2	5	...	21	4	5	42	2	21	87
	Purchased.	68	...	...	...	...	...	4	4	38	2	20	68
	Converted.	5	...	...	5	...	...	...	...	...	...	...	5
	Built.	14	4	2	...	...	2	...	1	4	...	1	14
1854.	Total.	40	6	1	...	...	10	...	8	6	7	2	40
	Purchased.	31	...	...	...	...	3	...	8	4	7	2	31
	Converted.	3*	3*	...	...	...	...	...	...	...	...	...	...
	Built.	6	3	1	...	...	7	...	...	2	...	...	13
1853.	Total.	9	6	2	...	...	1	...	...	...	...	...	9
	Purchased.	...	...	...	...	...	...	...	...	...	...	...	...
	Converted.	...	...	...	...	...	...	...	...	...	...	...	...
	Built.	9	6*	2	...	...	1	...	...	...	...	...	9
1852.	Total.	5	2	1	...	...	1	...	...	...	...	...	5
	Purchased.	1	...	...	1	...	...	...	...	...	...	...	1
	Converted.	...	...	...	...	...	...	...	...	...	...	...	...
	Built.	4	2	1	...	...	1	...	...	...	...	...	4
1851.	Total.	6	1	1	...	...	4	...	...	...	...	...	6
	Purchased.	1	...	...	...	...	1	...	...	...	...	...	1
	Converted.	...	...	...	...	...	...	...	...	...	...	...	...
	Built.	5	1*	1	...	...	3	...	...	...	...	...	5
1850.	Total.	6	2	1	1	...	...	...	...	1	...	...	6
	Purchased.	1	...	...	...	...	...	...	...	1	...	...	1
	Converted.	2	...	...	1	1	...	...	...	...	...	...	2
	Built.	3	2	...	...	...	1	...	...	...	...	...	3
1849.	Total.	10	2	1	...	...	4	...	...	3	1	...	10
	Purchased.	3	...	...	...	...	...	...	...	3	...	...	3
	Converted.	...	...	...	...	...	...	...	...	...	...	...	...
	Built.	7	2	1	...	...	4	...	...	...	1	...	7
1848.	Total.	4	1	...	...	...	2	...	...	...	1	...	4
	Purchased.	...	...	...	...	...	...	...	...	...	...	...	...
	Converted.	...	...	...	...	...	...	...	...	...	...	...	...
	Built.	4	1	...	...	...	2	...	...	...	1	...	4

+ Converted after having been launched.

* Includes built and converted on slip.

STEAM NAVY, January 1, 1859.

	Afloat.		Building or Converting.	Total.
	Screw.	Paddle.	Screw.	
Ships of the Line	33	...	16*	49
Frigates	19	9	6	34
Block Ships	9	...	...	9
Mortar Ships	4	...	...	4
Corvettes and Sloops	38	35	9	82
Small Vessels	3	24	...	27
Gun Vessels	26	...	...	26
Gun Boats	161	...	1	162
Floating Batteries	8	...	...	8
Tenders, &c.	4	38	...	42
Troop and Store Ships	13	2	...	15
Yachts	1	4	...	5
Total	319	112	32	463

* Six converting.

Parliamentary Proceedings.

CONDENSED FOR THE "MECHANICS' MAGAZINE."

THURSDAY, FEBRUARY 24.

HOUSE OF COMMONS.

THE WORKS AT LONDON BRIDGE.

In answer to General Codrington the First Lord of the Admiralty said the Board of Admiralty had given its official sanction to the construction of the permanent works now being made beneath the southern arch of London-bridge about the end of March last, since which time he had the honour of receiving a deputation on the subject, but on due consideration of the arguments advanced, he had not thought fit to alter his decision.

FRENCH VESSELS AT SPITHEAD.

In answer to Sir C. Napier,

Sir J. Pakington said he had received information from Portsmouth that two or three nights ago a French vessel, an aviso, with two cutters, had anchored at Spithead; that during the night the aviso got under way, and that she was at anchor again in the morning; but whether she took soundings or not in Stokes' Bay he was not in a position to state. Those vessels had been constantly up and down all parts of the coast of England, and they were engaged in the protection of the French fisheries. That was the ground on which they were constantly in our waters. They had also anchored in Portland Roads under similar circumstances. He was not aware whether anything particular had been done upon this occasion, but these vessels had been for a considerable time hovering about the coast of England.

Sir C. Napier asked if the aviso had more than her usual complement of officers on board.

Sir J. Pakington was not aware whether she had on board more than her proper number of officers.

STATE OF THE NAVY.

Sir C. Napier moved the return of the number and actual condition of the several classes of ships of war and steamers, and of the ships built and broken up since 1815.

Sir J. Pakington objected to the return that it would be very expensive, and of little use, as it could not possibly be prepared before the discussion on the navy estimates, when he hoped he should be able to make a statement that would be satisfactory to the gallant admiral and the House itself.

Sir C. Napier believed the Admiralty could give the return with the greatest facility. All he wanted to know was the exact state of the navy.

Admiral Duncombe hoped the gallant admiral would not press for the return.

The motion for the return was then negatived.

AGRICULTURAL STATISTICS.

Mr. Caird, according to notice, moved the following resolution:—"That it would be advantageous to the public interests that the Government should ascertain and publish periodically the agricultural statistics of Great Britain, in so far as they relate to the extent of acres under the several crops of corn, vegetables, and grass."

After numerous speeches the House divided, and the numbers were,

For the motion	152
Against it	163
Majority	—11

The motion was therefore lost.

BLEACHING AND DYEING WORKS.

Mr. Crook moved for leave to bring in a Bill to place the employment of women, young persons and children, in bleaching and dyeing works under the regulations of the Factories Act.

The Bill was strongly opposed by Mr. Kirk, Mr. M'Carthy, and Mr. Turner, as impracticable, unnecessary, and contrary to the general opinion of the Select Committee that reported on the subject.

Mr. Packe thought the Bill premature.

Mr. Corbett thought the House should allow the Bill to be brought in.

Mr. Richardson believed that the employment of women and children in bleach-fields was gradually on the decrease, and that legislation was altogether unnecessary.

Mr. Labouchere hoped that the House would be favoured with the views of the President of the Board of Trade on this subject.

Mr. Henley said, this vexed question had been discussed for the last three or four years. It had been sent to a committee, which sat upon it for a great part of one session, and for some part of another. The members were divided in the proportion of seven to five on the main question, and after taking evidence decided against any immediate legislation. They ought at least to wait and see whether the recommendations of the committee produced any effect upon the trade.

Mr. Chpetham, as a practical man, opposed the motion.

Lord J. Manners believed the time was not ripe for the introduction of a Bill like this.

Mr. Pease held that the operatives had the first claim on the sympathies of the House; and all the arguments now adduced with respect to the peculiarity of the bleaching trade had been urged over and over again against the regulation of factory labour. He should have been glad to see legislation adopted in this case.

Mr. Greer said there had been no complaint from the operatives engaged in the bleaching works of Ireland.

Mr. Crook replied, expressing his determination to take the sense of the House.

The House then divided, when the numbers were:—

For the motion	30
Against	108
Majority against	—78

FRIDAY, FEBRUARY 26.

HOUSE OF COMMONS.

PRINTING OF THE BIBLE.

Mr. A. Black asked whether it was intended to renew the patent for printing the Bible and Acts of Parliament, which expires in January next; and, in the event of the patent not being renewed, whether the right of printing the Bible in England was to be limited to the two Universities, or to be thrown open; and if any other arrangement would be made for printing the Acts of Parliament.

Sir S. Northcote said the whole subject was under the consideration of the Government, and he could give no answer.

HARBOURS OF REFUGE.

In reply to Mr. Garnett,

Sir S. Northcote said the report of the Commissioners would be laid on the table before the end of next week.

THE ATLANTIC TELEGRAPH.

Mr. Wyld asked whether the Government intended to grant any guarantee to the Atlantic Telegraph Company.

The Chancellor of the Exchequer said the Government had come to a resolution to grant no guarantee except on conditional terms. Since then the company had made another application, to which the Government had responded in the sense of the rule which they had laid down for themselves, but whether the company had accepted the assistance of the Government on the conditions on which it had been offered he was not prepared to say. Any assistance which the Government might afford to that company, or to any other, would be on the condition that the line was in a working state.

THE NAVY ESTIMATES.

For the debate on this subject see p. 149.

MONDAY, FEBRUARY 28.

HOUSE OF COMMONS.

ATLANTIC TELEGRAPH COMPANY.

Mr. Moffatt asked the Chancellor of the Exchequer whether any guarantee had been promised to the Atlantic Telegraph Company; and, if so, whether he was prepared to state the nature and terms of that guarantee. He also wished to know whether the United States' Government were parties to the guarantee.

The Chancellor of the Exchequer said the Atlantic Telegraph Company originally required an unconditional guarantee, which the Government declined to give; but recently the Government offered to give them a guarantee upon certain conditions. Those conditions, he believed, were still under the consideration of the Atlantic Telegraph Company.

Mr. S. Wortley asked whether the Chancellor of the Exchequer had any objection to state whether or not the Government, before offering to give any assistance to the Atlantic Telegraph Company, asked them to surrender the exclusive right of laying marine cables along the coast of Newfoundland.

The Chancellor of the Exchequer said the Government did ask for such surrender.

TUESDAY, MARCH 1.

HOUSE OF COMMONS.

SHIPPING INTEREST.

Mr. Lindsay moved the appointment of a select committee to inquire into the operation of certain burdens and restrictions specially affecting merchant shipping.

Mr. Liddell seconded the motion.

Mr. Crawford moved, as an addition to Mr. Lindsay's motion, the following words, "and of the following statutes, 9 and 10 Victoria, cap. 93, an Act for compensating the families of persons killed by accidents; the Merchant Shipping Act, 1854; the Merchant Shipping Act Amendment Act, 1855; the Passengers Act, 1855; and the Chinese Passengers Act, 1855."

Mr. Collier seconded the amendment.

After remarks from Mr. Horsfall, Mr. Labouchere, Sir S. Northcote, Mr. Fenwick, Mr. Clay, Mr. Ingham, Mr. Ridley, Mr. Cardwell, Mr. Henley, Mr. Adams, Mr. J. Wilson, and Mr. Speight, the motion, with Mr. Crawford's addition, was agreed to.

The Admiralty Tables.—A periodical has this week reprinted the Admiralty Tables which were published three weeks ago in our Supplement, accompanying them by the following announcement: "The Committee on Steam Ship Performance, having recently memorialised the Admiralty, and the prohibition to the publication of the two sets of tables just referred to having been removed, we are *now* enabled to present to our readers, &c." We can only pity the man who could take the pains to pen such a very ingenious but misleading sentence. Suffice it to say, the Committee referred to took no effective part in getting the Admiralty restriction removed from the tables, but were very glad indeed to receive them from us after we had gained their Lordships' consent. We take no credit to ourselves in the matter beyond that of *knowing how to ask for them properly*: but we grieve to see a man embracing a privilege which we have obtained for him, and then thanking others for the boon. Has he no friend to tell him what is just in such a case?

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LONDON FIRES IN 1858.

TWENTY-EIGHTH ANNUAL REPORT.

By Mr. WM. BADDELEY, *C.E., Inventor of the Portable Canvass Cisterns, Farmers' Fire-engine, Improved Jet-spreaders, &c.*

"The statistics of London fires are by no means devoid of interest, and the time may come when they will form an index to the social advancement of the people; for, in proportion as houses are built more and more fire-proof, and habits of carefulness become more and more diffused, the number of destructive fires will assuredly lessen."—*Knight's London.*

"IF our own business is concerned," observes a recent writer,* "when the next house is on fire, that business must be pretty generally extended in the Metropolis, where no fewer than one thousand one hundred and fourteen fires occurred last year."

This number, singularly enough, is just one less than in 1857, so that, having regard to the increase of population and of buildings, the actual decrease may be considered as decidedly satisfactory. The general character of last year's fires, however, is described as "more serious than usual, entailing very severe labour and watching on the part of the firemen."† The casualties have also been unusually heavy.

The number of *totally destroyed*, 32, is the same as in the previous year; the number of *seriously damaged* is 385, and of these 85 were "all but destroyed;" the number of *slightly damaged* is 697. Of course, these numbers only relate to those fires which have come to the knowledge of the firemen, and are officially recorded. From what is known, however, it is probable that the total number of fires, where slight damage only is done, greatly exceeds the whole of those which are reported.

Of last year's fires, one was self-extinguished; 300 were extinguished by the inmates of the premises without assistance; 376 were extinguished by casual aid; and the extinguishing of 437 devolved upon the firemen.

Parish engine-keepers are reported to have rendered efficient services at 104 fires, but this does not convey an adequate idea of their real usefulness; services which have been considered worthy of pecuniary reward by the officers of the Fire Brigade being frequently unreported.

The following table shows the monthly distribution of last year's fires, with their fatalities, &c.

The total number of chimneys on fire (a very large one) is not reported, but only those which were said to be "fires," and attended as such.

Months.	Number of Fires.	Chimneys on Fire.	False Alarms.	Fatal Fires.	Lives Lost.
January	108	13	2	2	3
February	94	7	3	0	0
March	91	4	5	3	17
April	78	17	6	1	1
May	79	7	5	0	0
June	99	10	12	0	0
July	92	10	13	2	5
August.....	104	10	17	0	0
September....	87	3	9	2	3
October	65	9	6	0	0
November	113	11	8	3	3
December ...	104	11	8	3	6
Total...	1114	112	94	16	38

The instances in which insurances were known to have been effected upon

The building and contents	289
The building only	91
The contents only	349
Uninsured	385
	1114
Chimneys on fire	112
False alarms	94
Making the total number of calls	1320

The Royal Society for the Protection of Life from Fire was first established in 1836, but its objects were not fully developed, nor its operations carried to any extent until 1843, when the necessity for, as well as the utility of such an Institution became so apparent, that the Society was re-organised, and placed upon a permanent footing, and from that time its course has been progressive and prosperous. Commencing with six fire-escape stations, they have now 67, extending over all parts of London (with but few intervening vacancies) at half-mile distances from each other, each attended throughout the night by an efficient and well-trained conductor. During the past year 504 fires have been attended, and 57 lives rescued from burning buildings by the Society's servants, as shown by the following statement:—

Date.	Place.	Conductor's Name.	Lives saved
Jan. 2	Clerkenwell-green	Robinson	2
Mrh. 4	1 Sandy's-row, Bishopsgate-st.	Eilbeck	3
„ 10	30 Union-st., Spitalfields	Eilbeck	8
„ 17	17 Devonshire-st., Bishopsgate-st.	Eilbeck	2
„ 15	12 Finsbury-st., Little Moorfields	Preston	9
Aprl. 9	Commercial-pl., Limehouse...	Neville	3
Jne. 21	32 Sun-st., Bishopsgate-st.....	Eilbeck	3
„ 23	19A Charles-st., Middlesex Hospital	Clark	2
July 4	High-st., Islington	Newell	2
„ 5	High-st., Shadwell	Douglas	4
„ 5	Upper Holloway	Hemery	2
„ 15	37 Ludgate-st., City.....	Welford	2
„ 15	20 Cumberland-row, Walworth-road	Simmons.....	2
Spt. 14	1 William-pl., Camberwell-rd.	Harmsworth	2
Oct. 13	34 Old-st., St. Luke's.....	Passmore ...	3
Nov. 1	Islington-green	Newell.....	5
„ 17	89 High Holborn	Putnam	2
Dec. 6	123 Old-st., St. Luke's	Passmore ...	1
			57

The following twelve additional stations have been established during the past year, viz.:—

1. Green Man Gate, Old Kent-road.
2. Tooley-street, near Bermondsey-street.
3. Ratcliffe, in the Commercial-rd., by the railway-arch.
4. Mile-end-road, opposite Messrs. Charringtons' brewery.
5. Limehouse, corner of the Commercial and East India-roads.
6. St. John, Wapping, in front of the church.
7. St. John's Church, Bethnal Green.
8. Bishop's Road, facing Trinity Church.
9. Kensington, in the High-street.
10. Notting-hill, near the gate.
11. West Brompton, by the Consumption Hospital.
12. Tower-hill, by the Mint.

The Royal Society acknowledge with great satisfaction the cordiality which continues to exist between the firemen of the London Brigade and the Society's conductors, as well as the hearty co-operation of the City and Metropolitan police.

The number of *fatal fires* is two more than in the preceding year, but the number of lives lost is, from peculiar circumstances, unusually large. The fatal fires may be classed under the following heads:—

	Fires.	Lives lost.
Personal accidents from the ignition of wearing apparel or bedding	4 ...	4
Ditto ditto from intoxication.	3 ...	3
Killed by explosion of firework manufactory.	1 ...	4
Inability to escape from burning buildings ...	8 ...	27
	16	38

Of these fatal fires, the following require a passing notice:—

Monday, January 11th, 3¼ A.M.—The premises of Mr. Smith, coffee-shop keeper, 49 Gray's-inn-lane, were discovered, by a police-constable, to be on fire. Several families were in the house at the time, and on the alarm being given, all but two persons effected their escape. Conductor Horne, with the Royal Society's fire-escape from Bedford-row, was promptly in attendance; he immediately ascended to the third floor, and went to the back room, where he found Mr. and Mrs. Odder; both were very aged, and the former bed-ridden. Mrs. Odder had her husband round the neck and would not leave him; while endeavouring to separate them the flames rushed into the room and enveloped the three persons. Conductor Horne threw himself out of the back window and fell upon a lead flat, where he was found and rescued by Conductor Arkell. Horne was so dreadfully burned about the head and hands, that he was taken to the Free Hospital, Gray's-inn-lane, and it was many months before he was sufficiently recovered to resume duty. The origin of the fire could not be satisfactorily ascertained, but it appeared to have begun in the back parlour, and very soon ascended the staircase.

Wednesday, March 17, 2¼ A.M., a fire broke out in the house of Mr. Dullins, foreign merchant, at the corner of Devonshire-street, and Devonshire-square, Bishopsgate-street; the first alarm was given by a police-constable, who saw a dense column of black smoke issue suddenly from one of the chimneys. Conductor Eilbeck, with the Royal Society's fire-escape, was immediately in attendance, and placing his machine to the second floor window, brought down Mr. Dullins and Mrs. Graff, the housekeeper. The only other inmates of the house were Mr. and Mrs. Ampsell, who only moved in the evening before, and were sleeping on the third (attic) floor. Mrs. Ampsell was roused by the cries of "fire," and awoke her husband; finding it was impossible to go down stairs for the smoke, they returned to the attic, and Mrs. Ampsell got out of window, but her husband was overpowered by the smoke and fell just within the window, where he was afterwards found quite dead. After he had rescued Mr. Dullins and his housekeeper, Conductor Eilbeck ascended to the attic window, but could not enter for the dense black smoke which poured from it, and which he recognized as the product of burning naptha or turpentine. The person of Mrs. Graff was quite black, and her hair was saturated with the vapour of turpentine, a large quantity had been inhaled by her, and she was for a long time an inmate of the German Hospital. The fire was found to have commenced in the lower part of the premises, which had been saturated with turpentine. At the coroner's inquest it was stated that the Union fire-office had an insurance on the stock, in the name of Dullins and partner, for £2,400. In November previous, Mr. Dullins cancelled a policy in the Manchester fire-office for £1,200, and took out a new one for £2,200. At the same time Mr. Graff effected an insurance in the Sun fire-office for £1,200, he having no property to represent such a sum in the premises at the time of the fire. Mrs. Graff stated at the inquest that her husband left for Holland about three weeks before the fire; she did not know his business! The only property he had on the premises was a small quantity of furniture that Mr. Dullins had paid for. After three lengthened sittings the jury returned the following verdict—"That the deceased lost his life at the fire that occurred at the house, No. 17 Devonshire-square; and though there is no proof as to the origin of the fire, yet the circumstances connected with it, we (the jury) think are of a very suspicious nature."

Sunday, March 28th, 2¼ A.M.—The most fatal fire that has for many years occurred in the metropolis, broke out in the lower part of No. 20 Gilbert-street, Bloomsbury, occupied as a carpenter's workshop. A private passage led to the upper part; the first floor (two rooms) was occupied by a family named Eastwood, consisting of father, mother, and three children; on the second floor there were two families, the front room being occupied by Mr. and Mrs. Smith and nine children; the back room was tenanted by Mr. and Mrs. Hedger, and two adult sons. The fire was discovered by a police-constable named Sullivan, who gave an alarm, and was quickly joined by police-constable Soar; procuring a short ladder from a building opposite, they got out Mr. Eastwood and his family. One of Mr. Smith's sons threw himself from the second floor window and was fatally injured; none of the other inmates were seen alive. Although the Royal Society have for many years had a fire-escape stationed at Bloomsbury Church, within three minutes' run of the fire, no alarm was given there for twenty minutes; the consequence was, that on the conductor's arrival the house was enveloped in flames, and an entry impossible. A similar delay took place in calling the fire-engines, so that very shortly after their arrival the building fell to the ground, burying in a mass of *débris*, fire and smoke, no less than fourteen persons. An inquest was held on the bodies before Mr. Wakley, the coroner, which from the great excitement resulting from so lamentable a loss of life, was expected to lead to something useful. A post-mortem of the bodies, by direction of the coroner, led to the propounding of a fanciful theory by Mr. Rogers, lecturer on chemistry, who attributed the death of the parties to the inhalation of arsenical fumes given off from a cabinet of minerals in the adjoining building; Mr. Bennett, Surgeon to St. Giles's Infirmary, endorsed this singular notion. It was proved, however, that the minerals in question were not acted upon by fire, until long after the deceased had ceased to live; and that, so far from any poisonous vapours having penetrated through the wall and acted injuriously on human life, several persons were engaged in saving property in the room where the minerals stood, without feeling any inconvenience from such vapours. After several sittings, the real object of the inquiry was lost sight of, and it degenerated into a personal squabble between landlord and tenant; the patience of the jury became at last exhausted, and they precipitately closed the inquiry on the 5th of May, returning a verdict "That the deceased persons were found dead in the ruins of a certain house which had been destroyed by fire, but in what part of the premises, and by what means the said fire was caused they have found it impossible to discover." A very able report was prepared and submitted to the jury by Mr. Marsh Nelson, on the laws relating to the construction of buildings, the overcrowding of lodging-houses, the management of fire-engines, &c., suggesting the placing in more immediate connection police-stations, fire-engine and fire-escape stations, and the supply of water in case of fire; the whole of such establishments throughout the metropolis and its suburbs being rendered instantly available for public service in case of necessity by means of the electric telegraph.

Monday, July 12th, 6½ P.M.—While Mrs. Bennett (better known as Madame Coton), a young woman, a little girl, and two little boys, brothers, were engaged in the manufacture of fire-work, in the premises No. 4 Elizabeth-place, Westminster-road, the coloured fire suddenly, and spontaneously, ignited, and a fearful explosion was the result. A great number of persons passing at the time were more or less injured, four persons fatally; these were Mrs. Bennett herself; John Murray, aged 40, who in a state of intoxication attempted to enter the burning premises, and was blown from the first-floor window; a girl named Caroline Bridges, 11 years of age, who was standing in the road when the explosion took place; and Ann Williams, also 11 years of age, who had been sent on an errand, and in returning home called at Mr. Gibson's, No. 2 Melina-place, opposite to Mrs. Bennett's; some of the rockets from

* The *Standard*. † Mr. Braidwood's report.

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Mrs. Bennett's flew into Mr. Gibson's house (he also being a fire-work maker), and set fire thereto, when the girl Williams was burned to a cinder. Mrs. Bennett's premises were all but destroyed by fire and explosion, and seven other buildings seriously damaged. At a coroner's inquest, the jury returned a verdict, "That the deceased died in consequence of burns received from an explosion at a fire-work manufactory in the Westminster-road, on the 12th ultimo, carried on by William Bowyer Bennett; and the jury therefore find a verdict of manslaughter against the said William Bowyer Bennett, for having unlawfully carried on such manufactory, contrary to the 9th and 10th William III. c. 7." Mr. Bennett was then committed for trial at the Central Criminal Court, bail being accepted for his appearance. On the 18th of August, Mr. Bennett surrendered to take his trial for the manslaughter of Caroline Bridges. The facts having been given in evidence, Mr. Giffard submitted "that there was no evidence upon which the jury could return a verdict to constitute the crime of manslaughter. It must be shown that the person so charged had committed an act, or omitted to act, the result of which had caused death." Mr. Justice Willes said, "it was a case for the jury. The fact could not be hidden that this was a question whether trades of such a character, imperilling as they did the lives of the public, could be said to be properly carried on, when it was found that such boys as those who had been examined were engaged to work at them. It made him shudder to think of the danger which existed to those who passed along." Mr. Giffard, in a very able speech, contended that there was neither act nor omission on the part of the prisoner to render him liable to conviction. The jury acquitted the prisoner, who was, on the following morning, again arrainged for the manslaughter of Ann Williams. After some discussion, it was agreed that Mr. Justice Byles should direct the jury to find a verdict of guilty, under the Act of William III., subject to appeal. In November following, the case came before the Criminal Court of Appeal, when the Court quashed the conviction.

Tuesday, July 27th, 1¼ A.M.—A fire broke out in the premises of Mr. Saunders, carver and gilder, Foley-street, Portland-place. The fire commenced in the apartments of Mr. Mason on the second floor, from a candle left burning. Three families were in the house at the time; Mr. and Mrs. Saunders, aged people, slept in the third floor front room, their son in the third floor back. The young man being roused by the smoke got out of window, and climbing up a water-spout reached the roof, when he commenced removing the tiles over the front room, and made a noble but unsuccessful attempt to save his parents. The fire-escape from Portland-road was promptly in attendance, but the flames pouring from the windows set fire to it and prevented the building from being entered, until the heat had been reduced by the working of the engines. Mrs. Saunders was then found dead from suffocation in the third floor front room, and Mr. Saunders in the back room nearly suffocated, but on removal to the hospital he recovered.

Sunday, September 12, 4 A.M.—A fire broke out in the premises of Mr. Roper, corn chandler, Royal-hill, Greenwich. The fire was discovered by Mr. Roper, who effected the escape of himself, his wife, an infant, and the nurse from the first floor back window. A servant girl and two young children were sleeping in the attic; the girl was woke by the heat, and in opening the door saw the flames coming up the staircase; without closing the door she rushed to the window and got on to the roof, from whence she was rescued by Smart, the fire-escape conductor; but the flames issuing from the window made an entry impossible, and after the fire was extinguished the two children (daughters, aged five years, and 15 months) were found burned to a cinder in the fallen débris on the basement. An inquest was held upon the bodies before Mr. Cartar, the coroner, when it appeared that after the fire Mr. Roper had sent in a claim to the Kent Fire-office, in which he was insured for £300, for goods amounting to £483; many of the articles were put down at excessive values, and were afterwards found to have been removed from the premises a few days previous to the fire. The servant girl also deposed to having been sent for turpentine the night before the fire, and the whole affair seemed so full of suspicion, that after numerous sittings the jury found "that Isabella Caroline, and Eliza Jane Roper, on the 12th of September, 1858, were burned to death in the house No. 8 Royal-hill, Greenwich; but how, or by what means the said fire originated, there is not sufficient evidence to prove. The jury cannot return this verdict without expressing their decided conviction that the origin of the fire is involved in great doubt and mystery, and grave suspicions exist in their minds that the fire did not result from accidental circumstances, and it is only from the want of strict legal evidence that the jury feel compelled to return this open verdict." Mr. Roper had, however, been charged at the police court with arson, and after numerous hearings was on the 12th of November committed for trial at the Central Criminal Court. On the fifth of January following, Mr. Roper was tried upon an indictment which in the first count alleged the capital offence of having feloniously and maliciously set fire to a dwelling house, a person being therein at the time; and in two others, the lesser offence of committing the same act, with intent to defraud the Kent Insurance Company. After a lengthened inquiry, the jury returned a verdict of "Not Guilty" on the first count, and it was considered unnecessary to proceed with the second indictment.

Friday, September 24th, 11½ P.M.—A fire broke out in the premises of Mrs. Harvey, dealer in china, Queen's-road-east, Chelsea. Pending the arrival of the fire-escape, police constable Pither obtained a ladder and entered the second floor back room, where he found Mr. and Mrs. Higginson; the constable got hold of Mr. Higginson, but he got away and threw himself out of the window, and sustained a concussion of the brain, which caused death. The constable then laid hold of Mrs. Higginson, but she struggled violently, and also got out of the window and fell, by which she was seriously injured. The coroner's inquest returned a verdict of "Accidental death."

Monday, December 6th, 2¼ A.M.—A fire took place in the house of Mr. Pond, coffee-house keeper, 122 Old-street, St. Luke's. At the time stated a police constable on the opposite side of the street had his attention called to the house by a sound like falling crockery-ware, and at once saw it was on fire; he immediately sprang his rattle, and knocked at the door to arouse the inmates, but received no answer. A ladder was brought from the police-station adjoining, and an unsuccessful attempt made to enter the first floor window. Conductor Passmore, with the Royal Society's fire-escape, was in front of the building in a few minutes, but the issuing flames fired the escape, and it was evidently impossible to enter the house. Hearing cries from the roof of the police-station, he ascended, and there found Mr. Pond, who told the conductor that his wife and daughter were in the burning building. After the fire was extinguished the mother and daughter were found dead near the fire-place in the third floor front room. At the inquest Mr. Pond stated that on being alarmed he placed a chair upon a table beneath the trap door leading to the roof, and got out, whilst holding his wife's hand to pull her up, a rush of hot air came up the staircase, and overpowered them; he fell backwards on the roof, his wife and daughter rushed towards the front window, but being overtaken by the smoke and heat, fell where they were found. The most extraordinary circumstance was, that both of the females were fully dressed, with garters, boots, and stays completely laced up, and in Mrs. Pond's stays was found the sum of twenty-three pounds; in her pocket was a portmonnaie with twenty shillings in silver, and some other trifling things. The jury returned a verdict that the deceased persons met their death by suffocation and burning, owing to a fire breaking out on the 6th of December; but how the said fire was caused there was not sufficient legal evidence to prove.

Thursday, December 30th, ½ A.M.—A fire broke out in a small four-roomed house in London passage, Upper Whitecross-street, occupied by Mr. Wrench, a cane-dresser, who carried on his business in the back room ground floor, and front room first floor, in which a quantity of oily cane shavings had accumulated, and which were of a highly inflammable character. Mr. Wrench, on smelling fire, ran down stairs, and found the back room in flames; he returned to the sleeping room, and rescued two of his children, when the flames spread so rapidly as to cut off all communication with the other inmates, and the house became a mass of fire. Conductor Passmore, with the Royal Society's fire-escape, as well as the fire-brigade with their engine from the Whitecross-street station, were very quickly in attendance, and every possible attempt made to rescue the inmates, but without avail. After the fire was extinguished, Mrs. Wrench was found sitting by the front window with her infant daughter in her arms. Their eldest son, Charles, aged nine years, was found in the back room first floor burned to a cinder. At the coroner's inquest the evidence went to show that this fatal calamity was the result of some undiscovered accident, and the jury returned a verdict "that the three deceased persons met their death by accidents at a fire which occurred in Mr. Wrench's premises, but how the said fire took place there was no evidence to prove; and the jury considered that the Royal Society's escape-men, the fire brigade, and the police rendered all the aid in their power to save the lives of the deceased persons."

Habits of intoxication are reported as having occasioned three fatal fires, the total number of these accidents unreported is, however, fearfully large. The number of deaths by fire from the ignition of wearing apparel during the past year has been truly awful; females and children in all ranks of life have been the victims, and the papers have been filled with suggestions for the prevention of such accidents. In one of the daily papers, people were recently advised after washing muslins, bed and window curtains, or children's clothes, to rinse them in water in which SALTPETRE had been dissolved. The *Medical Times*, in alluding to the melancholy deaths of the ladies, Laura and Charlotte Bridgman, says:—"The light fabrics manufactured for lady's dresses must be made blaze-proof. Nothing can be more simple. The most delicate white cambric handkerchief, or fleecy gauze, or the finest lace, may, by simple soaking in a weak solution of chloride of zinc, be so protected from blaze that if held in the flame of a candle they may be reduced to tinder without blazing. Dresses so prepared might be burnt by accident without the other garments worn by a lady being injured. When poor Clara Webster was burnt, we inculcated the same moral; and now the dresses of stage dancers are prepared in the way we recommended. Why are dancing ladies of rank to be exposed to danger from which their dancing sisters by profession are protected?"

Chloride of zinc is well adapted for this purpose, but *alum* answers almost as well, greatly improves the appearance, especially of coloured fabrics, and is oftener at hand.

The use of *fire-guards*, as a protection for children, has gone very much out of fashion; why should this be? The propensity of children to play with fire, candles, or lucifer matches is reported to have caused 24 fires during the past year, but this is not a tenth part of the accidents arising from this fruitful source of mischief.

The *daily* distribution of last year's fires was as follows:—

Monday	189	Friday	136
Tuesday	166	Saturday	148
Wednesday	167	Sunday	155
Thursday	153		

The average number of fires per day is three, but the actual distribution has varied as follows:—

There were	13	days on which	no fire occurred;	
while on	59	"	1 fire occurred...	59 fires.
	83	"	2 "	166 "
	83	"	3 "	249 "
	55	"	4 "	220 "
	40	"	5 "	200 "
	17	"	6 "	102 "
	9	"	7 "	63 "
	2	"	8 "	16 "
	1	"	9 "	9 "
	3	"	10 "	30 "
Total ...	365	"		1114 "

Their *hourly* distribution has been as follows:—

	HOUR.											
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
A.M.	62	76	40	42	23	25	20	26	23	16	24	26
P.M.	27	27	28	39	44	52	68	91	110	82	75	68

The probable causes of fire, so far as could be ascertained, were as follows:—

Accidents, unforeseen and for the most part unavoidable	11
Apparel, ignited in the person	3
Areas, lights thrown down	13
Bleaching vats	1
Candles, various accidents with	137
" ignited bed curtains	71
" " window curtains	43
Carelessness, palpable instances of	13
Charcoal and coke, hot	2
Chicory and coffee roasting	2
Children playing with candles	3
" " " fire	9
" " " lucifers	12
Cinders put away unextinguished	17
Coppers improperly set	3
Fire sparks (4 fatal)	73
" from locomotive engines	4
Fireworks, making (1 fatal)	3
Flues, blocked up	17
" defective and overheated	35
" foul and ignited	37
" hot air	2
Fumigating incautious	4
Furnaces	15
Gas, escape of from defective fittings	71
" " street mains	4
" accidents in lighting	8
" left burning too high, or in contact with combustible materials	45
" fittings, repairing of	3
" works, explosion at	1
Hearths, defective	7
Hot plates	1
Intoxication (3 fatal)	15
Kilns overheated	3
Lamps, oil	2
" naptha	4
Lightning	1
Lime slaking	5
Linen, drying or airing before fire (upset by cats 3)	59
Lucifer matches, accidentally ignited	7
" " making	3
" " careless use of	17
Naptha and turpentine, boiling of	3
Oil, boiling	2
Ovens, defective or overheated	3
Pitch, heating of	1
Reading in bed	1
Shavings, loose and ignited	31
Smoking bacon	1
Soot, put away on fire	1
Spontaneous ignition of blue lights	1
" " charcoal	1
" " cotton waste	3
" " felt, tarred	1
" " greasy rubbish	4
" " hemp rope and mats, wet	5
" " lamp black	7
" " phosphorous	1
" " rags, wet	7
" " sulpher and saltpetre	2
Steam boilers, heat from	9
Still, leaking of	1
Stoves, improperly set, defective, or overheated	27
" drying	11
" gas	2
" ironing	5
" pipe	8
" portable charcoal	5
Suspicious	29
Tobacco, lighting	3
" thrown down unextinguished	41
Varnish making	2
Wilful (3 fatal)	47
Unknown (4 fatal)	67
Total	1114

(To be continued.)

STEAM FIRE ENGINES.

GENTLEMEN,—It is said "comparisons are odious," and yet they are indispensable if we wish to ascertain the relative values of either natural or artificial productions. When we read or hear of a steam fire-engine, the mind almost involuntarily reverts to the first contrivance of that kind, Messrs. Braithwaite and Ericsson's, and seeks by com-

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paring notes to ascertain the superiority, or otherwise, of the new candidate. Your last number introduces to our notice a new steam fire-engine, by Shand and Mason. The picture is a pretty one, and the references very explanatory; but the practical mechanic wants to know something about the proportion of the parts, the pressure of the steam, and the rate of working; but upon these important points no information is vouchsafed.* With reference to its performances, all that is said is, "that one of these engines is found to deliver as much water in a given time as *three* engines of like size worked by twenty-eight men each;" which statement is positively untrue. In a report of the public trial of this steam fire-engine in October last, which appeared in the *Times*, we are told, "in ten minutes from lighting the fire sufficient steam was obtained to throw a 1lbs. jet of water to a considerable elevation. This was changed for larger ones up to one inch in diameter, the height from the latter being equal to that from a brigade engine when worked at its greatest speed. Two jets, one being ⅞ths of an inch, and the other a 16th smaller, were used at one time, and projected water to the same height."

From this account of its performances we learn that the engine never equalled *two* brigade engines, much less *three;* two brigade engines would have thrown two ⅞th jets, the steam fire-engine delivered a 16th less. As no scale accompanies the engraving at page 124, it is difficult to ascertain correctly the dimensions of the parts; as the machine is said, however, to be the same size as a brigade engine, I take the scale to be half-an-inch to the foot, which gives the dimensions of the pumps eight inches in diameter by six inches stroke, and their contents in round numbers 301·6; while a brigade engine with 7-inch pumps and 8-inches stroke is 307·9. In order, therefore, to get twice the quantity of water delivered in a given time, the steam engine must work at considerably more than double the speed of the brigade engine. On referring to your 18th volume, page 2, I see that in Messrs. Braithwaite's steam fire-engine the steam cylinder was 12 inches diameter, working two 10½ inch double-acting pumps, with a 14-inch stroke, and that it threw one jet of 1¼ inch; or two jets of ⅞ths inch; or four jets of ⅝ths; exactly the work of *two* brigade engines. In this engine the steam engine and pumps lay in a horizontal plane with direct action, requiring no fly-wheel or cranks—a very simple and beautiful arrangement, which Messrs. Shand and Mason have copied with advantage in their steam floating fire-engine. In their land fire-engine, however, they have adopted the most complicated and objectionable arrangement that could well be devised; as manufacturers, of course they undertake to make anything to order, and it is due to them to state that the present engine is no invention of their own, but the pet project of another patentee, by which they are not likely to add to their celebrity. A single glance at the engine will convince everybody at all conversant with the subject, that a little working followed by a little rest will render the working of the engine very difficult; and a gentleman who has just come over from St. Petersburg states that in the first attempt to set it to work on its arrival there, it broke down and proved a failure. To work such an engine with the foul and gritty water almost always used at fires, is certain destruction; and even Messrs. Braithwaite's steam fire-engine was open to this objection for street use. While working from a river (as in the case of a floating engine) this difficulty is not encountered. But even there the want of lubrication to the pump pistons entails great friction and needless wear and tear of the machinery. The open tapped pumps and oil-covered pistons of the ordinary fire-engine, lubricating the barrel at every stroke, is an admirable arrangement, with this immense advantage, that any sand or grit drawn into the engine is expelled by the succeeding stroke, and a few minutes' working with clean water thoroughly cleanses all the passages.

February 17th, 1859. VULCAN.

* We endeavoured in vain to get detailed information.—EDS. MECHANICS' MAGAZINE.

FACTORY SMOKE.

GENTLEMEN,—By simply altering our furnaces we may dispense with gigantic chimneys, and not only improve the health of our towns, but, at the same time, convert the *smoke*, by the following process, into "mineral tar, pitch, and varnish." All that is required being to erect the furnaces *below ground* instead of above, by which greater stability will be acquired. The plan may prove acceptable to a "Voice from the Potteries."

Let the furnaces be erected in 20, 30, or 50 stoves or more; the smoke is then conducted, by proper horizontal tunnels, into one capacious and close *funnel*, of some yards or more in length; this funnel is built of brick, supported by brick arches, and covered on the top by a shallow pond of water; the *chill* of the water gradually condensing the smoke, it falls upon the floor of the funnel in the form of tar, and is conveyed by proper pipes into a receiver, from whence it is pumped into a large boiler, and boiled to a proper consistence, or otherwise inspissated into pitch; when this latter is the case, the volatile particles which arise during the inspissation are again converted into an oil used for varnish. By this process the smoke is decomposed and destroyed, and the atmosphere is freed from the empyreumatic oils, acetic acid, soote, and numerous noxious salts (sometimes ammoniaco-chloride) given off by the soot and smoke.

J. BRUCE NEIL.

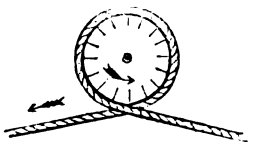
ON TELEGRAPHIC CABLES.

BY CAPT. JASPER H. SELWYN, R.N.

No. II.

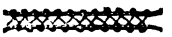
I PROPOSE now to give the account I promised in my former paper of the mode to be adopted in underrunning the cable there spoken of, and to treat of some other points which it seems necessary to consider.

We take the cable as it at present lies, and either at one or at both ends commence the operation thus: The end is passed twice or three times round the barrel of the cylinder, thus:—



The arrows show the direction of the progress and rotation of the cylinder.

The cylinder being taken in tow, the result will be that the force of the paddle-floats on the water will be brought into action to raise the sea part, and deposit it again after the two or three turns have passed over the cylinder. During their passage (as the whole cable will thus successively be brought into view), opportunities will be given for examination, and should a fault be discovered, the cable is "racked" to its own part thus:—



and the damaged portion cut out, and replaced by one of several short pieces which must be kept at hand. To avoid the entire loss of the cable in case of breakage, and to indicate when a fault is coming up (if it be in the form of a "kink"), an auxiliary rope must be fitted with a weight to keep it at the required depth, and a nipper like that used with Burt's patent buoy, which will admit of the cable coming up freely, but will grasp it instantly, if broken and beginning to descend. And this will not probably be required to go to any great depth, for I need scarcely point out that before the cable would break at a fault, the weak part would most likely have been raised considerably off the bottom, so as to bring the weight and strain of a large portion of the cable on it. If the breakage should occur in any moderate depth, the cable might be dredged for and recovered by that means, if this should fail. The indication of a "kink" coming up would be derived from the slackening of the auxiliary rope.

In case of a gale of wind coming on during the operation, a length of cable must be provided, which will hang loose under the cylinder, from its frame, and when it is necessary from any cause to abandon the operation, the "rackings," as before, are put on at the points where the cable enters on and leaves the cylinder, and the ends of this loose part being connected with the cable by cutting and splicing, the "rackings" are cut, and it is allowed to fall free. It is evident that whatever the depth, the weight of the cable will be equally balanced on the cylinder, *i. e.*, the descending part will exert the same force to turn it in one direction, as the ascending part has to cause it to revolve in the other; and as the total weight on the cylinder as regards the cable can never be more than twice that due to the greatest depth (4 miles or tons of cable), a very moderate size of cylinder would suffice were it intended to accomplish the object of underrunning alone.

The cylinder is of course hung, so to speak, in a frame of wood or iron, which offers facilities for a platform for men, towing rings, &c., &c., but these are engineering details on which I need not now enter with regard to raising entirely. I have already said that this can be done by towing in the reverse direction, or (which is the same thing), passing the cable on in the opposite way.

I would here point out that no plan of raising by means of a steam engine on board a ship can be other than hazardous when the ship is pitching, for the engine continues its pull, irrespective of the enormous additional strain caused by the sudden upward motion of the stern; and there is another objection, for if only 40 or 50 miles per diem can be coiled into a ship's hold, under the most favourable circumstances, how long would the coiling of 2,000 miles take at sea? admitting that no gale of wind came to put a fatal termination to the operation. These objections are both obviated by the use of the cylinders. In the first case the lifting power is derived from the water itself, and is, as I before said, not absolute but comparative and yielding; and as regards the second, the speed with which the operation can be performed is only limited by that of the towing vessel.

As to the financial part of the question, I should add to what was stated in my former paper that while I have reason to believe, taking the weight of cylinder at 245 tons, that the sum of £12,000 is considerably in excess of the probable cost, I have been told, on good authority, that to build a vessel fit to carry 2,000 tons of cable for the Channel Islands line cost not less than £24,000. So that, for half the money, that work might have been done, and in greater security—for a cask will weather a gale which would sink a line-of-battle ship.

A small but sufficient model is now to be exhibited at the Polytechnic Institution, Regent-street, by Mr. King, who is already known there as a lecturer on subjects connected with ocean telegraphs. It has been shown to many nautical men—mercantile as well as naval—and to not a few engineers; and, while among the former I have scarcely heard a doubt as to its success, among the latter, the only objections have been to the towing and management at sea—an opinion on which, I may be excused for thinking, can best be given by the profession to which I have the honour to belong.

With regard to the cables themselves, I may, perhaps, be allowed a few remarks, though their construction does not so properly fall within a seaman's province. First, it seems to me that no great fault can be found with the form or weight of the present cable, when properly treated; and secondly, if we run into the extreme of a very light cable, the surface-currents may probably be found to act injuriously on a very slowly sinking body, while the admixture of hemp with which it has been sought to reduce the weight, is so far to be deprecated, as it introduces a vegetable substance, whose limit of duration under water (whatever it may be) is certainly sooner reached than that of the metals with which it is combined.

It will, perhaps, be contended that this matters little when once the cable is laid; but how will it act in case it should be necessary to relift it for repair, as has hitherto been the case with various lines, not unfrequently?

There is another fact which has been discovered by the careful experiments of a gentleman well known as a telegraphic cable maker. It is that in parts of a cable which has been passed over the brake wheels generally used for paying out, the copper wire which should have been, and was when made, in the centre of the gutta percha, has been often found nearly approaching the surface, thus:— and this without any external fault being discoverable. This is another evil effect of the soft core and rigid exterior which I have before condemned; and in saying that the present cable is not in fault, I merely mean that the great error is in the laying, not in the cables.

I will conclude by saying that neither public guarantees nor private credit can be expected to be given to the Atlantic Company so long as they do not propose some better means of laying than that which has already thrice resulted in failure. I enclose a sketch of the cylinder in tow;* and, with many thanks for the kindness which has afforded me space for these papers,

J. H. SELWYN.

* See next page.

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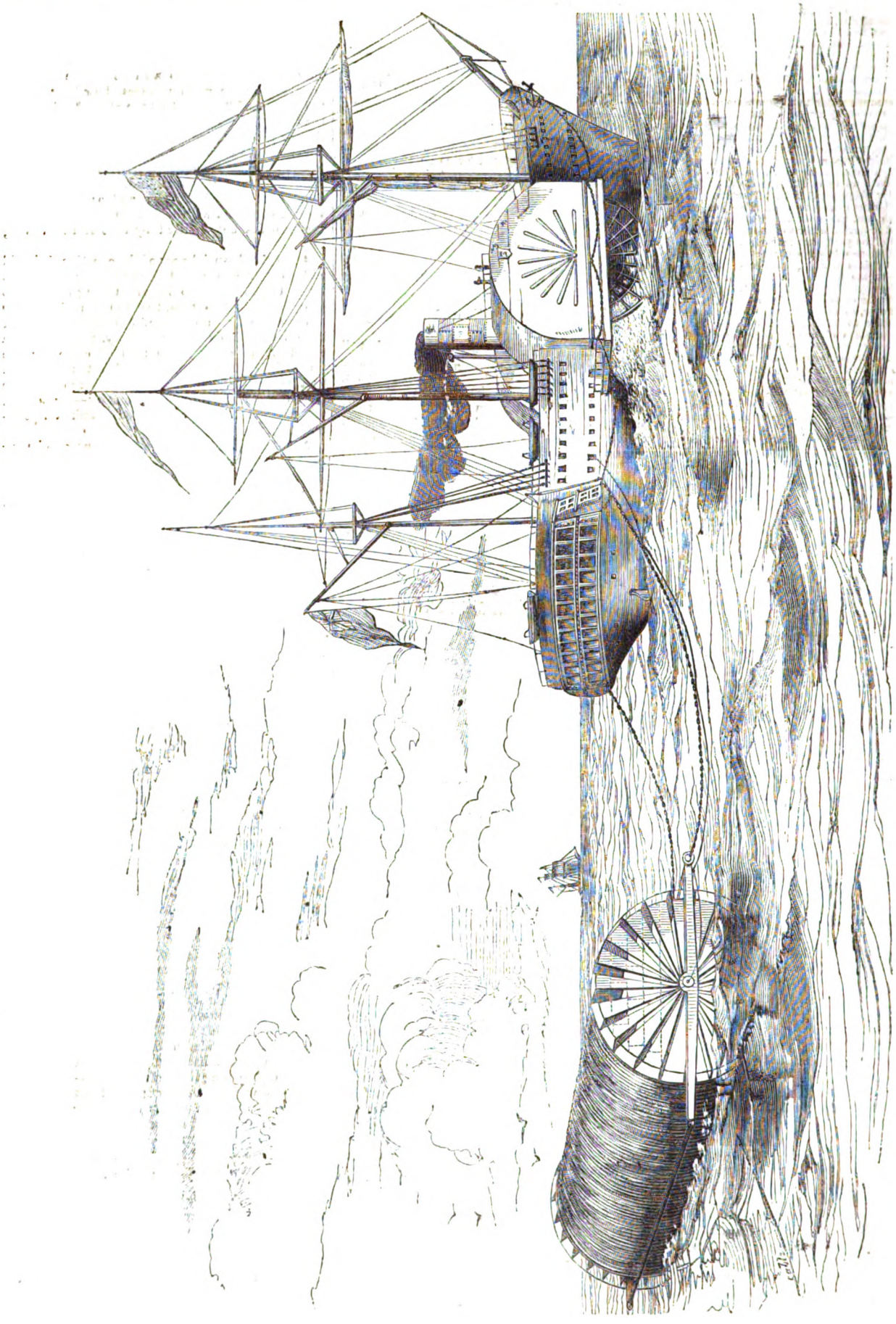

CAPTAIN SELWYN'S (R.N.) APPARATUS FOR PAYING-OUT ELECTRIC TELEGRAPH CABLES.

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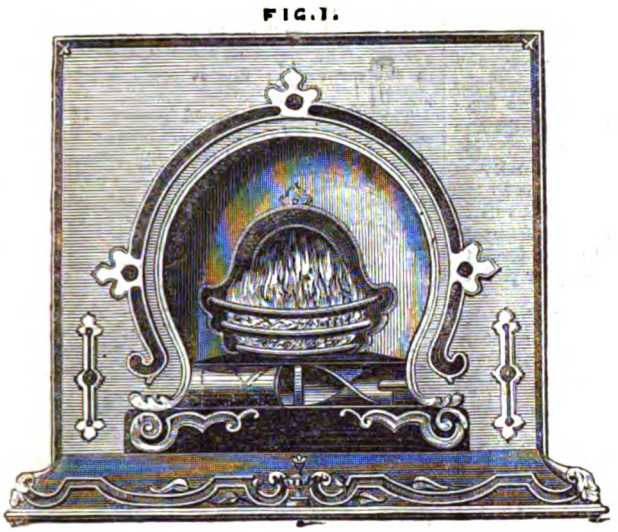
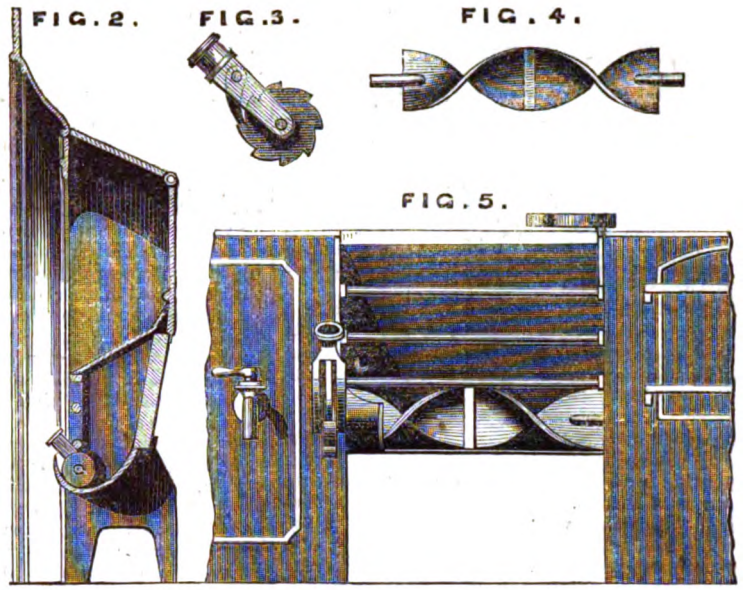
YOUNG'S SMOKELESS DOMESTIC GRATES.





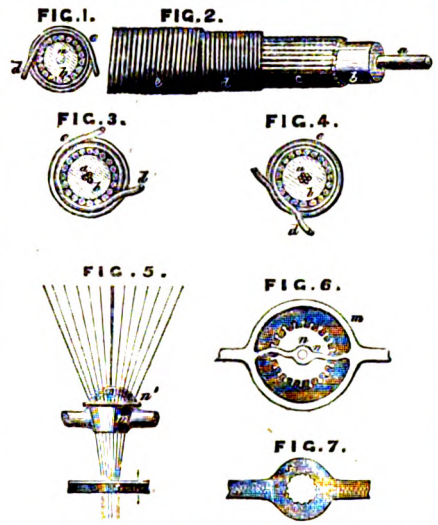
YOUNG'S SMOKELESS DOMESTIC GRATES.

MESSRS. YOUNG & Co., of Queen-street, London, have introduced a simple improvement in the form of domestic grates, which gets rid in a very simple and effectual manner of the nuisance of smoke proceeding from such grates. It consists of a simple and ingenious method of feeding domestic fires with fuel from below, which completely answers the desired end, and is no less applicable to the drawing-room stove than to the kitchen range. The whole invention lies in fitting below and in front of the grate a double-screw partly covered by a case, as shown in the parlour stove, fig. 1, in which part of the case is removed to expose the screw; Fig. 2 is a transverse section of another stove fitted with a similar screw; fig. 3 is a detached view of a ratchet wheel which is fitted on the end of the screw, with a pawl socket to receive a rod, poker, or other instrument by which the ratchet and screw may be turned; fig. 4 is a detached view of the double screw; and fig. 5 is a view of a portion of a kitchen range fitted with the arrangement, the principal part of the case being here also removed. It will be readily understood that when coal is placed in the case at either end, and the screw is turned by means of the ratchet wheel, the coal will be carried by the screw from each side towards the middle of the fire, and forced in beneath the hot fuel in the grate, through which the whole of the gases generated from the fresh supply must necessarily pass. We have seen the plan in operation, and believe it is exceedingly well fitted to get rid of all further trouble with the smoke of household fires.

DE BERGUE'S SUBMARINE TELEGRAPH CABLES.

MR. CHARLES DE BERGUE, of Strangeways Ironworks, Manchester, has just completed a patent for improvements in submarine telegraph cables, and in machinery for manufacturing and paying-out such cables. The first part of his invention consists in making a cable so that its specific gravity shall only slightly exceed that of water, and so that it shall have no tendency to form snarls or kinks. To effect this he takes the gutta percha core enclosing the copper wires, and envelopes it with small cords, placed in parallel to the gutta percha core, and paid round with two layers of twine in opposite directions. The straight cords are to give the cable strength lengthways, and may be made of metallic wire, or of fibrous materials. A few fine metal wires may be inserted in combination with the small cords.

Figs. 1 to 4 of the accompanying engravings illustrate this part of the invention. Fig. 1 is a transverse section, and Fig. 2 a side elevation of a short length of cable, the parts of which are exposed to view, by removal of other parts. *a* is the copper-wire conductor, and *b* the gutta percha covering; *c*, *c* are the longitudinal strengthening



cords; *d* is an inner layer of twine bound round the longitudinal cords in one direction; and *e* is a second layer bound round in the opposite direction. Figs. 3 and 4 are transverse sections, similar to Fig. 1, but representing the core as enclosing three and seven telegraphic wires respectively, instead of one only.

The second part of the invention consists in making suitable machinery for covering the gutta percha core with the straight cords or wires, and for paying over the cable with the double layer of twine at the same time.

Fig. 5 is a diagram illustrating the method of laying the longitudinal cords upon the core. It consists simply in providing suitable guiding tubes or apparatus for directing the cords evenly upon and around the core as both are received from the reels from which they are separately delivered whilst the cable is being formed. Two guides are shown in the sketch, one, *m*, being in plan, and drawn larger in Fig. 6, from which it will be seen that a separate channel is provided for each of the longitudinal cords, and also a central guide, *n*, for the core, the latter being supported by a bridge piece *n'* across the piece *m*. The cords and core, after passing through the guides *m*, *n*, also pass through the second guide *s*, which presents an orifice corresponding in size with the actual external dimensions of the cable previously to binding, and presenting a series of notches or grooves corresponding with the number and size of the cords employed. Fig. 7 is a plan of the guide *s*, to a scale corresponding with Fig. 6.

A vertical arrangement of the machine is preferred, as in Fig. 5, which does not, however, show the reels (from which the cords and core are delivered). The binding with twine is effected by machinery similar to that ordinarily employed for similar purposes, except that two revolving shuttles or binders are employed instead of one, and that they revolve in opposite directions at the same time.

The last part of the invention consists in arranging suitable paying-out machinery for this kind of cable. From the nature of the cable, while being paid out, there will be comparatively no strain upon it as due to its own gravity, because it will weigh so very little under water; but it should be payed out very slack, that it may accommodate itself to currents, or to irregularities in the bottom of the ocean; to effect this, it will be simply necessary to have a paying-out machine of the most simple description—just a few grooved pulleys, over which the cable will pass, and which will have to be driven by a steam engine, but so arranged that its speed can at all times be regulated in proportion to the speed of the vessel through the water.

ARKELL AND MELHADO'S APPARATUS FOR SUBMERGING TELEGRAPH CABLES.

MR. P. ARKELL, of North Woolwich, and Mr. A. Melhado, of Bayswater, have patented an apparatus for preventing cables being injured by torsion during the paying-out. In order to neutralise this effect, they propose to attach to the cable at given distances apart, and while it is being submerged, floats of such a construction that, when they enter the water, they will offer considerable resistance to the tensile strain of the cable, and at the same time serve to buoy it up, and relieve the paying-out machinery from a portion of the direct strain of the cable.

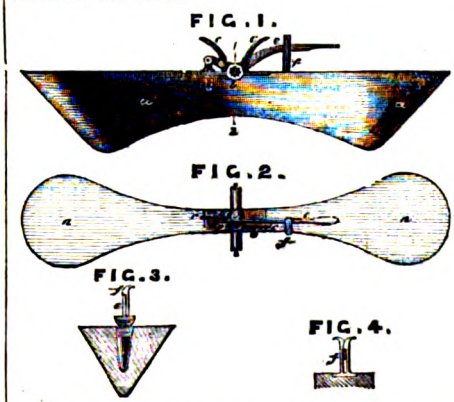


Fig. 1 shows, in side-elevation, their novel construction of float; Fig. 2 is a plan, and Fig. 3 a cross-section on the line 1, 2, of Fig. 1. It consists mainly of a wedge-shaped

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block of wood, *a*, *a*, rounded and tapered off at its ends, and hollowed out at its sides, which form will enable it to ride easily in the water, and offer a sufficient resistance to any force that may be imparted to it, having the tendency to cause one end of the float to dip, and the other to rise. Upon the upper face of the float is a metal clip for gripping the cable. *b*, *b* is a plate formed with a semispherical recess for the reception of the cable. This plate is screwed down to the block *a*, *a*, and it is provided with horns or guide-pieces, *c*, *c* (detached at Fig. 4), and a bracket *d*. Hinged to this bracket is a hand-lever *e*, furnished with a semicircular recess corresponding to that of the plate *b*. The inner faces of these recesses are grooved or ribbed, to ensure a firm grip of the cable that is to be held between them. A spring catch *f* is driven into the block *a* in such a position that when the hand-lever *e* is pressed down, so as to grip the cable (it being guided in its course by the horns *c*), this spring catch will hold the lever fast, and the teeth or ribs of the gripping surface pressing into the gutta-percha or other soft covering of the cable, will take a firm hold of the cable.

In applying their invention, they provide a number of these floats, using more floats per mile in deep seas than in shallow waters. Two men take up a float and hold it (with the lever hand thrown back) immediately under the passing cable. When the signal is given that a certain length of cable has been run out, one of the workmen will strike down the lever handle, and by thus putting a grip upon the cable, will firmly secure the float thereto. At the same time, the float being let go, it will enter the water with the cable, and be submerged with it, but being of a buoyant character, it will serve for a time to keep the cable suspended in the water, and thus relieve the paying-out apparatus (as before observed) of considerable strain. When a series of floats have been thus submerged with the cable, their tendency will be to assume a horizontal position in the water, and being firmly secured to the cable, they will effectually resist and neutralise the tendency of the unrolled coil of cable to turn in the water and twist the fibres of the wire of which it is composed.

THE ENGINEERS OF THE ROYAL NAVY.

GENTLEMEN,—In perusing your valuable periodical of the 25th inst., under the heading "The Civil Service" occurs the following passage:—"It is our purpose to maintain—at all hazards, and without reserve—the indefeasible rights of the practical, useful, and efficient men of the Civil Service, and also of the Naval and Military Services." Emboldened by these remarks, and knowing also that your valuable Journal is keenly scanned by those high in authority, I would wish to call attention to the *liberal* style of remuneration awarded to the staff who play so prominent a part in the well-being of our steam navy. By reference, then, to the "Navy Estimates" we find that the "Chief Engineer and Inspector of Steam Machinery of Her Majesty's navy"—him upon whose judgment and integrity depends much of the efficiency and well-being of our millions expended in steam machinery, and who is *de facto* comptroller of the steam machinery of the British Navy—receives £150 per annum less than that accorded to a chief clerk! Imagine now that some of this costly machinery, in many cases verging in value on £50,000, is received and fitted to some one of our splended frigates. Its future efficiency and preservation is entrusted to an officer—a naval engineer—holding a commission, but remunerated with a scale of pay not even on a footing with an Admiralty messenger. This officer again is aided in his duties when the ship is called for active service by a First Class Assistant Engineer, receiving a pay some few pounds less than that of a hall porter. And the staff is completed by other Assistant Engineers, with rates of pay but slightly in excess of those lucky domestics who keep their "weary watch" in the tempestuous neighbourhood of Whitehall. How widely different are those things managed in the service of foreign powers, to say nothing of that management long since found imperative to the due efficiency and economy of our large steam companies. I trust that you will direct some of your attention to this point, in that which seems to you a labour of love, viz., the improvement and increased efficiency of our "Royal Steam Navy," and am your's, &c., NAVALIS.

ON A QUICK-WORKING POWER ENGINE.

(*Continued from p.* 121)

THE WORKING AND MANAGEMENT.

The preparation for working would be by fixing the end of the beam at about the highest and lowest levels, filling with water the two cylinders under the pistons and the pipes and reservoir, making a vacuum in the small chamber, and screwing two of the springs forward against the parallel rods, and advancing the other two less; the sliding valves at the division of the pipe and at the junction of the two pipes being shut. No air vessel would be wanted to secure continuity of motion in the water; which would be done by the springs continuing the action of the pistons without an interval in their changes. A pressure of air, however, would be desirable to give force to the descent of the contents of the upper part of the pipe through the vacuum.

But there is the difficulty that, if the valve at the junction of the pipes were opened together with the one at the division of the single pipe, the air would pass back to the reservoir, and through it and the perpendicular tapering pipe, as in a syphon, up to the vacuum, and against the discharge from above. Therefore the valve at the junction should be opened a small fraction of a second after the other, by mechanism acting on both with one motion. The withdrawing of the valve at the junction, when the water should have fallen through the space in the vacuum, would set the piston free; and the pressure from the discharge through the tapering pipe on the full and close reservoir, would give a sudden and very strong impulse to the movement.

When the engine was filled with water the two sliding valves would have been closed; and on their being opened the hollow left at the summit of the pipe would be filled up from the air vessel. To prevent the vacant chamber being refilled out of the current passing through it, all the water should be exhausted of its air. Then if it were distilled there could be no generation of animal or vegetable line, or deposition of earthy matter; and it might be prevented from absorbing any air from the vessel, by a film of oil on the liquid contents.

At the point of time when the sliding valve at the division of the pipe was being withdrawn, the self-acting coupled valves in the bottoms of the cylinders would be held a little open, and the side valves would be dropped by their own weight and that of the water over them in the pipes. The nearly instantaneous withdrawing of the valve at the junction of the pipes would set the pistons free to yield to the first pressure of the discharge on the reservoir; gravity in the water would assist the lower more than it resisted the depression of the higher one. The springs would play in opposite directions to promote the action, and the intensity of the injection would be multiplied in amount against the forced piston, without being countervailed by re-action according to the law of the paradox against the forcing one. The reservoir and the cylinder open to it at bottom would be together like a vessel close as well as full, owing to the influx shutting up the side valve at the entrance into the pipe; while the corresponding side valve in the cylinder at bottom would be dropped, and give passage to the discharge from the pump through a pipe divided and opening at one place, and open to an air vessel. The self-acting side valves, and those in the bottoms being respectively closed and opened with the changes of the strokes, the interior of the engine would be always divided into two parts both full, but only one quite close, as is required for the operation of the law of the paradox. Thus the principle of the plan would be made good. The forcing piston, indeed, would be resisted solely by general friction in the liquid and the solids, since gravity in their ascent would be balanced by the same in their descent. The difference, then, between the internal resistance and the internal force would afford a power very far beyond what was borrowed for self-working, and disposable for any duty.

The working could be regulated by a stopper with a press screwed against it, and by the sliding valves being inserted more or less, or not at all, to impede the current, or leave it quite free. The action would be stopped by thrusting in these valves; the mechanism by which this was done being so adjusted as to shut them exactly together. The re-action would spend itself partly in the air vessel; and it could not move the pistons.

Then the stoppage should be so timed as for a crank worked by the beam of the double pump to be in a position as to give, in the removal of the action, the desired direction forward or backwards to the wheel attached to the other body attached to the engine. A crank, supposed to be a bore, would be either up or down at the end of the beginning of a stroke. Then, if it were up, and the working were to be forward, it ought to be a little forward out of the perpendicular, that the rod from the beam might pull it down forwards. Or if it were down, it ought to be a little back for the rod to push it up from behind. It could be in these positions in working forwards only after a stroke was begun. The time might be hit exactly enough, if the action were first checked by unloading the empty stopper, and inserting the two slides slowly. To reverse the action the stoppage should be before the stroke was quite completed. The crank, then, if up would be a little backward, and if down a little forward from the perpendicular, and in the former case the rod would pull it down backwards, and in the latter lift it in that direction.

The outward working might be by one end of the beam, or by both ends; and the two ends might do different kinds of work or the same kind. One engine might serve for two paddle-wheels, if that were preferred to having two engines. It might be competent to such duty with the larger wheels, as being able greatly to surpass steam engines in the intensity of force, because the parts liable to bursting might be of any massiveness, whereas a boiler must be rather thin not to impede the penetration of heat too long, while for amount of price distinguished from degree, it might be of the largest dimensions that could be desired. Magnitude is objectionable in the common hydraulic press, because it retards the operation, unless equally greater power is used to inject in a larger volume; but this engine would work itself, and slowness would be out of the question. The only apparent difficulty is, that if great cylinders had one bottom valve and a side one, these might be too large to play nimbly enough. But there might be as many openings in the bottoms and at the sides, and as many pipes as was convenient, with arrangements to enable the sliding valves to all shut exactly together, and to be opened, some a moment later than the others.

AN UNREWARDED INVENTOR.

SOME while since a Mr. Phillips took out a patent for an ingenious arrangement to give to a swimmer additional powers of buoyancy and rapidity of motion. The apparatus, or rather that portion of it intended to fit around the ancles, *expanded and collapsed* somewhat after the fashion of an umbrella, as the wearer struck out or drew in his legs. We had altogether lost sight of this invention when accident informed us of the patentee's decease, together with some facts which may not be altogether uninteresting to our readers. This patent is now in the hands of Miss Phillips, of 44 Clipston Street, a maiden lady of great age, and the sister of the inventor. Miss Phillips, upon the subject of the patent, writes to a correspondent who is interesting himself in its sale: "I have now outlived all my relatives and old friends; I am now the only living person that can even relate an authentic anecdote of Mr. Hogarth the great painter, having been the companion of my cousin Mrs. Lewis, who supported Mr. Hogarth in his last moments. All my early days, to my 22nd year, were passed in Mr. Hogarth's house at Chiswick, up to his death and burial in the vault. After that, his effects and myself came to my

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uncle, Mr. Hart, who had the honqur of serving His Majesty George the Fourth for 48 years as Chief Clerk in the Duke of Cornwall's Office, then in Somerset House, and Second Clerk in His Majesty's Kitchen, and died in the King's service in the year 1823. My brother was writing a biography of Mr. Hogarth's works, and anecdotes of our family, and I think he had nearly brought his notes up to the restoration of the tomb at Chiswick, having repaired that monument at his own cost in 1825, and again in 1832, but after that period it wanted re-leading and he had not the means of doing it, and my brother gave the tomb to Mr. Hogarth of Aberdeen, who restored it three years ago, and whose property it now is. My brother's last moments were intensely increased by the pain of leaving me wholly destitute. My only hope is in the sale of the patent."

We give the poor old lady's simple narrative as it is written, and trust her forlorn condition will reach the eye of some of the many who are ever ready to help the deserving.

INDIAN ITEMS.

Mr. Purser, chief engineer of the Allahabad and Cawnpore section of the East Indian Railway, has resigned his appointment, and Mr. Campbell, formerly an assistant on the Caledonian Railway, has succeeded Mr. Gower as locomotive superintendent.——Mr. R. B. Thomas, agent for the Punjaub Railway Company, arrived by the last mail. Mr. Thomas is to be stationed at Kurrachee as transit agent for the despatch, on arrival, of all stores and material intended for the railway. His office will be no sinecure, as from 25,000 to 30,000 tons of stores are on their way out.——An electric time ball is now dropped daily at the Colaba observatory, to enable the shipping in the harbour to adjust their chronometers.——Mr. H. P. Owen has been appointed deputy-superintendent in the Electric Telegraph Department, at Bombay; Mr. J. T. Blisset, deputy-superintendent at Madras; and Mr. W. W. Mayes, deputy-superintendent of the east coast line.——The half-yearly report of the Madras Railway Company states several facts of interest. On the south-west line between Goriattum and Beypoor, the progress of the works is, with one exception, satisfactory, and the line will be finished as fast as the permanent way materials can be transported to it. The further opening for traffic to Vaniembady is, however, likely to be delayed in consequence of difficulties experienced with a bridge over the Palar river. On the completion of this bridge the line will be opened to Salem, upwards of 200 miles from Madras. On the western half of the line satisfactory progress is stated to have been made, and this division is expected to be completed from Beypoor to Paulghaut, 70 or 80 miles, by the end of the year. The local government has been instructed by the home authorities to proceed with projected improvements of the port of Beypoor, and of the water communication between the railway and the town and harbour of Cochin. This is to be effected by a short canal from a point where the railway touches the Ponany river, and the navigation which extends by Cochin southward and parallel with the coast nearly to Cape Comorin. The Bangalore line which leaves the main south-west division near Vaniembady, is being surveyed; it will be about 80 miles in length. Surveys are also to be made for a branch to the Neilgherry hills. The survey of the north-west line has been extended to its proposed junction with the railway from Bombay in the Raichor Dooab, formed by the rivers Krishna and Tungboodra. The length of this line from Areonum, where it leaves the trunk line at 42 miles from Madras, will be about 330 miles. Between Areonum and Cuddapa, the works are being vigorously pushed on. The company has now 96 miles in working between Madras and Goriattum, and the receipts for the six months ending December 31, 1858, were £21,720.——It is stated that a Dutch company intend running steamers between Java and Borneo, Singapore and China.——A corps of civil engineers is to be formed for permanent service in India.——The estimated cost of the first section of the Great Southern of India Railway, from Negapatam to Trinchinopoly, has been fixed at £500,000.——The Oriental Inland Steam Company have concluded contracts for two new steamers and two new trains of barges, consisting in all of 12 vessels of large size. These will, at an early period, be added to the other vessels of the company already in India. The engines will be high pressure, intended to work to 800-horse power.——Mr. Russell, the *Times* correspondent, says, it will be good policy to have vessels of lighter draught, armed with howitzers and a few Enfields, on our large Indian rivers for some time to come.

The Armstrong Gun.—We find that in the Armstrong Gun, as now made, the large screw at the breech is formed hollow, and the charge is passed into the gun through it. With this arrangement the moveable breech-piece is only required to close the breech, and receive the force of the explosion. Both the slot and the breech-piece are therefore smaller than they would require to be were the gun loaded through the slot.

NOTICES.

The Speech of Sir John Pakington on the Navy Estimates, and the Report of Mr. Baddeley on London Fires, which we have published annually for many years past, occupy so much of our space this week that we are compelled to defer our paper on "Naval Architecture" until next week.

The Mechanics' Magazine will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

The demand for Mr. E. J. Reed's paper—

"On the Modifications which the Ships of the Royal Navy have Undergone during the Present Century, in respect of Dimensions, Form, Means of Propulsion, and Power of Attack and Defence,"

has been so great that the Journal of the Society of Arts, the Mechanics' Magazine, and all other Scientific Journals in which it appeared in December last, are now out of print. The demand still continuing, it has been deemed desirable to reprint it in a separate form. An 8vo. edition of it, in large type, and on fine paper, has, therefore, been prepared, and may now be had at the Office of this Magazine, price 1s.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of insertions less than 13; for 13 insertions, 4d. per line; and for 52 insertions, 3d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

A friendly correspondent sends us the following suggestions:—

Gentlemen,—As a subscriber to your admirable Magazine, permit me to congratulate you upon and thank you for the improved state in which it now appears. Not the least instructive part of it is that contained in the notes from the different parts of England concerning the iron, &c., trades. Without wishing to appear a meddler, I think that they might be greatly improved by printing the subject of each paragraph in larger type than the context, something after the arrangement you have adopted with reference to the list of patents, this is the only appearance of improvement I or perhaps any body else could suggest, though your more experienced judgment may not think it necessary to adopt it.

Spontaneous Generation.—There is one question occurs to me with reference to this interesting subject of which no one, I think, has offered a solution. If there be no such thing as spontaneous *generation* (not creation; the neglect of this distinction has, in my opinion, been the cause of much vituperation that might well have been spared), whence comes the moss or vegetable well known to opticians as growing upon the object glasses of telescopes. No one will, I think, be so bold as to say that glass always did exist, yet, as soon as it was invented a parasite seized hold of it, one that is unknown anywhere else. Take ink, again, every one knows the mould that grows on ink, this mould is quite distinct from any other species of its class, and is found only on ink: many other instances might be brought forward. The doctrine of spontaneous generation is assuredly the ground of much misconception; no sooner are the words spoken, than certain men conceive an idea of *self-creation* of matter, and brand the supporters of the theory of spontaneous generation with the absurd epithet of atheist, whereas, by this latter phrase, nothing more is meant than that the laws of nature are in operation to work out the will of Providence impressed on matter at its creation. Let any one of these ultra-theists (they leave Christianity with its brotherly love far behind them) place a drop of the solution of any salt crystallizing at ordinary temperature in the focus of a microscope, and watch the generation of the crystals and their growth; if, after in this manner assisting at the birth of a new thing, he does not thenceforth hide his diminished head, and what is more to the purpose, rule his tongue, he is not a mortal fallible man and a brother of gentlemen.

Yours, &c., P. H. H.

Law Case.

VICE CHANCELLOR'S COURT.—March 2.

(Before Vice-Chancellor Sir W. P. Wood.)

GRIFFITHS *v.* TURNER.

This was a motion for an injunction to restrain the defendant from infringing the plaintiff's right in respect of a whisk and churn, which had been exhibited at various agricultural meetings in the course of last year, and of which Mr. Kent, the patentee of the rotary knife cleaning machines, was the sole licensee. It was urged that this was a case in which the question would be better tried by a jury summoned before this Court than in the ordinary way at law.

Mr. Rolt and Mr. Fooks supported the motion; and Mr. Amphlett and Mr. E. E. Kay were for the defendant.

The Vice-Chancellor said that the delay which had taken place was such as to disentitle the plaintiff to the interlocutory injunction. It did not appear that this was a case contemplated by the Act of last session, which provided for the summoning a jury before this Court when in any suit a question of fact was raised. Now, the action in this patent case was not an action to try a question of fact raised in a suit, but an action to determine the legal right, and to such an action the suit was merely auxiliary. The trial would therefore take place at law, under the ordinary order, directing the motion to stand over, plaintiff undertaking to try an action at law.

CURRENT EVENTS

IN THE CENTRES OF THE IRON, COAL, MACHINE, AND SHIPPING TRADES.

[compiled by our own correspondent.]

Shocking Railway Accident at Leamington: Commencement of the Inquest—Sir William Armstrong and his Workpeople: Address to Him—Sunderland Dock and River Wear Amalgamation—Aston Hall and Birmingham—Royal Agricultural Show at Warwick—Increase of Machinery at Blackburn—Oriental Inland Steam Company: Increase of Vessels—Movement of Colliers for a Short Hours' Bill: The Petition—Opposition to the Boot-Sewing Machine at Stafford and Northampton.

A disastrous railway accident occurred on Saturday on the Rugby branch of the London and North-Western Railway near to Leamington, by which two drivers and a stoker were killed and three passengers slightly injured. The train which leaves Rugby for Birmingham at 10.5. in the morning, had reached an embankment near Radford, a short distance from Leamington, when the driver and fireman became aware of something amiss with the leading spring link of the engine; they put on the brake, and did all they could do to stop the train, but were unable to effect their purpose. Very soon the engine left the rails, and rolled down the embankment. At the inquest on Monday William Clayton, a servant of the company, who was also on the engine at the time of the accident, deposed:—"We were going at the ordinary speed, say thirty-five miles an hour. 150 yards before the engine was off the line the adjusting link of the left-hand spring broke, which would cause the engine to ride on the axle-box; and before she went off she jumped badly. We saw the spring broken; it hung over the framing, the break was put on, and she left the rails after going about 150 yards." Mr. M'Connell, the engineer of the line, said that the engine was one of Sharp's and in good repair. The reason of the engine going off the line seemed to be beyond the comprehension of the witnesses, who had known spring links to break, but not for an engine to leave the rail in consequence; it would be more likely to keep it on the line. The part of the road where the accident took place is level; there is a curve, the radius of which is three-quarters of a mile, on the spot. The inquest was adjourned till to-day (Friday) for further scientific evidence.——A most gratifying reception was given to Sir William Armstrong, when, on Monday afternoon, for the first time since he received his knighthood, he visited the Elswick works at Newcastle. His men all assembled and congratulated him in an enthusiastic but respectful manner. Sir William arrived in his carriage, accompanied by Lady Armstrong, and on entering the gates to the yard in which the workmen were assembled, was received with loud and enthusiastic cheering. In addition also to gentlemen of local distinction, there was a considerable muster of ladies present. The extensive works were gaily decorated with flags, &c. Cannon boomed from various parts, until from a temporary platform, an address from the managers and workmen was read and presented to their distinguished employer. Among other terms of felicitation, the men thus addressed Sir William:—"We who have occasionally been permitted to witness your indomitable perseverance in pursuing your experiments under most perplexing circumstances with the most extraordinary zeal and energy, and have observed how frequently your disappointments or failures have been made the key to the successful attainment of your purpose, have become involuntarily interested in your most triumphant success, and do most sincerely rejoice that to some extent the value of your invention and services are recognized by the government of our country." Sir William, in his reply, intimated that the skilled artizans of the locality would, he hoped, be benefitted by his success, and ordered an entertainment for the men, which is yet to come off.——At the half-yearly meeting of the Sunderland Dock Company, on Monday, Mr. G. Hudson, M.P., the Chairman of the Directors, explained the present position of the undertaking, and the terms upon which it was proposed to transfer it to the hands of the River Wear Commission. There was no dividend proposed to the original proprietors, the dividend on the preference shares requiring all the profits; but, though some discussion took place, the feeling was hopeful, the report was unanimously adopted.——A series of ward meetings are being held in Birmingham to promote a movement for raising by the 1st of June the sum of £10,000, in order to secure Aston Hall and park to the people of the town.——It is announced that the sum of £4,200 has already been collected in furtherance of the ensuing annual meeting at Warwick of the Royal Agricultural Society of England. It has been resolved to have no pavilion dinner on the occasion.——At Blackburn Messrs. Richard Thompson and Sons are erecting a new spinning mill, to contain 38,000 spindles, with preparations. The situation is close to the Leeds and Liverpool Canal. Throstle Nest Mill, which has been standing for nearly two years, the machinery being sold, was last week purchased by Messrs. Robert and John Railton, ironfounders, and will be got to work as speedily as possible. This was the only mill in the town standing through the late depression in trade.——The Oriental Inland Steam Company have concluded contracts for two new steamers and two new trains of barges, consisting in

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all of twelve vessels of large size. These vessels will at an early period be added to the other vessels of the Company already in India, for navigating the great rivers of that country. The engines of the new vessels, which will be high-pressure engines, are intended to work to 800 horses' power.——Acting in unison with the Yorkshire colliers, the colliers of South Staffordshire are making vigorous preliminary efforts to secure numerous signatures to their nine hours' petition.—— All the Stafford operatives in the boot trade, who form part of unions, have struck work, in consequence of their masters issuing machine-bound tops. Nearly 500 men have left the town "on tramp" in one day. As many as have left remain; and as they are unconnected with the union, they are expected to help the masters to introduce the machinery.

NOTES FROM THE EASTERN DISTRICTS.

[FROM OUR OWN CORRESPONDENT.]

Chelmsford Water Supply—Testimonialising a Locomotive Superintendent—Screw Steamers for the Greenland Seal Fishery—Vernatt's Drain—Baths at Lincoln—Ancaster Stone — Singular Memorial Tower — A Challenge on Draining — The Dams in the Nene and the Wisbech Authorities—The New Telegraph through Newmarket.

In recent "Notes" allusion has been made to steps taken at Chelmsford with reference to the improvement of the water supply of that place. The committee of the Local Board of Health to whom the subject was referred have considered the report presented by Mr. Chancellor, their surveyor; and the result of their deliberations is, the expression of an opinion that the supply of the town is at present inadequate, and that it would be desirable, if possible, to procure an additional quantity of water from springs below the property of the Board in Hall-street. ——Mr. Kitson, locomotive superintendent of the Cambridge division of the Eastern Counties Railway, is about to leave England for Belgium. On Monday evening, Mr. Kitson was testimonialised by the men employed in his department.——Two screw steamers have left Hull for the Greenland seal fishery, viz., the *Labuan*, of 1,000 tons, and the *Corkscrew*, of 400 tons. A large concourse of persons—upwards of 10,000—witnessed the departure of the steamers. ——Vernatt's drain in the Spalding district is about to be widened and deepened from end to end.——Steps are being taken to promote public baths at Lincoln.——Mr. Denison, M.P., in announcing the completion of St. James's church at Doncaster, observes in a letter to the Great Northern board:—"It is probable that the pleasing effect of the Ancaster stone in this church, together with its great facility of working and its durability (testified by many of the old Lincolnshire churches), will bring it into use in districts from which it had been excluded until the opening of the Sleaford line lately brought the Ancaster quarries into connection with the Great Northern Railways."——The Rev. E. Bull, rector of Pentlow, is erecting as a memorial to his father and predecessor, the Rev. J. Bull, an octagonal tower in the Tudor style. The site is an elevated spot in the rectory grounds, and the material employed is red brick with white dressings. The diameter at the base is 16 feet, and the structure will taper to the height of 60 ft., where it will be contracted to a diameter of 10 feet. It will then rise perpendicularly 30 feet higher, making a total elevation of 90 feet. The tower will be lighted on the sides by lancet windows, and will be surmounted by a machicolated cornice and embattled parapet; and a spiral staircase will ascend in the interior to the summit, from which the visitor will doubtless be ready to exclaim—

"Straight my eye hath caught fresh pleasures
When the landskip round it measures."

——The Huntingdonshire farmers have thrown down the gauntlet and challenge the United Kingdom to enter into a competition for pipe-tile draining 4 feet deep.——The Nene Valley Commissioners have been foiled in their application to the Court of Chancery for an injunction to restrain the Wisbech town council from further interference with the dams in the river Nene, Vice-Chancellor Wood remarking that they had failed to show the necessity for the former, and observing that they did not give an undertaking for the completion of the original works. The commissioners, in consequence of this decision, have suspended the restoration of the dam at Gwyhirn.——The wires of the new telegraph system from the metropolis to the continent viâ the eastern coast are to be carried by the company (British and Irish Magnetic) in pipes under the main street at Newmarket for some considerable distance upon the London and Bury turnpikes. Some of the posts have been removed from the east entrance of the town as far as the exercising heath extends, in consequence, it is stated, "of the noise from the wires, &c., being objected to by owners and trainers of race-horses."

NOTES FROM THE SOUTH WEST.

[FROM OUR OWN CORRESPONDENT.]

Cambridge University Non-Gremial Examinations: Meetings at Bristol.—Welsh and North of England Steam Coals.—Postal Communication between Ireland and Bristol.—Plymouth Great Western Docks.—Salisbury and Yeovil Railway.—Portsmouth and the Admiralty.—New line of Steamers from Southampton to the United States.—The Water Supply of Southampton.—Schooner for the Natal Trade.—The West India Steamer "Thames."—The Packet Service Estimates.—Bristol and South Wales Union Railway.—Speed of the "Ellora."

There has been a very brilliant gathering at Bristol with reference to the non-gremial examinations of the University of Cambridge. A public meeting, presided over by Earl Ducie, was followed by a dinner, and the host of speeches delivered expressed cordial approval of the movement made by the university authorities to adapt their system to the requirements of the age.——An interesting item occurs in the half-yearly report of the Taff Vale Railway Company. It appears that the directors have been appealed to by the Aberdare Steam Coal Association for pecuniary assistance to enable them to conduct a series of experiments by competent and authorised Government officers, for ascertaining the comparative values of Welsh and North of England steam coals, and that a subscription of £250 has been made by the railway company. The results of the experiments are not yet officially announced, but it is stated that they confirm the report made to Parliament on the subject some time since by Sir Henry de la Beche and Dr. Lyon Playfair.—— Postal communication is about to be accelerated between Bristol and Ireland. —— At the half-yearly meeting of the Bristol and Exeter Railway Company, the chairman referring to the Great Western Docks at Plymouth, said that property had been for many years in a state of almost hopeless depression, but he was happy to say there was now a great change. The floating dock had been completed, and the shipping interest was likely to avail itself of the accommodation to a greater extent than was anticipated.——Mr. Brunel, C.E., in reporting to the proprietors of the Plymouth Great Western Docks says the works undertaken last year for the protection of the outer forestead of the old Millbay pier, and the temporary means adopted for securing the masonry of the sea-wall have hitherto proved effectual to preserve the works from injury during storms. Some more permanent remedy will, however, Mr. Brunel adds, be required to make the works completely secure. The pontoon or floating pier continues in a satisfactory condition. During the last half-year considerable progress has been made in the construction of works consisting of a sea wall-and pitched slope on both sides of the entrance gates, for protecting the sea-face of the inner or floating basin. The entrance gates continue to work well, and being now protected by storm gates have suffered no injury from heavy seas. At the graving dock a large pumping engine for emptying the dock has been put to work, and has been for some time in use; but the dock has been so much occupied during the winter that it has been difficult to determine with certainty what steps may be required to remove some impediments in the action of the pumps, which appear to interfere with the smoothness of the engine's working. At the entrance to the outer basin, between the dam heads, it will be desirable to proceed with the construction of the dolphin or extension of the east dam head. Increase of business has rendered necessary the erection of several new warehouses.——The portion of the Salisbury and Yeovil Railway between Salisbury and Gillingham is expected to be opened for traffic in the course of a month, and working arrangements are being negociated with the London and South Western. The completion of the line to Yeovil, so as to enable it to be opened simultaneously with the London and South-Western extension to Exeter, is to be pressed forward as fast as possible.——The Admiralty authorities have made an adverse report on the Portsmouth New Dock and Railway Bill.——Another line of first-class screw steamers is about to be established between Southampton and the United States, the American Government having given a mail contract to the vessels of the North German Lloyds, running between Bremen and New York and calling at Southampton either way for French and English mails and passengers.——The special works committee of the Southampton Town Council are making inquiries with the view of checking the waste of water continually occurring through the neglect of owners and tenants not having their water taps and fittings kept in good repair.——A brig of 175 tons, 104 feet in length, and 20 feet beam, has been launched by Mr. G. Lungley at Northam for the Natal trade.——Mr. West, late chief officer of the West India Mail Company's steamer *Thames*, has been appointed commander. The *Thames* is to be employed on one of the inter-colonial lines.——The total estimate for the Post Office packet service for 1859 is £991,596 against £988,488 in 1858.——Considerable progress is being made with the works of the Bristol and South Wales Union Railway.——The *Ellora*, a recent addition to the splendid fleet of the Peninsular and Oriental Steam Navigation Company, made her trial trip in Stoke's Bay on Saturday, previous to her departure for Marseilles, where she is to relieve the *Eurine*, ordered home for repairs. The average speed attained was 11·229 miles an hour, the maximum with the tide being 13·235 and the minimum against the tide 9·118. The *Ellora* has been fitted with Lamb and Summer's boilers.

NOTES FROM SCOTLAND.

[FROM OUR OWN CORRESPONDENT.]

Steamers for Copenhagen: Other Shipbuilding—State of Trade in Clackmannanshire and Fifeshire—The Growth of Glasgow—Scottish Railway Traffic—Private Telegraphs—Additional Fire Plugs for Glasgow—The Pig Iron and Coal Trades—Alford Valley Railway—Railway Dispute—Kirkwall Harbour Bill.

Messrs. Caird and Co., Greenock, have just launched a screw steamer of 300 tons, for a Copenhagen firm. She has been named the *Freia*, and will be propelled by a pair of full-powered direct acting engines, her speed being anticipated at 11½ knots an hour. Messrs. Caird and Co. will also launch in about a week a paddle steamer for the same owner, to be named the *Aalborg*, and to be fitted with engines of 60-horse power. Messrs. Denny, Brothers, Dumbarton, have received an order for an iron tug intended for the navigation of the Indian rivers. Messrs. J. Reid and Co., Port Glasgow, have contracted for building two large steamers, including ten barges, for the Oriental Steam Company.——It is stated that the woollen manufacturers of Clackmannanshire have not enjoyed so prosperous a season as the present for many years. Trade in Fifeshire, on the other hand, is reported to be languid. "Mill spinners," says a local journal, "are adopting measures for lessening the production of yarns, and many mills are now open only four days a week. In linens, very few transactions have been conducted."—— From some interesting tables prepared by Mr. Andrew Scott, late of Her Majesty's Customs, it appears that the Glasgow customs revenue was £469 in 1800, £19,434 in 1810, £11,428 in 1820, £72,053 in 1830, £472,563 in 1840, £645,669 in 1850, and 803,356 in 1858.——The increase of Scottish railway traffic was £1,313, as compared with the corresponding period of 1858.——The proprietors of the St. Rollox Ironworks have caused a telegraphic wire to be laid between their Glasgow establishment and the works at Motherwell. This is the first adoption of the private telegraph system in Glasgow.——The Glasgow police committee have made arrangements for laying 1,800 additional fire plugs in various parts of the city.——The pig iron market was slightly lower towards the end of last week, but on Monday it was rather firmer, mixed ores being quoted 51s. 6d. to 51s. 9d.; No. 1 g. m. b., 50s. 6d. to 50s. 9d.; No. 3, 50s. 3d. to 50s. 6d.; Gartsherrie No. 1, 54s. 9d. to 55s.; American Brands No. 1, 52s. to 52s. 6d. Last week's shipments were 3,249 tons foreign, and 4,990 tons coastwise, making a total of 8,239 tons against 11,472 tons in the corresponding week of last year. Coals have continued in limited request both for shipping and home use.——A party of gentlemen have passed over the Alford Valley Railway prior to its being inspected by the government, with a view to the opening for traffic. The run between Alford and Kintore occupied about 50 or 60 minutes.——A dispute has arisen between the Stirling and Dunfermline and the Edinburgh and Glasgow Railway Companies, with reference to certain waste lands on the Stirling and Dunfermline line and along the branch to Tillicoutry. The extent in dispute is about 20 acres, and the Dunfermline Company maintain that in giving up their line to the Edinburgh and Glasgow Company they did not also give up to them the land in question. The difference has been referred to arbitration.——The Lords of the Admiralty have assented to the works proposed to be carried out under the provisions of the Kirkwall Harbour Bill, on condition that plans, sections, and working drawings are approved by them before the commencement of operations. This is the usual stock condition.

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated October 19, 1858.

2328. E. Walker, of London-st. An improved filter. A communication.

Dated December 27, 1858.

2960. J. Davies, of Liverpool, Provision Merchant. An improved portable self gas generating lamp. A communication from J. L. Butler, of Brooklin.

Dated January 14, 1859.

123. M. A. F. Mennons, of Paris. A new or improved time-measurer. A communication from P. Perelli-Ercolini.

Dated January 19, 1859.

158. J. Thornton, of Cleckheaton, Machine Maker. Improvements in carding engines.

Dated January 20, 1859.

175. T. Greenwood and J. Batley, of Leeds, Machine Makers. An improvement in the process of gassing textile fabrics. A communication from H. Van den Berghe, of Courtrai, Belgium.

Dated February 4, 1859.

314. M. Smith, of Heywood, Machine Maker. Certain improvements in looms for weaving.

328. J. Honeyman, of Glasgow, Miller. Improvements in the construction of ships, vessels, and boats, and in propellers for propelling the same.

330. W. Clark, of Chancery-lane. Improvements in the means or apparatus for preserving grain, flour, eggs, and other vegetable and animal substances. A communication from L. J. Chateau, of Paris.

Dated February 7, 1859.

339. J. Holroyd, of Leeds, Cloth Finisher. An improvement in apparatus used in finishing woollen and other cloths.

341. W. H. Crispin, of Stratford, Copper Smelter. An improved atmospheric and hydraulic engine for sailing and steam vessels.

343. J. Lee, of Lincoln. Improvements in the manufacture of cranks for steam engines and other purposes.

345. E. T. Hughes, of Chancery-lane. Improvements in ovens. A communication from Herr Von Langen, of Berlin.

347. J. Wilson, of Sunderland. Improvements in ventilating mines, and in combining apparatus used for such purpose.

Dated February 8, 1859.

349. E. T. Hughes, of Chancery-lane. Improvements in machinery or apparatus for sorting and numbering the threads or filaments of silk or other fibrous materials. A communication from F. Mainardi, of Lyons.

351. G. Thomas, of Paddington, Plasterer. A double bottomed horse-shoe.

355. J. Aspinall, of Great Tower-st., Civil Engineer. An improvement in the refining of sugar.

357. A. Clark, of Gate-st., Lincoln's-inn, Engineer. Improvements in revolving shutters and blinds, and in apparatus connected therewith.

359. T. S. Cressey, of Homerton. Improvements in machinery used in the manufacture of casks.

Dated February 9, 1859.

361. E. Wilkins, of Camberwell-road, Gentleman. Improvements in flower vases.

362. J. S. Joseph, of Rhostyllan, near Wrexham. Improvements in coke ovens, and in cooling and extinguishing coke.

363. W. Archer, of Bolton, Jacquard Machine Maker. Certain improvements in Jacquard machines.

364. H. Jefferies, of Birmingham, Button Maker. An improvement in castors.

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365. J. Crossley, of Halifax. Improvements in the means employed when steaming printed yarns.

366. J. Taylor, of Stalybridge, Machinist, and C. Wild, of Oldham, Doubler. Improvements in self-acting mules for spinning and doubling.

367. J. H. Johnson, of Lincoln's-inn-fields. Improvements in fire-arms. A communication from W. H. Bell, of Washington.

369. J. E. McConnell, of Wolverton, Bucks, Civil Engineer. Improvements in steam boilers and in the generation and treatment of steam.

370. W. E. Newton, of Chancery-lane. An improved mode of bleaching and purifying, or refining sugar and vegetable juices or extracts. A communication from E. Rousseau, of Paris.

371. E. Herring, of Weybridge. Improvements in the mashing and fermenting of grain for the production of alcohol.

372. W. E. Newton, of Chancery-lane. Certain improvements in breech-loading fire-arms, and in cartridges to be used in such fire-arms. A communication from G. Smith, of New York.

Dated February 10, 1859.

373. H. P. Burt, of Charlotte-row, Mansion-house. Improvements in railway carriages and waggons.

374. J. Young, of Wolverhampton, Manufacturer. An improvement or improvements in the construction of knobs and the roses used for connecting knobs with doors, and with the cases of locks and latches, and other like fastenings.

375. J. G. Taylor, of Glasgow, Merchant. Improvements in writing materials, and the manufacture thereof.

377. R. J. Ellis, of Liverpool, Merchant. Improvements in the apparatus for lifting sunken vessels and other submerged bodies.

379. H. Inger, of Red Lion-sq., Commission Agent. The improvement of blinkers used by horses whilst drawing, to be called the "Patent Safety Blinker." A communication from E. Souché, of Paris.

381. C. L. Perry, of Marcham, Berks. An agricultural implement for paring and ploughing land.

Dated February 11, 1859.

382. M. Billing, of Birmingham, Stationer, and W. Kloen, of Ashton, Commercial Traveller. A method of, and apparatus for, decolourising tea.

383. J. Evans, of Liverpool, Coach Builder. An improvement in "Hansom" cabs.

384. J. Parkinson, of Manchester, Dentist. A certain improvement in coffins.

385. N. Bennett, of Furnival's-inn, Gentleman. Improvements in the construction of brooms or brushes for sweeping or cleansing streets, roads, and thoroughfares, also applicable to domestic purposes.

387. G. Hyde, of Fleet-st., Stationer. A pen for producing a copy or copies of a letter or other writing simultaneously with the production of the original.

388. R. Cogan, of Red Lion-sq. Glass Dealer. Improved instruments for crushing and mixing solid and liquid substances.

389. H. A. Bartlett, of Thetford. Improvements in machinery to be used with or without the plough for clearing and cleaning land from weeds.

390. C. Jackson, of Store-st., Bedford-sq., Pianoforte Maker. Improvements in the action of pianofortes.

391. J. Grimes, of Whitechapel, Pewterer. Improvements in beer engines.

392. H. Ransford, of West Brompton. An improvement in building ships and other vessels.

Dated February 12, 1859.

393. G. Hadwen, of Audenshaw, Lancaster, and J. Wadsworth, of Droylsden. Improvements in Jacquard apparatus applicable to power looms.

394. H. Lea, of Birmingham, Engineer. Improvements in changing or reversing motion.

395. T. Willis and G. Chell, of Longsight, near Manchester, Machine Makers. Improvements in machinery for spinning, twisting, doubling, and winding yarns and threads.

397. J. Crabtree, of Bradford, Commission Agent. Improvements in the manufacture of bobbins and spools.

398. S. H. Huntly, of Upper Baker-st. Improvements in cooking apparatus.

399. T. White, of Portsmouth, Shipbuilder, and G. Jenkins, of the same place, Engineer. Improvements in apparatus for raising and lowering ships along inclined slips.

400. J. and J. Bennett, of King-land-road, Engineers. An improvement in refrigerators for cooling beer and worts.

401. G., G. W., and J. Betjemann, of Upper Ashby-st., Desk and Dressing-case Makers. Improvements in book slides.

402. W. G. Rawbone, of Gloucester-st., Gun Maker. Improvements in fire-arms and ordnance.

403. G. T. Bousfield, of Brixton. Improvements in revivifying the scarlet colour of woollen cloth, lace and embroidery, in use for military and other garments and furniture. A communication from Messrs. Andrès, Burdell, and Chicard, of Paris.

404. H. Gardner, of Old Quebec-st., Portman-sq. Improvements in machinery for breaking and preparing flax and other fibres.

405. R. Bell, of Paris. Improvements in separating and recovering wool from fabrics composed of wool, or wool in connection with cotton and other vegetable substances.

406. W. E. Newton, of Chancery-lane. Improvements in breech-loading fire-arms. A communication from J. H. Merrill.

407. W. E. Newton, of Chancery-lane. Improvements in sewing machines. A communication from J. S. Moody.

Dated February 14, 1859.

408. J. Parkinson, of Manchester, Dentist. Certain improvements in coffins.

409. T. Hunt, of Crewe, Engineer. Improvements in steam boilers or generators, and in the prevention or combustion of smoke.

410. C. Sanders, Photographic Mat Maker, of Birmingham. Certain improvements in ornamenting English passe-partouts for photographic pictures, also the glasses used with the same, and which said modes of ornamenting are also applicable to ornamenting photographic frames generally.

411. J. Wright, of Sheffield, Spring Manufacturer. Improvements in reducing and rolling steel and iron wire, and other forms of those metals in long lengths.

412. J. L. Clark, of Haverstock-hill. Improvement in the means of working railway signals and switches.

413. J. Copcutt, of Kirby-st., Hatton-garden. Improvements in obtaining light from gases.

414. R. Clegg, of Islington, F. Angerstein, of Kennington, and J. W. Page, of Walworth-road. Improvements in making soap.

415. A. B. Clarke, of Edward-st., Blackfriars-road. Improvements in discharging sewage and water from lands into tidal rivers, and in flooding lands therefrom, also conveying sewage and other waters or liquids across canals and over structures, part of such said improvements being applicable as a substitute for sluice cocks and valves.

Dated February, 15, 1859.

416. E. H. Aldrich, of Shoreditch. Improvements in ladies' dress caps.

418. R. Mushet, of Coleford, Metallurgist. Improvements in the manufacture of steel, iron, and cast steel.

420. W. Raymond, of Albion-sq., Dalston, Master Mariner. An improved life-raft.

422. J. T. Jones, of Glasgow, Machinist. Improvements in sewing machines.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, March* 1, 1859.)

2328. E. Walker. Filter. A communication.
2335. W. E. Newton. Springs for railway carriages. A communication.
2339. W. Riddle. Packing bales.
2341. R. D. Clegg. Screws.
2348. J. and S. Marland. Power looms.
2356. E. and E. Palmer. Cutting hay, &c.
2369. R. Bodmer. Toy. A communication.
2374. E. Cottam. Carriage fittings.
2377. F. Fowke. Umbrellas and parasols.
2380. W. Craddock and J. White. Harness hames.
2385. A. V. Newton. Pulverizing, kneading, &c. A communication.
2391. A. P. A. Beau. Stereoscope.
2395. G. Speight. Plaints and curls.
2403. J. Westerby. Lubricating cylinders.
2404. C. Pooley. Carding engines.
2413. W. Kirrage. Substitute for wood, metal, &c.
2420. R. W. Chandler and T. Oliver. Agricultural apparatuses.
2429. G. Davies. Weaving. A communication.
2432. J. Dobson and D. Pearce. Bird cages.
2533. A. V. Newton. Securing doors. A communication.
2566. W. Clark. Treating wood and marble. A communication.
2567. W. Clark. Advertising. A communication.
2717. J. H. Johnson. Locomotive engines. A communication.
2750. F. Fincham. Annealing kilns or ovens.
2907. T. S. Woodcock. Index. A communication.
2978. H. Hutchinson. India rubber goods.
2980. A. V. Newton. Reaping and mowing. A communication.
95. J. Gibbons. Fixing knobs.
166. W. Poupard. Wheel-skid or shoe.
195. A. J. A. Gautier and J. G. Dumay, and J. T. Persin. Manure.
235. W. R. Alexander. Furnaces, &c.
277. H. J. Newcombe. Heating buildings.
280. J. Grimond. Hearth rugs.
322. G. H. Baylis and F. Robinson. Liquid meter.
355. J. Aspinall. Refining sugar.
369. J. E. McConnell. Steam boilers.
383. J. Evans. Hansom cabs.
406. W. E. Newton. Fire arms. A communication.
409. T. Hunt. Steam boilers.
422. J. T. Jones. Sewing machines.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed February 25, 1859.

1942. W. Esson.
1948. J. Fowler, jun., and R. Burton.
1949. R. Knight.
1955. G. Weedon and D. W. Rice.
1959. J. Brazil and J. McKinnell.
1960. G. Davies.
1961. J. Brazil and J. McKinnell.
1963. J. Oxley.
1964. G. Jones.
1965. J. L. Clark, F. Braithwaite, and G. E. Preece.
1966. E. Lindner.
1970. E. Spary.
1976. D. and J. Heyworth.
1981. P. D. Margeason.
1992. J. Walker and J. Barnes.
1998. J. Robertson.
2008. D. Andrew.
2018. J. Shanks.
2032. W. Parsons.
2034. W. Parsons.
2040. W. Prisley.
2045. T. Timms.
2086. R. Lakin and J. Wain.
2107. J. G. N. Alleyne.
2122. A. V. Newton.
2154. M. A. F. Mennons.
2519. J. Buchanan.
2537. J. Buchanan.
2580. S. Hoga, W. P. Piggott, and S. Beardmore.
2818. W. E. Wiley.
2896. J. Kerr.
2936. J. Whitelaw.
2950. J. H. Johnson.
2969. J. Leek.
2998. J. H. Johnson.

Sealed March 1, 1859.

1984. W. Hobbs.
1994. J. Bleakley.
1997. J. M. Bellinger.
1999. W. Harkes.
2002. R. A. Brooman.
2005. R. A. Brooman.
2010. H. Hyde.
2014. J. Fielden.
2016. R. A. Brooman.
2020. J. Fyfe.
2024. F. W. Brind.
2082. J. Luis.
2123. J. Dewrance.
2441. N. Brough.
2460. E. Fielding.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

460. E. Schischkar.
466. T. G. Messenger.
467. R. B. Jones.
469. J. Warburton.
470. H. Loveridge.
492. P. and F. Schäfer.
497. G. T. Bousfield.
505. T. T. Jopling.
506. F. P. Walker.
509. I. Westhorp.
512. J. Fowler, jun., and D. Greig.
513. E. T. Archer.
529. H. A. Dewar.
730. A. Tolhausen.
893. A. V. Newton.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

483. W. S. Clark, of Cannon-st. West. Improvements in the formation of cast-iron rails for city railways, and also in the method of uniting the ends of two adjacent rails for railway use. A communication from S. A. Beers, of Brooklyn. Dated February 22, 1859.

LIST OF SPECIFICATIONS, &c.

Published during the week ending February 25, 1859.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s d		s d		s d		s d		s d		s d
1613	0 3	1628	0 3	1638	0 3	1649	1 3	1659	0 5	1929	0 7
1618	0 7	1629	0 6	1639	0 3	1650	0 3	1660	0 3	...	...
1620	0 3	1630	0 5	1640	0 6	1651	0 7	1662	0 10	...	...
1621	0 3	1631	0 3	1641	0 6	1652	0 8	1663	0 3	...	...
1622	0 6	1632	0 3	1642	0 3	1653	0 5	1664	0 3	...	...
1623	0 6	1633	0 9	1643	0 3	1654	0 8	1666	0 3	...	...
1624	1 1	1634	0 11	1645	0 7	1655	0 6	1670	0 3	...	...
1625	0 3	1635	0 7	1646	0 7	1656	0 10	1678	0 7	...	...
1626	0 7	1636	0 6	1647	0 5	1657	0 3	1685	1 0	...	...
1627	0 3	1637	0 3	1648	0 3	1658	1 10	1686	0 3	...	...

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINES, &c., 1479, 1495, 1514, 1517, 1532, 1535.

BOILERS AND THEIR FURNACES, 1478, 1479, 1495, 1510, 1516.

ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1480, 1487, 1533.

SHIPS AND BOATS, including their fittings, 1511, 1512, 1518, 1529, 1542, 1545.

CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines. *None.*

FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 1485, 1493, 1498, 1530, 1536.

FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1484, 1486, 1490, 1521, 1527, 1543, 1544, 1547.

BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c., 1502, 1504, 1519.

LIGHTING, HEATING, AND VENTILATING, 1488, 1494, 1504, 1530.

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1506, 1508, 1516, 1523.

METALS, including apparatus for their manufacture, 1481, 1489, 1507, 1524.

CHEMISTRY AND PHOTOGRAPHY, 1501, 1505, 1526, 1534.

ELECTRICAL APPARATUS, 1483, 1491, 1520, 1538.

WARFARE. *None.*

LETTER PRESS PRINTING &c. *None.*

MISCELLANEOUS, 1482, 1486, 1492, 1496, 1499, 1500, 1503, 1509, 1513, 1515, 1522, 1524, 1525, 1531, 1537, 1539, 1540, 1541, 1548.

1478. J. KINGSLEY. *Improved mechanical arrangements applicable to preventing the sudden bursting of steam-boilers.* Dated July 1, 1858.

This consists of the following arrangements:—A large aperture is cut in the upper region of the boiler, and a lid, its upper surface being an inclined plane, rests closely upon the aperture. A weight is laid upon the inclined plane, having rollers to facilitate its moving off the inclined surface. One extremity of a wire is fastened to the weight, the other to the safety valve. A tube is fitted upon the

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customary aperture in the boiler, its height being determined by the temperature of the steam. Assuming the working pressure of the engine 50 lb. on the cubic inch, that number is marked at the base of the tube; and assuming that an explosion is almost certain at a pressure of 150 lbs., that number is marked 6 in. higher on the tube, the range of the scale terminating at that measurement. The wire is loosely attached to the valve at, say 4 in. The customary safety valve is finally placed within the tube, a stud being attached and adjusted thereto, being under control. It is obvious that, as soon as the stud is raised upwards 4 in. in the tube, the wire must be detached therefrom; the weight being then let loose descends the inclined plane. The lid being thus relieved of its great weight must be raised upwards by the pressure of the steam, by which it will be also removed. *Patent abandoned.*

1479. T. BLINKHORN. *Improvements in the construction of steam boilers and engines.* Dated July 1, 1858.

This relates, 1, to increasing the heating surfaces of tubular steam boilers. This is effected by enlarging the diameter of the tubular flues, and placing therein water pipes which extend from the water space at one end of the boiler to the water space at the other end of the boiler. 2. To the flues and water pipes of tubular boilers, with the view to economise the fuel. Instead of allowing any of the gases to pass off by the chimney after they have traversed the length of the boiler he arranges a system of return flues, and places the smoke box and chimney at the fire-box end of the boiler. By this means he doubles the distances the gases travel through the flues, before they make their final exit into the chimney. The flues also contain water pipes which connect together the water spaces at the opposite end of the boiler. 3. To rendering agricultural engines compact, and simplifying their construction. To this end he places the steam cylinder within the shell of the boiler, and sets the same in a vertical position. A strong saddle piece, which serves to carry the bearings for the crank shaft, rests on the top of the boiler, and is firmly bolted thereto. Affixed to this saddle piece is the steam cylinder, which projects down into the boiler, and is therefore always kept at an equable temperature.

1480. T. RIDDELL. *Improvements in the construction of omnibuses, and in breaks to be applied to such and other wheel-carriages.* Dated July 1, 1858.

The object here is to provide accommodation for first and second class inside passengers. The body of the carriage is formed of two octagonal compartments, separated by a vertical partition. To the hinder compartment access is gained by a door at the back; but for the front compartment a side door is provided in one of the angles formed by the two octagonal figures. In the opposite angle are fixed steps for reaching the roof. It also relates to means of stopping omnibuses, &c., which are not described apart from the drawings. *Patent completed.*

1481. W. H. WIMSHURST. *Improvements in manufacturing sheet metal.* Dated July 1, 1858.

According to this invention either a cylinder or block of the metal to be formed into sheets is first cast in a mould, and then acted upon by a knife. When the cylindrical form is adopted the detail may be somewhat as follows:—A spindle or shaft of iron or other metal is provided, the ends of which are turned to fit truly into bearings. The centre of this spindle is fluted or turned to allow of perfect combination between it and the metal to be cut into sheets. This spindle is placed in a cylindrical mould, and the metal cast round it to the desired length and diameter. The spindle with the metal thereon is then placed in its bearings in a machine somewhat similar to a turning lathe, and made to revolve by steam or other power. A knife the length of the cylinder of metal is gradually brought near to the cylinder by means of wheel work or some other method (the cutter being supported on a sliding frame) and a continuous shaving or sheet of the metal thereby taken from the cylinder until the whole (or nearly so) is removed from the shaft or spindle. *Patent completed.*

1482. W. T. SMITH. *Improvements in and the combination of certain machinery or apparatus for winnowing, washing, sifting, and separating grain, ballast, sand, shot, minerals, and other materials.* Dated July 2, 1858.

This consists in attaching to a hollow perforated vertical shaft, one or more sieves or screens one above the other, which sieves or screens have outlets or mouths for discharging the completed material into compartments or fixed hoppers or shoots for simultaneously loading carts, &c. The upper sieve or screen is supplied with material by a self-regulating hopper. On the machine being set in motion the larger portions of the material pass out of the mouths of the upper sieve or screen, and are washed by water supplied to the hollow perforated vertical shaft and the self-regulating hopper, the smaller gravel or other material falling through upon the next sieve or screen, and so on until completed. The perforated shaft works in a collar or ring at top, and on a step or bearing at bottom. *Patent completed.*

1483. C. F. VASSEROT. *An improved wire-conductor for electro-magnetic machines.* (A communication.) Dated July 2, 1858.

This consists in using a cord made either of hemp, cotton, wool, flax, horse-hair, cloth, cane, or other material capable of being twisted, plaited, or rolled, and offering at the same time resistance and suppleness, and in surrounding the said cord with a wire of conducting metal. *Patent abandoned.*

1484. J. MORRIS. *An improved construction, or improvements in the construction, of copper rollers or cylinders for printing fabrics.* Dated July 2, 1858.

This consists in constructing such rollers, &c., so that when finished, portions of the interior bore will be enlarged, the metal removed from the enlarged parts of the bore reducing the weight, while the parts remaining of the smaller bore will give the required strength. The inventor first bores out the roller, &c., to fit the usual size of mandrill, and then enlarging the bore at each end, leaves a part of the middle untouched, and fixes at each end a copper ring (bored to fit the mandrill) which is inserted by pressure, and secured by closing over a portion of the end of the roller, &c. It relates also to copper rings in thin rollers, &c., for printing fabrics, and consists in forcing such rings in their places by pressure at the time such rollers, &c., are expanded by heat. After the rings are fixed the rollers, &c., may be placed in the machine to cut rings to the exact bore required to fit the mandrill, and to form the "rib" or part which fits in the groove formed in the mandrill. *Patent abandoned.*

1485. F. RICHMOND and H. CHANDLER. *Improvements in machines for cutting hay, straw, and other vegetable substances.* Dated July 2, 1858.

This invention was described and illustrated at p. 125, No. 8, of the MECHANICS' MAGAZINE (NEW SERIES.)

1486. E. LORD. *Improvements in looms for weaving, parts of which are applicable to other machines, and in machinery for making the crank shafts of looms and other machines.* Dated July 2, 1858.

This consists, 1, in the application of improved shaped friction wheels and palls to the letting-off motion of looms and to other machines, and in the machinery employed therewith. 2. In moistening the warp in its passage from the warp beam to the healds. 3. In supporting one or more of the lease rods on adjustable brackets. 4. In the application of friction wheels and palls of improved shapes to the taking-up motion of looms and other machines, the said friction wheels and palls being used in lieu of the ordinary ratchet wheels and clicks. 5. In an improved combination of parts applicable to the taking-up motion of looms for regulating the motion of the taking-up roller according to the increasing diameter of the cloth. 6. In the application of a locking apparatus to the vibrator for holding the warp tight when the lay or reed is beating the weft up into the fabric. 7. In making the circumference of brake wheels with a V-shaped groove or with a bevelled run, and the brake of a corresponding shape. Lastly, in the application of suitable machinery to bend rods or bars of iron into cranks to make the crank shafts of looms or other machines. This invention is not fully described apart from the drawings. *Patent completed.*

1487. P. R. HODGE and G. SPENCER. *Improvements in the means of preventing or regulating the recoil of springs used in railway engines, carriages, and station buffers.* Dated July 2, 1858.

This consists of an apparatus composed of cylinders provided with a piston working in a fluid contained in such cylinders. The fluid is, by compression, forced from one cylinder to the other through a channel connecting the two cylinders, in which channel there are valves to regulate the motion of the fluid. *Patent completed.*

1488. A. V. NEWTON. *Certain improvements in lamps.* (A communication.) Dated July 2, 1858.

The patentee claims: 1st. The use of a tube and burner arranged with a lamp or fountain, so that the flame which is fed direct from the burning material within the fountain, may serve as a gas generator to supply the illuminating flame that issues from the burner, and this he claims irrespective of any particular means which may be employed for supplying the illuminating flame with oxygen. 2, A case attached to the lamp or fountain, and provided with a cap, arranged substantially as shown in the patentee's drawings, that the illuminating flame may be supplied with the necessary amount of oxygen to produce a proper or perfect combustion. *Patent completed.*

1489. W. SELLERS. *Improvements in machinery for turning metal shafting or bars and cylindrical rings and cutting screws.* Dated July 2, 1858.

This consists in providing a revolving cutter head or chuck adapted to receive suitable tools or cutters and revolved by competent power. This cutter head has an opening in its centre through which the shaft to be turned, or the cylindrical ring or screw to be cut, is passed, and the said cutter head is caused to pass along the said shaft as it revolves, or the shaft is forced through the cutter head so that the revolving cutters shall remove the metal in the desired manner. The motion thus given endways of the shaft is communicated by screws acting on a slide rest or mandrill head. To support the shaft and prevent vibration between the cutter head and end of shaft double clamps are used, which hold the said bar centrally of the cutter head, and travel in a slide or rest. To sustain the parts of the bar, shaft, or ring that has been operated on by the cutters in the revolving head the patentee makes use of pairs of grooved rollers contained in head blocks set in cross slides and acting on opposite sides of the shaft, bar, or ring, to hold it central, and these head blocks are drawn together to clamp and hold the shaft (by said rollers) by a lever acting on a shaft with connecting rods to the head blocks. A blank shaft with a centre point is used between the rollers to guide the end of the shaft, bar, or ring to be turned. *Patent completed.*

1490. T. MELLODEW, J. DUXBURY, and E. LAYFIELD. *Improvements in machinery or apparatus for spinning and doubling or twining cotton and other fibrous materials.* Dated July 2, 1858.

This refers to the winding-on motion of mules, and consists in a method of governing the action of the regulating screw ordinarily used. The patentees cause a part projecting from the carriage to give rotary motion to a scroll or scrolls, or conical pullies, which being thus caused to rotate communicate a variable motion to the screw by a band or chain and suitable gearing; this arrangement is adapted both to hand and self-acting mules. The scroll in the former case, if caused to travel with the screw, is turned by apparatus fixed to the framing or other ordinary part. *Patent completed.*

1491. J. L. CLARK. *An improvement in electric telegraph cables or ropes.* Dated July 2, 1858.

To distinguish one wire from another when coated with gutta-percha, &c., a projecting rib or ribs, or groove or grooves, are formed longitudinally on or in the coating. By these means, when such coated wires are made up into telegraph ropes, the wires have each their distinguishing marks. *Patent completed.*

1492. D. LE SOUEF. *An improved shaft bearer or tug, and an improved manner of affixing the same to the harness.* (A communication.) Dated July 2, 1858.

This consists of a band of metal, the lower half of which supports the shaft, whilst the upper half is moveable on hinges, and, being intended to secure the shaft in its place, can be locked by a spring catch or pin. *Patent completed.*

1493. T. SCOTT. *Improvements in dressing, separating, and cleaning seeds, and in apparatus for these purposes.* Dated July 3, 1858.

This invention was described and illustrated at page 58, No. 4, of the MECHANICS' MAGAZINE (NEW SERIES). *Patent completed.*

1494. J. BIELING. *Improvements in fire-places or stoves.* Dated July 3, 1858.

This consists in conducting a supply of air from the exterior of the room to the fire by a passage in the wall or floor. The patentee causes this passage to communicate with an aperture on one side of the fire-place, and conducts a pipe or passage over or round the fire-place to another aperture on the other side of the fire-place. These apertures supply the air to the fire and to the room. The apertures have valves or regulators, and may be adjusted to direct the air so as to counteract accidental draughts in the room. *Patent completed.*

1495. S. LEES and J. JAQUES. *Improvements in the means for generating steam and economising fuel.* Dated July 3, 1858.

This consists in causing atmospheric air and the smoke or gases to be deflected on to each other so as to meet, the air being internal and deflected at the front of the fire-box, and the smoke or gases being reverberated and deflected at the back of the fire-box by apparatus arranged for the purpose. The invention is not described apart from the drawings. *Patent completed.*

1496. C. BURRING. *Improvements in apparatus for filtering liquids and other fluids containing impurities.* Dated July 3, 1858.

This relates to filtering liquids from the surface, and consists in employing a charcoal porous stone arranged to float upon the liquid. The inventor employs a pump or syphon for drawing the liquid up through the filtering medium. *Patent abandoned.*

1497. T. RESTELL. *Improvements in breech-loading fire-arms and ordnance, and in ammunition to be used in breech-loading arms.* Dated July 3, 1858.

This invention is not described in detail apart from the drawings. *Patent completed.*

1498. W. BOND and T. STANDING. *Improvements in apparatus for churning, mixing, and stirring cream, milk, and other liquids.* Dated July 3, 1858.

This apparatus consists of a vessel for containing the liquid, to the upper edge of which is fitted a bar or frame carrying a horizontal driving shaft which is furnished with a fly wheel and winch handle. Near the middle of this shaft is keyed a bevel wheel or pinion, which gives motion to a corresponding bevel wheel fast on the upper end of a vertical shaft working in the centre of the vessel, and supported in a footstep bearing placed on the bottom thereof. To the opposite ends of this central vertical shaft is keyed a series of radial arms, which form the bearings of a set of agitating shafts, fitted with agitators or open revolving frames. On the under side of the cross bar or frame, which is secured to the top of the vessel, is fixed a spur wheel which remains stationary, and into the teeth of which gear a series of spur wheels or pinions fitted one on to the upper end of each of the agitating shafts. These small wheels or pinions may either gear directly with the stationary wheel, or through the intervention of an intermediate wheel. On imparting rotatory motion to the central vertical shaft, by turning the winch handle, the radial arms, with their agitating shafts and agitators, will revolve round the central shaft, and through the intervention of the wheels on the agitator shafts will, at the same time, rotate round their own axis, the combined motion being the well-known sun and planet motion. *Patent completed.*

1499. J. CHISHOLM. *A method of disinfecting and deodorizing or treating sewage and other matters and structures and places.* Dated July 3, 1858.

This consists in the application of electric or galvanic agency to sewage, &c., whereby the foul gases are decomposed, noxious air or matters purified, and the products turned to useful account. *Patent completed.*

1500. J. G. JENNINGS and T. CULPIN. *Improvements in apparatus for measuring, regulating, and preventing waste when supplying fluids.* Dated July 3, 1858.

Here a cylindrical vessel is mounted on axes, on one of which is mounted the plug of the supply cock, which is so formed that the inclining of the vessel first in one direction and then in the other, causes the direction of the flow of water to be reversed, and the plug or valve is so formed that it will not quite close the passage, by which there will be a constant flow, even when the vessel is changing its direction of motion. Within the vessel there is a weighted piston moving fluid-tight by the aid of cupped leathers. The weighted piston moves on a piston rod which works fluid-tight through the ends of the vessel. The piston rod is of such length that when one end is protruding the other end is flush with the end of the vessel, and there are projections fixed near the ends of the piston rod, by which, when the piston comes against the collar at either end, it moves the piston rod and causes it to be withdrawn from the other end, and protruded at the end nearest that where the weighted piston has arrived, by which the opposite end of the rod is withdrawn from a catch or detent when the vessel completes its motion. To prevent waste a cylinder or barrel is used; the supply is introduced at one end, which is covered with a valve, and the outlet passage is beyond such valve, and to the valve stem is affixed a piston with a cupped leather. In the cylinder is a bucket on a rod. The valve rod spindle is formed with a narrow passage, which has a piece of wire passing through, but not filling the passage, the end of the wire is fixed on the end of the bucket rod; by this means the passage through the valve spindle is constantly kept open and clear as the valve spindle in its movement slides on the wire, and the movement of the bucket rod also moves the wire through the spindle. Between the upper and lower end of the cylinder or barrel is a tube by which the water which passes through the bucket in its descent is forced back into the main

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When the bucket rod is moved, the pressure of the water supply will move the valve, and the water will flow to the outlet, till, by the passage of water or fluid through the valve spindle the space between the piston and bucket becomes full, when the pressure between the piston and bucket will close the valve. *Patent completed.*

1501. O. SABONY. *Improvements in treating and colouring photographic pictures.* Dated July 3, 1858.

The object here is to give the artist's work upon paper the softness, delicacy, and transparency which the same work would present upon ivory. This effect is produced by submitting the picture to the action of a hot metal plate, and covering the back of the picture by means of a brush with melted bees'-wax. *Patent completed.*

1502. J. G. JENNINGS. *Improvements in air-bricks, and in bricks for bonding hollow walls.* Dated July 3, 1858.

This consists in manufacturing air-bricks of clay and earth, by expressing the clay, &c., through dies. Numerous air passages are made through each brick horizontally, and arranged to any desired device. There are several modifications included. *Patent completed.*

1503. A. V. NEWTON. *Improvements in soldering irons.* (A communication.) Dated July 3, 1858.

This consists in the construction of hollow soldering irons for containing the solder and giving it out as required. *Patent completed.*

1504. J. G. JENNINGS and J. LOVEGROVE. *Improvements in water-closets, and in apparatus used in ventilating house drains or sewers.* Dated July 3, 1858.

This consists in constructing the basin with a conical outlet in the side or bottom, in which is fitted a hollow plug of metal, &c., made water-tight by a flexible ring. This hollow plug is made of such a length as to retain the water in the basin at a proper level, and any addition of water flows off through the hollow plug. The plug is fitted with an ordinary closet handle, and when lifted liberates the contents of the pan into the ordinary syphon trap. At other times the plug is to remain in position during any determined time, the object being to save water from sinks, waste-pipes, or other sources where the supply of water may be limited. To ventilate house drains and sewers, the patentees combine an air valve with the ordinary syphon trap and outlet valve, the valve being metal faced; the agent of ventilation being the variation in the temperature of the atmosphere and the water discharged into the drains. *Patent completed.*

1505. E. HAEFFELY. *Improvements in recovering oxides of manganese from products arising out of the manufacture of chlorine, and in raising commercial manganese to higher oxides.* Dated July 3, 1858.

This consists in recovering oxides of manganese by treating products arising from the manufacture of chlorine with lime or barytes, and so that there shall be an excess of such alkaline earth. The substance so treated is submitted to a temperature of 212° Fahrenheit. The lime is subsequently extracted by an acid. *Patent completed.*

1506. E. SIMONS. *Improvements in castors for furniture.* Dated July 5, 1858.

This relates principally to castors in which a sphere of metal is employed. The sphere is enclosed in a hemispherical cup, and prevented falling out of the cup by a ring screwing into the mouth of the cup, or by the mouth of the hemispherical cup being turned inwards. *Patent completed.*

1507. R. A. BROOMAN. *Improvements in the manufacture of cast steel.* (A communication.) Dated July 5, 1858.

The object here is to produce cast steel from iron in one operation, and the invention consists in cementing in a crucible fragments of iron of any description by a mixture composed of oxide of iron or of manganese, carbon, and potash, soda, lime, alumina, &c. To produce the required reactions between these substances it is necessary to mix them intimately by a suitable solvent, and to spread them as uniformly as possible among the fragments of iron. *Patent completed.*

1508. G. J. NEWBERY. *Improvements in the manufacture or production of coverings for floors, applicable also to the manufacture of table mats and other articles or coverings.* Dated July 5, 1858.

According to one mode of construction, this fabric is composed of threads, tapes, yarns, bobbins, twines, flexible gums, or compositions such as threads of india-rubber, gutta-percha, kamptulicon, &c., woven or interlaced together. These threads (when of fibrous material) are to be saturated and covered with any elastic gum, siccative oils, varnishes, or albumen, as a vehicle combined with pigment colours before being made into a fabric, after which such fabric may be pressed by passing through rollers slightly heated. There are various modifications included. *Patent completed.*

1509. J. HODGKINSON. *Certain improved machinery or apparatus for kneading dough in the manufacture of bread.* Dated July 5, 1858.

This consists in providing each end of the kneading trough with one or more pairs of crooked or bent arms or blades secured upon a short central shaft, only passing through the ends of the trough sufficiently to support the arms inside the trough; the shafts and arms are caused to rotate in opposite directions by spur gearing, or otherwise, actuated either by steam or hand power, so as to cause the arms to twist and turn over the dough in a similar manner as when kneaded by hand. *Patent completed.*

1510. T. WOOLNER. *Improvements in apparatus for feeding steam boilers with water.* Dated July 5, 1858.

This relates to the feed pipe for supplying the boiler with water, and consists in causing the water to pass through the interior of the boiler flues in a zig-zag direction, commencing at the fire-hole of one flue and making it exit at the fire-hole of another flue, and in all the flues passing beneath the fire-bars, so that the water in the pipe is not subjected to the heat of the flames until it has passed beyond the bridge of the fire-bars. The zig-zag bend is contained between the bridge and the extreme end of the boiler flue, and from thence passes into the next flue. The feeding end of the pipe has a valve opening inwards to the boiler, so that the water once admitted to the boiler cannot return; by this means the boiler and pipe is kept full. The water is heated by the apparatus and becomes ready for admission to the boiler, where it is quickly converted into steam. *Patent completed.*

1511. M. NELSON. *Improvements in propellers for vessels.* Dated July 5, 1858.

This consists in the arrangement of two propeller frames on each side of the vessel, moving in opposite directions, and carrying buckets hinged on one of the vertical edges, so that the buckets can turn down against the reciprocating frames in either direction. And the patentee makes use of moveable blocking devices by which the buckets are sustained when open, and allowed to turn down towards the stern when the vessel is going forward, or towards the bows when the propellers are giving sternway to the vessel. The method of actuating these propeller frames may be varied. *Patent completed.*

1512. J. GREENWOOD. *Improvements in marine propellers.* Dated July 5, 1858.

This relates to floats or float boards, either disposed around a circular wheel of the ordinary form, or applied as propelling surfaces upon arms, or as vanes radiating from a central axis or shaft, which may be placed either horizontally at a right angle with the keel line, or placed in the centre of the vessel, in a well-hole; or the axis or shafts may be placed horizontally in a line with the keel, or transversely at a right angle with the keel line. *Patent completed.*

1513. J. T. DAVIES. *An improved lock.* (A communication.) Dated July 5, 1858.

This relates to that class of combination locks which have no key-hole, and consists, 1, in the peculiar construction of the key, and of the corresponding parts of the lock, by which the key can be opposed directly to the lock, and the lock operated without referring to any index signs or figures. 2, in the use of two working shafts, one within the other, one of which has a rotating movement in which every point describes a circle, while the other has a rectilinear movement only, both produced by the use of the key making movements resulting from the action of the key bits, while the separate movement of these shafts when moved by hand, and without the application of the key, result for each given point irrespectively in a circle and straight line, thereby giving clue of the extent of the movements of the sliding tumblers. *Patent abandoned.*

1514. J. DODD and T. PHILLIPS. *Improvements in the slide valves of steam engines.* Dated July 6, 1858.

This invention was described and illustrated at page 106, No. 7, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

1515. H. HUGHES. *Improvements in gauffering and crimping machines, parts of which are applicable to the manufacture of continuous belts and shutters.* Dated July 6, 1858.

This consists in forming a continuous band from plates or strips of metal, parts of one side of each being cut away, and the metal between the parts so cut away being twisted at right angles to the face of the plate and holes pierced in the twisted end for the reception of a rod of metal or of links to hold the plates together, and so form a continuous length. For gauffering and crimping machines a head of the shape required to suit the gauffre crimp or plait is added or formed on the edge of each plate, and a nick or part is cut away longitudinally through the centre of the rising edge of each plate to receive a steel rod or bar, or a chain; the effect is to form a groove in the centre of the material to be crimped or gauffered. *Patent completed.*

1516. W. E. NEWTON. *Improvements applicable to roller blinds.* (A communication.) Dated July 6, 1858.

This consists in the application of india-rubber to the pulley of the window blind roller over which the endless cord for turning the roller is to pass, by which sufficient friction is given to the cord to make it bind on the roller, and cause the same to rotate, but at the same time to prevent the blind from accidentally unwinding. This arrangement admits of dispensing with the lower bracket for straining the cord, and thereby allows the cord to hang loosely. The roller, which is cylindrical, is simply to be cut to the right length, and the ends are received in curved or semicircular sockets. *Patent completed.*

1517. J. DAVIS and T. EVANS. *Improvements in engines to be actuated by steam, air, or gases.* Dated July 6, 1858.

Here the cylinders are caused to oscillate upon hollow trunnions, the steam being supplied through the trunnions to the cylinder, and distributed alternately to the steam passages by a fixed valve placed in the valve chamber, the rear face of which is always in contact with the steam from the steam pipe, the other face fitting close over the steam and exhaust ports in the side of the cylinder. This fixed steam valve has ports or openings cut in its face at regulated distances apart, also a hollow recess. As the cylinder oscillates, these openings in the fixed valve connecting with the ports of the steam passages alternately supply each with steam, while the recessed part puts the exhaust in connexion with either steam port. *Patent completed.*

1518. J. BUCHANAN. *Improvements in propelling ships, vessels, and boats.* Dated July 6, 1858.

This consists essentially in the use of a propelling wheel, of large diameter, and fitted with inclined or screw propelling blades, which wheel or drum is so disposed that its lower portion shall protrude through the bottom of the vessel or ship. This wheel is placed right across the ship on a horizontal propelling shaft running fore and aft, either in the line of the keel, or at a short horizontal angle with the keel. This divergence from the keel line is for enabling the force of the propelling blades to act right in the line of the keel. This wheel is connected to the engines in any convenient way. *Patent completed.*

1519. W. A. SMITH. *Improvements in machines for making bricks, tiles, or pipes of clay.* Dated July 7, 1858.

The patentee claims the using of flannel, &c., to cover the pistons used in brick machines, and the use of moulds running horizontally under channels through which clay is forced into them, the said moulds being open at top and bottom, and moving either in a continuous train, or in a reciprocating manner, together with the apparatus for discharging and carrying away the bricks or other articles, and supplying the pallet boards. *Patent completed.*

1520. H. C. SCHILLER. *Certain improved apparatus for laying down and recovering submarine telegraphic cables.* Dated July 7, 1858.

Here the vessel carrying the cable is to tow astern a requisite number of small steam-vessels or steam-tugs, travelling at the same speed, and connected with her and with each other by hawsers, chains, &c.; for keeping them at a given relative distance from each other, the weight of the hawsers or chains between the vessels being supported by means of buoys or floats. Each of these small steam-vessels or tugs is to carry a sling, the upper end of which passes over a windlass on board, which is connected to the steam engine, and the lower end carries a block with two sheaves or pulleys (one above the other), between which the telegraphic cable passes. Slings may also be attached to the buoys if necessary. Each sling is to be attached to its preceding and succeeding ones by diagonal traces or other gear. These slings are to be of a proportionately greater length relative to their respective distances from the leading vessel (which carries the cable), so as in the division of their aggregate distances from her, and that of the extreme of each from the surface, to produce the angle requisite for the safe suspension, at intervals, and delivery of the cable at the lowest soundings required, the shortest sling being nearest to the leading vessel, and the longest sling furthest from it. In recovering the cable, the same apparatus is employed, but reversed. *Patent completed.*

1521. J. J. FLORANCE. *Improvements in reels or spooling-wheels.* Dated July 7, 1858.

This consists in combining the several parts so that these reels take up less space than those hitherto used for the same purposes, and offer also more regularity and swiftness of motion. A suitable frame in which turns a main arbor is provided with a penion receiving motion by gearing, endless bands, cords, chains, &c., from a large wheel. The said main arbor has a fly wheel for steadying the motion, and with another large wheel which, by endless bands, chains, &c., transmit the motion to the spindles of one or more cops or bobbins turning in suitable bearings in the frame. The relative positions of the various parts, and particularly of the spindles from the centre of motion, are regulated by set screws. *Patent abandoned.*

1522. P. MERCIER. *Improvements in the treatment of peat, and in preparing the same for fuel.* Dated July 7, 1858.

This relates to a system of preparing peat to render it more serviceable as a fuel. The peat is first cut from the ground by any cutting tool, but the apparatus which the inventor prefers to employ consists of a tool or cutter having four cutting edges; to this tool a descending motion is imparted, whereby it enters the peat, and divides it by its four cutting edges, so as to enclose a cube of peat within it. Another cutter then passes along the base of the cube, severs it from the ground, when the cutters are elevated, carrying with them the detached cube of peat. The peat is now to be dried, which is effected by enclosing it in bags, baskets, &c., of a pervious nature, which are to be placed in a centrifugal machine, and the moisture is then expelled by centrifugal force. The peat is subsequently placed in a vessel which revolves on a vertical centre or pivot and within which rotates a series of arms whereby all the particles of the peat are mixed. From this machine the peat may pass to a pair of vertical millstones, whereby it is crushed and thoroughly pulverised. The peat having been sufficiently prepared by the millstones is forced by scrapers down a central passage into pressing and moulding machines. *Patent abandoned.*

1523. J. HOLLAND and F. POTTS. *Certain improvements in ornamenting metallic bedsteads, and which said improvements are also applicable to the ornamenting of other metallic surfaces.* Dated July 7, 1858.

This relates to a method of ornamenting metallic surfaces, so that they may have the appearance of being ornamented with gold or silver leaf. Also to a mode of heating the iron parts of metallic bedsteads that it may be desired to so treat, and this portion of the invention has for its object the imparting to the parts so treated the general appearance of enamelling. For the details, we must refer our readers to the specification. *Patent completed.*

1524. W. CLISSOLD. *Improved machinery for cutting or rasping dyewoods.* Dated July 7, 1858.

The block of dyewood is set up in a conical or trumpet-mouth case, through which project rotary saws or rasping surfaces, slots being made for that purpose in the conical case. Above the case is a follower for feeding the wood to the saws, and giving it at the same time a slow axical motion; the saws being caused to run with rapidity will rasp off the surface of wood, and a constantly changing surface being presented to the saw teeth, the end of the block of wood will be quickly reduced to a conical point, which will be sustained until the whole of the block is rasped away. *Patent completed.*

1525. T. JAMES. *Improvements in treating sewage matters.* Dated July 7, 1858.

At the mouth of a drain or sewer the inventor places a receiving vessel hermetically closed to the atmosphere, but communicating through perforated sides and bottom with an air-tight well into which the liquid portions of the sewage will flow through the perforated sides and bottom of the receiver. He pumps this liquid portion up into covered filtering vessels, through which the liquid in a filtered state is allowed to flow into the river. He removes the more solid contents from the perforated vessel through the tubes opening into exhausted tanks in barges brought alongside the first receiving vessel. The barges convey away the tanks containing the more solid matters to be used as manure. *Patent abandoned.*

1526. G. A. B. CHICK. *An improvement in the preparation of graphite, or plumbago, or black lead.* Dated July 7, 1858.

This consists in grinding the black lead, &c., to a fine powder, and mixing it with a small quantity of olive oil;

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the compound is pressed together, and after some days it is again ground, and is then ready for use. *Patent completed.*

1527. G. T. Bousfield. *Improvements in apparatus for ironing linen and other fabrics.* (A communication.) Dated July 7, 1858.

Here the iron is constructed with a smooth iron or face on one side, and with two spaces in which metallic rollers revolve on the other side, the metallic rollers projecting slightly beyond the face of the iron. The iron at its two ends is connected to the handle by pins or pivots, so that the iron may revolve in the handle; and attached to the handle there is a spring catch which enters recesses in the iron, so that the iron may be retained with either face downwards. The flat side is to be heated, and then the iron reversed, so as to iron with the other side. *Patent abandoned.*

1528. J. D. Weston. *Improvements in rolling iron for the manufacture of bolts and pins.* Dated July 7, 1858.

To make bolts or pins with projecting angles, &c., on the stems under the heads, the patentee first rolls the iron in the usual way into an elliptical or other section; he then passes it through a pair of rolls in which the shape of the angle or elevation required on the neck of the bolt or pin is indented at regular distances. The bars being thus rolled he cuts them up by the usual modes in lengths for the formation of bolts or pins. *Patent completed.*

1529. A. W. Sleigh. *Improvements in the construction of floating sea barriers or artificial beaches, breakwaters, and batteries.* Dated July 7, 1858.

This consists in making the floating caisson in which the inclined plane rests of a triangular shape, of which the base line which floats on the water is the longest, by which much greater buoyancy of the whole structure is obtained, and the caisson moored on each side without revolving on a centre of motion. It also consists in adapting these caissons for floating batteries. Reference to the drawings is required for a clear description. *Patent completed.*

1530. J. F. Stanford. *A new and improved method of and apparatus for applying heated air in drying corn, hay, and other like articles, in the stack or otherwise, and in drying goods, and in heating and drying rooms and buildings.* Dated July 8, 1858.

The inventor accomplishes his invention by means of a stove and blower, and certain appliances connected therewith. *Patent abandoned.*

1531. J. Marland and J. Widdall. *An improved self-acting hook or holder to prevent accidents in lifting, hoisting, or winding at coal-pits, or other similar purposes.* Dated July 8, 1858.

The part of the hook to which the rope or chain is suspended is jointed at one end, and held or clipped at the other by a catch, acted upon by a spring when within the bounds of safety, which catch gives way and releases the hook when the latter too nearly approaches the pulleys or drums by its coming in contact with a bar or projection. The invention is not fully described apart from the drawings. *Patent completed.*

1532. H. Gidlow. *Improvements in breaks for steam engines.* Dated July 8, 1858.

This relates to that class of steam engines which require to be frequently stopped at certain defined positions, as in the case of mining engines. The patentee applies a self-acting break, having one end attached to a chain or band passing over and fastening to a pulley, which is either fixed to the shaft of the fly-wheel or other counter shaft. The said chain coils around the pulley to which it is connected when the engine is in motion, and being regulated to the required length causes the break to act just as the receptacle or frame arrives at its destination, either above or below. The patentee also applies to the aforesaid steam engine a self-acting apparatus for lifting off the excentric rod or rods, so as to shut off the steam or close the port holes of the steam cylinder either before or just as the break is beginning to act. *Patent completed.*

1533. J. B. Booth and R. Ashworth. *Improvements in the means of stopping or retarding the progress or velocity of railway carriages.* Dated July 8, 1858.

These consist of an improved self-acting brake. To the tyre of the wheel the inventors place a shell, which is acted upon by a brake formed of segments of wood connected to radial arms, which are raised up when required so as to press the segments with great force against the interior of the shell, the radial arms being governed by a nut and worm wheel and pinion, worm and worm wheel, or spiral spring. Also in certain arrangements for giving a dead stop to the revolution of the wheels of railway carriage wagons or tenders, by placing in the boss of the wheel, or any part of the axle, a sliding catch, and upon the guard plate a sliding plate with ratchet tooth, the position of both catch and tooth being adjusted by cams, so that in one position the wheels may turn either way as desired, or placed so that the catch and tooth may come in contact with each other, and give a dead lock to the wheels. *Patent abandoned.*

1534. P. F. Demoulin and J. Cotelle. *Improvements in treating the heavy oils obtained from the distillation of coals, schists, and other hydro-carbons.* Dated July 8, 1858.

Supposing the patentees have to act on 100 kilogrammes of the said oils, they introduce them in a vessel which can be properly closed, and ultimately mix with the oil 50 litres of water; 1 kilogramme of chloride of lime; about 2 kilogramme of soda salt, and ½ kilogramme of manganese. The whole is then violently shaken, say for about an hour, and is then left to settle for about twenty-four hours, after which the supernatant oil is decanted from the sediment, and distilled, so as to bring the oil to a specific gravity of about 90° to 92° of Vignie's areo-meter, after which it is submitted to rectification by mixing with about 100 kilogrammes of the oil, and about 25 kilogrammes of resin oil. By this latter operation the oil is deprived of its gummy parts, and is at the same time entirely deodorised. *Patent completed.*

1535. T. T. Chellingworth. *A high-presure steam engine.* Dated July 8, 1858.

This consists, 1, in the arrangement of the steam ports, eduction port, and slide valve of steam engines, so that the steam, having been cut off after the completion of a portion of the stroke, is expanded the remaining portion, and the whole of the return stroke. 2. In fixing the trunk to the piston by a conical bolt, with an eye at one end, to which is attached the connecting rod for working the crank, and also in forming and arranging the stuffing-box, through which the trunk works, so that it may project inside the cylinder, while a corresponding recess is cast in the piston, so that they may fit into each other with only a very small space between them. *Patent completed.*

1536. P. R. Hodge. *Improvements in brewing fermented liquors, and in treating materials used therein for purposes of food.* Dated July 8, 1858.

This consists in crushing the malt, subjecting it to a heat in chambers, keeping it in motion, and drawing off the steam or vapour arising from such process. The patentee constructs one or more closed vessels for containing the malt, and others for containing the hops, which are previously hackled, torn, or ground, that heated water or steam may be forced through the same upwards through a wire gauze bottom. The temperature of these vessels is kept up by a steam casing; the malt is kept at a temperature of about 150° Fahrenheit, and the hops at a much higher temperature. The hops are hackled, or torn, by cutters or hackle pins fixed on revolving cylinders so that such teeth or pins pass between an iron grating which forms the bottom of the hoppers. The patentee, in some cases, admits high pressure steam to the surface of the extract or wort, to volatilize the oil or other products, and thereby preserves the aroma of the malt, and after the other impurities are cleared are drawn off, he lets the liquor into suitable vats or vessels for cooling and admixture in due proportions. There are modifications included. *Patent completed.*

1537. R. Smith. *An improved adjustable pipe tongs.* (A communication.) Dated July 8, 1858.

This consists in so constructing the adjustable tongs that the strain consequent upon the use of the tongs shall not separate the jaws by slipping or moving the pivot fixed to the one jaw in the slot of the other jaw. Those parts of the hooked end of the straight jaws by which the pipe is grasped are made in the usual well-known manner. The pivot which holds the tongs together is secured in the straight jaw piece so that they can turn on each other, and is provided with a collar which is partly recessed into the inner side of this jaw piece. The inner side of the hooked jaw piece rests against this collar, and that part of the pivot passing through the slot is flattened to fit the slot, and to prevent its turning round therein. Now, instead of having the two outer surfaces of the tongs parallel with each other at that place where the pivot holds them together, and securing them with the common nut and washer, the outer surface of the hooked jaw piece has an inclined plane, likewise slotted, which may either form a part of or be fixed to the jaw piece. This inclined plane inclines towards the hooked end of the jaw, and the washer fitting upon it is tapered to correspond with the inclined plane, so that the outer surface of the washer is at right angles with the axis of the pivot. A projection on the under side of the washer fits into the groove and prevents the washer from turning. That part of the pivot projecting beyond the washer is screwed in the usual manner to receive the nut by which the tongs are held together. It will be obvious that any strain which tends to move the pivot in the slot so as to increase the distance between the jaw hook and the pivot, would have to move the inclined plane of the washer up the inclined plane of the jaw piece, which cannot be done without breaking the pivot or stripping off the nut by direct tensile strain. *Patent completed.*

1538. S. Samuels. *Improvements in laying submarine telegraphic cables.* Dated July 8, 1858.

This consists in passing the cable from the ship into the water through some convenient opening made in the ship at or near the centre of the vessel. The inventor proposes to pass the cable from the deck down an inclined pipe or way, extending from the deck, to a hole near the keel. This tube or way is to be provided at top and bottom with antifriction rollers. *Patent abandoned.*

1539. S. Harrison. *Improvements in ovens.* Dated July 8, 1858.

This relates to ovens which are usually constructed of sheet or cast iron, and are heated by the flame of incandescent carburetted hydrogen gas. The patentee combines two, three, or more ovens together, and so arranges them that the heated gases and vapours are conducted over, under, or around the ovens in a serpentine direction. *Patent completed.*

1540. R. J. Crickmer. *Improvements in treating the sewage of London and neighbourhood.* Dated July 8, 1858.

This invention was described at page 106, No. 1825, vol. 69, of the Mechanics' Magazine.

1541. R. G. C. Fane. *Improvements in treating sewage, and in apparatuses to be employed therein.* Dated July 8, 1858.

This consists in constructing intercepting wells beneath sewers and drains, in placing in such wells receiving vessels perforated on all sides, and at bottom; in erecting a stop bridge on the further side of each well; in providing a passage upwards from each well on the further side of the bridge; and in providing suitable sealed openings through which to get at, remove, and replace the receiving vessels. Filtering, deodorising, or disinfecting agents may be employed in the wells. *Patent completed.*

1542. M. Scott. *Improvements in constructing breakwaters, and other like structures.* Dated July 8, 1858.

In constructing wood piles with screws, the same are each fitted with a worm or screw, formed by preference of T or angle iron. The angles of the wood piles are first removed, and then the iron bar (being heated) is wound spirally around the lower end, and shrinks thereon tightly. In constructing breakwaters, &c., by frames resting on the bottom, and fitted in with stone, the patentee sometimes prepares bearings for the frames when below the water-mark of spring tides, by divers, who lay flat stones in suitable positions, and then the measurements for constructing the frames can easily be taken from these foundations, and the frames may be built at a distance, and when finished brought to their places, and erected on the foundations already prepared. The invention is not fully described apart from the drawings. *Patent completed.*

1543. G. Collier. *Improvements in means or apparatus for the drying of wool and other fibres.* Dated July 8, 1858.

Here the fibre to be dried is conducted to, and so as to be held between, endless aprons formed of open work, and which pass over open cylinders through which air, heated or otherwise, is forced by fans or other suitable means, so as to cause it to pass fully amongst and through the fibre whilst it is being carried by the aprons over the open cylinders. *Patent completed.*

1544. G. Sampson. *Improvements in means or apparatus employed in the finishing of woven fabrics.* Dated July 8, 1858.

Here in place of the jets of steam as they come from the steam pipe acting directly down upon the fabric, the cover of such pipe forming a chamber to confine the steam and cause it to act more fully on the fabric, is provided with an internal roof or guard upon which the steam first acts, and rising above and within the lower edges of this internal roof or guard, yet so as to admit of the dry steam rising between them, there are side boards or frames. The lower edges of these side frames lead to gutters by which the particles of water become separated from the dry steam, and are conducted away by pipes, and the dry steam alone acts on the fabric. Other numbers of side plates or frames may be employed, each overlapping the other, yet so as to leave passage for the steam to rise upwards towards the centre of the chamber whilst the more liquid parts are conducted to the troughs or gutters. The inventor also applies pressing rollers to press the fabric after passing from the steam chest to the winding-on roller. Also the improvements relate to applying within such steam cover a vessel for sizing or other matter, and in causing the steam to open into such sizing matter to cause the sizing matter therein, or essential part thereof, to flow therefrom in the vapour, and in such manner and by means as referred to, to be conducted to the fabric, whilst any more liquid particles will be conducted away by the troughs or gutters as before described. *Patent abandoned.*

1545. W. Simons. *Improvements in or connected with ships or vessels.* Dated July 9, 1858.

This comprehends various improvements in the construction of ships, in the arrangement or construction of their masts and of parts connected therewith; in the mode of moving or anchoring them, and in the construction of boat anchor and other davits. The invention is not described apart from the drawings. *Patent completed.*

1546. G. Parsons. *Improvements in apparatus for the prevention of injury to, and the sudden bursting of steam boilers.* Dated July 9, 1858.

The patentee connects with the feed pipe, from a force pump of the engine, a cylinder in which works a piston. This cylinder is fitted with a whistle, and has an opening communicating with a pipe descending into the boiler; a steam pipe from the engine is also connected with the cylinder at the back of the piston. The action is as follows:—When the feed pump is in action, the water therefrom will force back the piston in the cylinder so as to cover the whistle, and allow the water to pass into the boiler; but should by accident the feed pump fail to supply water, then the piston will be forced forward in the cylinder by the pressure of steam from the engine, so as to uncover the whistle and sound the same, so as to give notice that the supply has ceased. To prevent explosion from the water falling so low as to expose the boiler plates to the action of the fire, and also to secure the escape of steam when above any desired pressure in the boiler, he places on that part of the boiler which is most exposed to the action of the fire a rising surface or cone through which passes the end of a rod, secured and held in its position by a fusible metal plug. On the other end of the rod is placed a loose piston or valve weighted down to any required pressure by a spring, and placed in a cylindrical cover, on the outside of the boiler in which it works. The cylinder is made in two parts bolted together, and a padlock is fastened through one of the bolts to prevent the removal of the cover or access to the spring after it is adjusted to the pressure desired. The pressure on the spring is regulated by a set screw on the end of the rod. By this arrangement the steam is allowed to blow off at a given pressure by the lifting of the piston or valve, and should the water fall so low as to expose the boiler plates to the action of the fire, the metal plug which is fusible at a low degree of temperature will melt, and liberate the rod and piston or valve, and allow the steam in the boiler to escape. *Patent comptd.*

1547. J. Broadley. *Improvements in means or apparatus employed in weaving.* Dated July 9, 1858.

This relates, 1, to means for giving motion to rotary shuttle boxes. 2, to so arranging parts in connection with rotary shuttle boxes operated by straps or bands, so that when, by the sticking of the picker or other derangement, a stopping of the working of the series of boxes takes place, the pulley wheel operating such band may be permitted to slip so as to prevent breakage. 3, to the construction of a series of rotary shuttle boxes or chambers in order to give additional strength thereto. 4, to means of obtaining pattern surface for operating to select rotary or other shuttle boxes, and which is also applicable as the selecting means for other purposes in weaving. 5, to apparatus for stopping the loom when weft fails, as adapted to picking successively from the same side, or what is called pick and pick. 6, to means for selecting the order of picking. *Patent completed.*

1548. F. Sang and T. W. Rammell. *Improvements in the means of conveying letters and parcels from one place to another.* Dated July 9, 1858.

Here the letters or parcels are placed in suitable receptacles or carriages to travel within tubes, and are propelled in the desired direction by the superior pressure of the atmosphere behind the carriages over that in front, which is rarefied to the requisite degree by pumping engines, so that the carriage or train of carriages within the tube is conveyed from one station to another. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, MARCH 11, 1859.

THE NEW IRON SCREW FRIGATES.

ALL the world knows now what was meant by Her Majesty's Ministers when they spoke of the "re-construction" of the navy, which proved to be no very grand affair, notwithstanding its high-sounding designation. But it is doubtful whether all the world, or even any considerable portion of it, has yet reflected upon that part of Sir JOHN PAKINGTON'S late speech in which a real and most costly re-construction was for the first time shadowed forth. "We have no option," said he, "in the discharge of our duty, but to commence the construction of iron-cased ships." In those words we find the beginning of a change which will ere long cost the country a far greater outlay than even the introduction of steam machinery into ships of war has occasioned. The cost of a 36-gun frigate, prior to the use of steam, was about £40,000; the cost of a 36-gun steam frigate is about £80,000; but the cost of a 36-gun iron-cased frigate will not be less than £200,000 or £250,000. So that where steam has cost its tens of thousands, iron will cost its hundreds of thousands. There is no exaggeration whatever in these estimates. We cannot give the exact cost of 36-gun ships of each kind, but we know that the *Pique*, a 40-gun sailing frigate, cost £42,844, and the *Curaçoa*, a 31-gun screw frigate, cost £73,819; and these figures are sufficient to show that £40,000 and £80,000 may be taken for the 36-gun sailing ship and screw ship respectively with no great risk of error. We are also fully prepared to affirm that £200,000 may be taken as a minimum for each of the 36-gun iron steam frigates which are now to be constructed. The subject is therefore worth a little consideration, and as it is exceedingly probable that these vessels will be built wholly of iron, let us first glance at what has heretofore been done by us in the way of building iron ships of war.

Between the years 1843 and 1850 the British Government expended (notwithstanding all that Mr. SIDNEY HERBERT has been pleased to state in the House of Commons to the contrary) some three-quarters of a million sterling in the construction of iron ships of war of different classes, varying in size from 300 to 2,000 tons, and carrying from three to eighteen guns. In 1850 experiments instituted at Portsmouth were reported to prove that "whether iron vessels are of a slight or substantial construction, iron is not a material calculated for ships of war;" and the confidence placed in the judgment of the naval officers superintending the experiments was such that, although it had been intended to build a large fleet of these ships, the orders for their construction were at once countermanded, and the ships already in existence were either sold or disarmed. In 1854 the French wooden floating batteries were designed, in which thick solid plates of iron were employed as armour upon the sides; and in the next year the English wooden batteries were built from the French drawings. But as these vessels drew nine feet of water, and it was reported that nothing deeper than eight feet could pass within the forts of Cronstadt, it was determined to construct similar vessels of iron as a means of securing the lighter draft. The *Erebus*, *Terror*, and *Thunderbolt* were accordingly designed and built in an incredibly short time, at a cost of about a quarter of a million; but just as they were completed the war terminated, and their services were not needed. At about this time, also, 47 iron mortar vessels of very light draught were constructed, at a cost of about £120,000; these also were too late for service. Recent experiments on the iron floating batteries seem to show that their sides are far too slight to withstand the shock of the projectiles thrown against them, and that in securing the desired light draught of water, their efficiency as shot-proof ships has been sacrificed. In their present state, therefore, these ships are of little value, even as block-ships; and it becomes a question whether their sides could not be so strengthened as to remove the defect, without bringing the ports too near the water.

That our experiments with iron war ships have hitherto been failures is clear enough, and it behoved any Government taking the matter in hand again to proceed with caution. That they should take it in hand at all after such experience, proves more clearly than any arguments we could use, that wood fails to meet the requirements of modern naval architecture. The difficulty of procuring timber of sufficient size, the length of time which such timber is required to stand to season, and its perishable nature under the best of circumstances, all make it desirable to adopt every possible means to supply its place in large ships with some other material. All our experiments show that we can only obtain great speed in our war ships by giving them great length; and the ship of war which, at the commencement of the year, is thought to be of extravagant dimensions, is by the end of it far outstripped by new designs. Such ships are necessarily very costly, and to expend hundreds of thousands of pounds on materials which will be devoured by dry rot in the course of ten or twelve years, seems almost like throwing money away; yet in modern ships, *rapidly built*, this is certainly the case. With these facts before them, the present Admiralty have determined to carry out the intentions of their predecessors, and make one more attempt to replace tough oak by tougher iron. In giving effect to their determination, they have, to use the language of Sir JOHN PAKINGTON, "called upon the most competent parties in different parts of England connected with private trade to give their designs and counsel." They have likewise called upon the present master shipwrights of the dockyards—all of whom are trained and experienced naval architects, and deserve the compliment paid them by the First Lord—to furnish designs. They have imposed no restrictions, we believe, on the architects in respect to the dimensions of the ships, or the power of their engines, but have simply stipulated that they should carry 36 guns of a certain calibre, with the necessary complement of men and provisions for four months, at a speed of 14 knots per hour, and that they should bear armour upon a portion of their sides, consisting of 1,000 tons of 4½ inch wrought-iron plates, backed by two feet of solid timber. The idea of protecting only a portion—the middle portion—of the ship by the iron plates, is a most important one. It seems to us to give an air of practicability to the scheme which it never had before. If the extremities of the ships had been burdened with these enormous weights, the ships would never have been seaworthy: they would necessarily have been as sluggish and dull as logs. But the concentration of the weights in the midship part of the ships will give them as much freedom and easiness of motion as can be desired. It will be necessary, of course, that the proportion between the displacements of the protected and of the unprotected parts of the ship shall be such that if the latter be riddled by shot and water-logged, the ship may still float at a safe draught.

It is, let us now say, impossible to discuss this question without observing that the Admiralty have taken upon themselves an exceedingly delicate task by the invitation which they have given to private builders to furnish designs for the proposed frigates. That such a proceeding will be popular with superficial observers, there cannot be a doubt; but we believe it will prove a source of much jealousy and discontent among shipbuilders, without resulting in any advantage to the nation. That the Government would have acted wisely in proceeding to build costly iron ships, without consulting private builders of known skill and experience, we do not for a moment believe; because, although we have excellent grounds for confidence in the ability of the Surveyor of the Navy and his assistants to perform what is now required, the public may doubt that they possess a sufficiently full and practical acquaintance with the art of iron-shipbuilding. But we have no hesitation in saying that the Admiralty have taken an imprudent step in calling upon merchant shipbuilders for designs of ships of war, with the nature and qualities of which the very best of them are most imperfectly acquainted. Instead of exciting the hopes, and possibly the intrigues, of eight or ten private shipbuilders, by inviting them to undertake a work for which none of them can be wholly competent, they should have called to their aid one or two men of known eminence as iron-shipbuilders, and who are known to be the designers of their own vessels — which many private builders are not, we are sorry to say. These the Surveyor and his assistants should have temporarily associated with themselves, and the whole together might have designed the vessels required. No one can doubt that by these means the nation at large would have been better served and better satisfied than by any other. We see enormous difficulties surrounding the matter as it now stands; but as we should only add to the probable embarrassment of the authorities by particularizing them here we refrain from mentioning them more minutely. We confess, however, that even now we see no other mode of both serving and satisfying the public than that we have pointed out. But little time was given for the preparation of the designs—only one month, we believe—and it is therefore scarcely possible that any of them will be so well-digested and complete as to be fit to be taken at once as the model from which the proposed ships are to be built. There will, therefore, probably be a design prepared by the Surveyor of the Navy, embodying any valuable improvements which the competing designs may contain, for which, of course, the designers must be liberally compensated. But we should not think the Surveyor would, under existing circumstances, choose to finally arrange a design without taking personal counsel of the best of the private builders to whom their lordships have appealed. If he should, with half-a-million of money at stake, there will be great room afforded for cavilling both in and out of Parliament.

But however this may be, after careful consideration of the means and appliances of modern naval warfare, we have no hesitation in saying that in avoiding the error which the French Government is committing in building wooden ships of the *Napoleon* or *Agamemnon* class razéed, covering them *completely* with iron—as they must—and driving them with engines of not more than 900-horses power, our own authorities have acted with true wisdom, and in this respect deserve the support of the nation. Nor can we refrain from expressing a certain grim sense of satisfaction in knowing that one effect of spending this half-a-million will be to place the entire navy of France at an undoubted disadvantage. Our faithful and

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pacific ally has, as is well known, put us to enormous expenses lately by menacing us with continual and rapid additions to his navy. We have him to thank for an expenditure of one million at least during the coming year. There is some sweetness in the quiet revenge which we are about to take. In little more than a year, we shall have two shell-proof frigates, so built that they may act as rams if need be, traversing the channel at the rate of 14 knots an hour. Against these he could not think of bringing the ships to which we have referred. He must, therefore, either accept our superiority with patience, or himself cast about for the means of providing vessels as costly as our own. Is he able to play out the game on which he has entered with so much boldness? For the sake of the tax-payers of both France and England, we hope he will not attempt to proceed with it.

GOVERNMENT SECRETS.

One of the sprightliest of American poets says, "There's nothing we read of in torture's inventions, like a well-meaning dunce, with the best of intentions." We are reminded of the verse just now by a few "dunces" with whom we have lately met, and who profess to feel terrified at the publicity we have given to a description of the wonderful Armstrong Gun. We cannot teach these people what we have long known ourselves, viz., that all pretences to secrecy on the part of our Government in respect of naval or military improvements are mere mockeries. They *will* believe that all the careful guarding, and housing, and locking up of the new weapon, which the *Times* sarcastically tells us of, is really done to keep foreign governments in ignorance of its construction; and they *will* believe that our publication of the facts was traitorous. It is, perhaps, useless to attempt to instruct such "well-meaning dunces," but let us, nevertheless, once more endeavour to enlighten them somewhat. First, then, we beg to inform them that an application for the purchase of a large quantity of a special kind of iron used in the Armstrong Gun was made by an agent of the French Government several days before our article appeared. Would this have been the case if the French Government had been ignorant of the structure of the gun? Again, we wish these timid spirits to know that, when the Government suppressed Sir W. Armstrong's application for a patent, and had his provisional specification carefully sealed up in the Great Seal Patent Office, a copy of that very document was in the hands of certain persons, and had been copied by private clerks, who must therefore have known all about it; and yet no steps were, so far as we can learn, taken to check the escape of the invention through that avenue. Again, the construction of the Armstrong Gun has all along been known, in all its details, to several individuals—not army and navy officers only, who may be supposed incapable of betraying the confidence of the Government—but private persons, who are under no obligation to keep it secret. And, still again, we would request our distressed friends to observe that the armed guard, and the watchful attendants, and the covered shed at Woolwich are manifestly mere blinds to the public, because no person could possibly find out how to produce such a weapon by the mere sight of the finished gun. The chief secrets, on which success almost exclusively depends, lie not in the mere contour of the gun, or the external arrangement of its parts, but in the internal construction, and the manufacturing process, which no mere inquisitive stranger could possibly discover by gazing at it. These Government pretences to secrecy are, we repeat, nothing more than mockeries. And lest any reader should refuse to accept our word in this matter, we will back our assertion by an authority—a very influential and a very modern one. Within a few hours after the appearance of our description of the Armstrong gun, and as if in anticipation of the foolish fears which we are now combating, Sir John Pakington, the First Lord of the Admiralty, in the House of Commons, said, "*Foreign Governments are perfectly well aware of what goes on in this country. If there is any concealment at all, it is a concealment from the people.*" (*Vide* the *Times* for Sat., Feb. 26). Are the sceptics satisfied? We have a word to add, with this declaration from Sir John before us. If Government departments are to practice "concealment" at all, let us visit them with the responsibility of secrecy. If the British public are to be kept in the dark in respect to things of this kind, and peaceable citizens are to be seized by armed soldiers, and to have their property taken from them, simply because they take a pencil sketch of what is there on an open common before them, then, in the name of reason, let us require the Government to keep foreigners also ignorant of such things. It is useless to say they cannot, for if they cannot do the one, what necessity can there be for doing the other? And we have the greater right to ask this, because that "concealment from the people," of which Sir John Pakington speaks, is likely to result in great personal injury. The Armstrong invention may, for example, prove to be an imitation of, or an infringement upon, another man's patented rights. Indeed, in a letter which appears in another column, we are told, now the description of it is made public, that a gun possessing some of its principal features has been repeatedly urged upon the attention of the War Department, and has been lying at Woolwich for years past. And, in addition to this, we know that in the first and only instance in which the English Government ever ventured to suppress a patent—which was in the case of Mr. Macintosh's extraordinary system of warfare proposed during the late Russian War—the inventor was trifled with until the war ended, and then, when the demand for the invention had ceased, had his patent coolly granted him, and has now to seek redress at the hands of Parliament. In these, and in many other ways, great injustice may be done under the secret system. In conclusion, we have to announce that the Government have abandoned the bill which they prepared and proposed introducing into the House of Commons to justify this novel process of sealing up patented inventions. In this they have done well; for unless they can first pass an act for the suppression of the press, an act for the suppression of patent specifications would add but exceedingly little to their present powers of "concealment from the people." Our article on the Armstrong gun has, therefore, had at least the one good effect of preventing the Government from committing an act of folly.

THE ARMSTRONG AND WHITWORTH GUNS.

It needs no prophet to foretell that the promotion, and the high appointment, and the £20,000 awarded to Sir William Armstrong (*vide* General Peel's speech on page 171), will arouse the cupidity and jealousy of many men who believe they have extraordinary claims upon the Government. And for this reason, all who in any way put forward the merits of other improvers of our ordnance will be suspected of being either envious themselves or the organs of the envy of others. But while aware of all this, we refuse to be trammelled by such considerations. Caring for nothing but what is just and right, we shall be daunted by no apprehension of what malevolent men may please to think or say of us. We fearlessly state that we are just now running some risk of exalting the improvements of Sir William Armstrong at the expense or to the injury of others; and as Mr. Whitworth's system very recently excited much public expectation—more recently than any except Sir William's—let us glance at a few facts in connection with it, in order to put ourselves upon our guard in this important matter.

Those who know anything of Mr. Whitworth's plans, must be aware that the mere polygonal form which he gives to the bore of the cannon is by no means the whole of his invention. That form admits, for example, of hard-metal projectiles being employed instead of compound shot, or shot coated with soft metal; and the piece, instead of being necessarily a breech loader, may be loaded at the breech or muzzle as required. Again, the Whitworth projectiles are variously adapted to suit special purposes. For ordinary practice, cast-iron shot, shaped by self-acting machinery so as to fit the hexagonal bore, are used. For firing through water, flat-fronted, or punch-shaped projectiles are employed; and we have been informed on good authority that these flat-fronted projectiles have been fired through thirty feet of water, and after that have retained more than sufficient force to penetrate a ship's bottom! This is a most significant result, and one which promises to be of immense importance in connection with naval armaments. These projectiles, if made of tough hard iron, may also be driven through the thickest wrought iron plates that are made. They were tried last year at Portsmouth, in the presence of an official committee, against the 4-in. wrought iron plates which we are now about to use as a casing for ships' sides. A 68-lb. flat-fronted projectile fired from a distance of 450 yards, perforated both the iron plate and the ship's side on which it was firmly bolted. It punched a huge saucer-shaped piece fairly out of the plate and left a clean hole behind it. As we stated in a former number, the gun from which the shot was fired burst; but this took place on a subsequent day. We were not then aware that the shot had successfully penetrated the plate and the ship's side in the manner explained. And this brings us to another important feature of the case. The gun used on the occasion referred to was an ordinary Government piece, cast solid on the old plan, and was inherently too weak to bear the strain caused by firing a long rifled projectile. But to test the invention fully and fairly, the gun should be constructed throughout on the improved plan of the inventor. The employment of a weak construction was ill-advised and unfortunate, and probably caused blame to be imputed to the system of Mr. Whitworth, when the failure was due to the use of iron cast solid in large masses. The experiment, however, may be considered to have settled two very important questions, and shown—1st, that guns cast on the old plan are inapplicable for rifled cannon; 2nd, that wrought iron plates four inches thick, are *not shot-proof* at a range of at least 450 yards. Mr. Whitworth, in his treatise on rifled arms, reviewed in a late number of the Mechanics' Magazine, makes these remarks:—"In comparing the "strain upon a rifled cannon with that upon a "smooth bore, the work done by the respective "pieces must be taken into consideration. If "the full powers of the former are to be exerted, "and if the extreme ranges which it is capable "of giving are required, a proportionally greater "strain will be put upon the piece on account

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"of the elongated form of the shot, and more "strength is therefore required. The mode of "making large iron guns, by casting them in "solid masses (as at present) is highly objection-"able, and is certainly not suitable for bearing "the full strain of a rifled gun. It is well known "that if iron be cast in large masses, great ir-"regularities will be produced in the metal "during the process of cooling; and, beyond a "certain limit, little or no increase of strength "is gained by increasing its thickness. Im-"proved modes of construction can, however, "be adopted, which will admit of the gun being "loaded at the breech when required, and will "give all the strength necessary for as large a "charge of powder as can be consumed with the "projectile intended for the piece."—See p. 82.

The concluding observation shows that Mr. WHITWORTH anticipates no difficulty in making his guns of sufficient strength; and it was not to be supposed that he would allow the matter to rest where it is. We were not, therefore, surprised to learn from General PEEL in the House of Commons on Monday last, that Mr. WHITWORTH is renewing his experiments with guns of greater strength. We wish him success in his undertaking.

As we have before said, there is great mechanical promise in his system; and it is a fact, however strange it may appear, that no gun has yet been made in order to test that system thoroughly. Such a gun is now, however, in course of construction, and, notwithstanding the great capabilities of the Armstrong weapon, we shall look anxiously for the trial of the other. We are, we firmly believe, nearer the beginning than the end of ordnance improvements.

ON THE CONSERVATION OF FORCE.

By PROFESSOR FARADAY, D.C.L., F.R.S., &c.

[THE volume of "Experimental Researches in Chemistry and Physics," (Vol. III.) which Professor Faraday has just published, contains the following original article on the Conservation of Force. As we very prominently discussed the previous papers of the author upon this subject, and as his present remarks appear to form a reply in part, at least, to the objections which we brought against those papers, it is incumbent upon us to give place to them.]

"During the year that has passed since the publication of certain views regarding gravitation, &c., I have come to the knowledge of various observations upon them, some adverse, others favourable: these have given me no reason to change my own mode of viewing the subject; but some of them make me think that I have not stated the matter with sufficient precision. The word 'force' is understood by many to mean simply 'the tendency of a body to pass from one place to another,' which is equivalent, I suppose, to the phrase 'mechanical force;' those who so restrain its meaning must have found my argument very obscure. What I mean by the word 'force,' is the *cause* of a physical action; the source or sources of all possible changes amongst the particles or materials of the universe.

"It seems to me that the idea of the conservation of force is absolutely independent of any notion we may form of the nature of force or its varieties, and is as sure and may be as firmly held in the mind, as if we, instead of being very ignorant, understood perfectly every point about the cause of force and the varied effects it can produce. There may be perfectly distinct and separate causes of what are called chemical actions, or electrical actions, or gravitating actions, constituting so many forces; but if the 'conservation of force' is a good and true principle, each of these forces must be subject to it: none can vary in its absolute amount; each must be definite at all times, whether for a particle, or for all the particles in the universe; and the sum also of the three forces must be equally unchangeable. Or, there may be but one cause for these three sets of actions, and in place of three forces we may really have but one, convertible in its manifestations; then the proportions between one set of actions and another, as the chemical and the electrical, may become very variable, so as to be utterly inconsistent with the idea of the conservation of two separate forces (the electrical and the chemical), but perfectly consistent with the conservation of a force, being the common cause of the two or more sets of action.

"It is perfectly true that we cannot always trace a force by its actions, though we admit its conservation. Oxygen and hydrogen may remain mixed for years without showing any signs of chemical activity; they may be made at any given instant to exhibit active results, and then assume a new state, in which again they appear as passive bodies. Now, though we cannot clearly explain what the chemical force is doing, that is to say, what are its effects during the three periods before, at, and after the active combination, and only by very vague assumption can approach to a feeble conception of its respective states, yet we do not suppose the creation of a new portion of force for the active moment of time, or the less believe that the forces belonging to the oxygen and hydrogen exist unchanged in their amount at all these periods, though varying in their results. A part may at the active moment be thrown off as mechanical force, a part as radiant force, a part disposed of we know not how; but believing, by the principle of conservation, that it is not increased or destroyed, our thoughts are directed to search out what at all and every period it is doing, and how it is to be recognised and measured. A problem, founded on the physical truth of nature, *is stated*, and, being stated, is *on the way* to its solution.

"Those who admit the possibility of the common origin of all physical force, and also acknowledge the principle of conservation, apply that principles to the sum total of the force. Though the amount of mechanical force (using habitual language for convenience sake) may remain unchanged and definite in its character for a long time, yet when, as in the collision of two equal inelastic bodies, it appears to be lost, they find it in the form of heat; and whether they admit that heat to be a continual mechanical action (as is most probable), or assume some other idea, as that of electricty, or action of a heat-fluid, still they hold to the principle of conservation by admitting that the sum of force, *i. e.*, of the 'cause of action,' is the same whatever character the effects assume. With them the convertibility of heat, electricity, magnetism, chemical action and motion is a familiar thought; neither can I perceive any reason why they should be led to exclude, *à priori* the cause of gravitation from association with the cause of these other phenomena respectively. All that they are limited by in their various investigations, whatever directions they may take, is the necessity of making no assumption directly contradictory of the conservation of force applied to the sum of all the forces concerned, and to endeavour to discover the different directions in which the various parts of the total force have been exerted.

"Those who admit separate forces inter-unchangeable, have to show that each of these forces is separately subject to the principle of conservation. If gravitation be such a separate force, and yet its power in the action of two particles be supposed to be diminished fourfold by doubling the distance, surely some new action, having true gravitation character, and that alone, ought to appear, for how else can the totality of the force remain unchanged? To define the force 'as a simple attractive force exerted between any two or all the particles of matter, with a strength varying inversely as the square of the distance,' is not to answer the question; nor does it indicate or even assume what are the other complementary results which occur; or allow the supposition that such are necessary: it is simply, as it appears to me, to *deny* the conservation of force.

"As to the gravitating force, I do not presume to say that I have the least idea of what occurs in two particles when their power of mutually approaching each other is changed by their being placed at different distances; but I have a strong conviction, through the influence on my mind of the doctrine of conservation, that there is a change; and that the phenomena resulting from the change will probably appear some day as the result of careful research. If it be said that ''t were to consider too curiously to consider so,' then I must dissent: to refrain to consider would be to ignore the principle of the conservation of force, and to stop the inquiry which it suggests—whereas to admit the proper logical force of the principle in our hypotheses and considerations, and to permit its guidance in a cautious yet courageous course of investigation, may give us power to enlarge the generalities we already possess in respect of heat, motion, electricity, magnetism, &c., to associate gravity with them, and perhaps enable us to know whether the essential force of gravitation (and other attractions) is internal or external as respects the attracted bodies.

"Returning once more to the definition of the gravitating power as '*a simple attractive force exerted between any two or all the particles or masses of matter at every sensible distance, but with a* STRENGTH VARYING *inversely as the square of the distance*,' I ought perhaps to suppose there are many who accept this as a true and sufficient description of the force, and who therefore, in relation to it, deny the principle of conservation. If both are accepted, and are thought to be consistent with each other, it cannot be difficult to add words which shall make 'varying strength' and 'conservation' agree together. It cannot be said that the definition merely applies to the *effects* of gravitation as far as we know them. So understood, it would form no barrier to progress; for that particles at different instances are urged towards each other with a power varying inversely as the square of the distance is a truth: but the definition has not that meaning; and what I object to is the pretence of knowledge which the definition sets up when it assumes to describe, not the partial effects of the force, but the nature of the force as a whole."

CARRIAGES FOR THE KING OF PRUSSIA.

IT can scarcely be otherwise than encouraging to inventors to find that the discoveries of some years past, which, for a time, were altogether adandoned for lack of appreciation, and patents which have almost consigned their then sanguine originators to a lunatic asylum, are now the common-place things of the day. In every circle one or more inventions which suffered discouragement will present themselves either as a prominent necessity, or as having formed an integral portion of that progress which is the characteristic of the present period. We were much struck with these facts upon inspecting the several improvements which the Messrs. Hooper, of the Haymarket, have brought into the science of carriage building, and which they have so successfully arranged into one happy and harmonious whole, in the carriages intended for the King of Prussia. In the building of these equipages there are patent inventions often and twelve years' standing, which, when they were first introduced, had to bear all the opposition and contumely of the trade, yet are now universally acknowledged to be correct in principle, and eminently valuable. The now well known C spring is one of these inventions. Eleven years ago few or none would look at it. It is now in every carriage built for royalty, whether in the luxurious east where "the extremes of motion and of rest are one," or in the not less refined cities of continental Europe. It is thus with patents as with children—they can be made to earn their own, if they be but kept long enough, and there exist intrinsic merit in their composition.

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THE THEORY OF NAVAL ARCHITECTURE.

No. V.

THE three rules before enunciated and proved, although sufficiently accurate for the requirements of the naval architect, are the simplest cases of that general method of approximating to a curvilinear area which consists in drawing a parabolic curve so as to coincide with the given curve at a number of points, and taking the area bounded by the parabolic curve as the area required, neglecting the small areas between the curves.

The equation to a continuous parabolic curve, which may always be made to pass through $n+1$ points, is

$$y = A + Bx + Cx^2 + Dx^3 + Ex^4 + \&c. \ldots\ldots + Px^n;$$

and when the points are at the extremities of $n+1$ equidistant ordinates, the area, which is bounded by this curve, the two extreme ordinates, and the line of abscissæ, may be obtained for a large number of values of n. Various mathematicians since Newton—the discoverer of the method—in endeavouring to render the approximations as accurate as possible, have fully examined the subject, and produced numerous formulæ by means of which curvilinear areas may be approximated to.

Atwood in the *Philosophical Transactions* of the Royal Society for the year 1796, has given formulæ for calculating the area corresponding to all numbers of ordinates from 2 to 9 inclusive; and whatever may be the nature of the given bounding curve, the approximating parabolic curve coincides with it at the extremities of all the given ordinates.

The following are these formulæ adapted to the notation we have already made use of:—

No. of Ordinates. *Area.*

2..... $\left(a_1 + a_2\right)\frac{m}{2}$;

3..... $\left(a_1 + a_3 + 4a_2\right)\frac{m}{3}$;

4..... $\left\{ a_1 + a_4 + 3(a_2 + a_3) \right\}\frac{3m}{8}$;

5..... $\left\{ 7(a_1 + a_5) + 32(a_2 + a_4) + 12a_3 \right\}\frac{2m}{45}$;

6..... $\left\{ 19(a_1 + a_6) + 75(a_2 + a_5) + 50(a_3 + a_4) \right\}\frac{5m}{288}$;

7..... $\left\{ 41(a_1 + a_7) + 216(a_2 + a_6) + 27(a_3 + a_5) + 272a_4 \right\}\frac{m}{140}$;

8..... $\left\{ 36779(a_1 + a_8) + 175273(a_2 + a_7) + 64827(a_3 + a_6) + 146461(a_4 + a_5) \right\}\frac{m}{120960}$;

9..... $\left\{ 989(a_1 + a_9) + 5888(a_2 + a_8) - 928(a_3 + a_7) + 10496(a_4 + a_6) - 4540a_5 \right\}\frac{8m}{28350}$.

By an inspection of the above formulæ we perceive that as the number of equidistant ordinates increases, the calculations to obtain the area become more difficult; and although accuracy is the chief point to be considered, simplicity is also very important.

Now, it would appear, at first sight, that if we wished to obtain a curvilinear area, having given the lengths of a number (9, for example) of equidistant ordinates, if we could obtain the area between a continuous parabolic curve which passes through the nine given points at the extremities of the ordinates and the other boundaries of the figure, this area would be a very close approximation to the area required, whatever the given curve might be; and would certainly appear to approximate more nearly to the true area than that obtained by passing four sets of parabolic curves through the extremities of the same number of sets of three consecutive ordinates, and finding the area of which these curves are the boundary—which is done when such an area is found by means of Rule 2.

In order to see whether this is the case or not, and also to show the application of the Rules we have already proved, we will find, by way of example, the area of the quadrant of a circle whose radius is 24 feet; a figure which may be regarded as the half midship section of a vessel, the breadth of which is 48 feet, and draught of water to the lower edge of the rabbet of the keel 24 feet. Let $P_1P_7N_1$ (Fig. 12) represent this half section, and P_1N_1 the load water line. Divide N_1P_7 into six equal portions, each being equal to 4 feet: and through the points of division draw ordinates parallel to P_1N_1; then from the property of the circle,

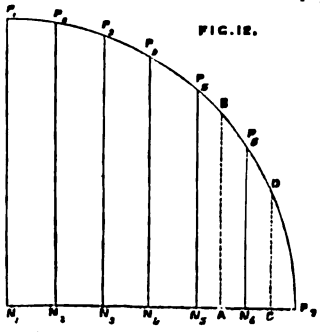
FIG. 12.

$a_1 = P_1N_1 = 24{\cdot}00$;

$a_2 = P_2N_2 = \sqrt{24^2 - 4^2} = 23{\cdot}67$;

$a_3 = P_3N_3 = \sqrt{24^2 - 8^2} = 22{\cdot}63$;

$a_4 = P_4N_4 = \sqrt{24^2 - 12^2} = 20{\cdot}78$;

$a_5 = P_5N_5 = \sqrt{24^2 - 16^2} = 17{\cdot}89$;

$a_6 = P_6N_6 = \sqrt{24^2 - 20^2} = 13{\cdot}26$;

$a_7 = 0$.

The exact area of the quadrant is, we know, equal to

$$\cdot 7854 \times 24^2 = \cdot 7854 \times 576 = 452{\cdot}39 \text{ feet.}$$

But applying the second rule to these ordinates, we have

First and last ordinates.	*Even ordinates.*	*Odd ordinates.*
24·00	23·67	22·63
0·00	20·78	17·89
	13·26	
24·00 Sum.	57·71 Sum	40·52 Sum
230·84	4 Multiplier	2 Multiplier
81·04		81·04
	230·84	
335·88		

4 Common interval

3 | 1343·52

447·84 Area according to the second rule
452·39 True area

4·55 Difference;

or, the approximation is just one per cent. less than the true area.

Applying the third rule to the same ordinates,

First and last ordinates.	*Remaining ordinates except the 4th.*	*4th ordinate.*
24·00	23·67	20·78
0·00	22·63	2
	17·89	
24·00 Sum	13·26	41·56
232·35		
41·56	77·45 Sum	
	3	
297·91		$\frac{3m}{8} = \frac{12}{8} = \frac{3}{2}$;
3	232·35	

2 | 893·73

446·865 Approximation by third rule
452·39 true area

5·525 Difference.

This approximation is not quite so near the true area as that obtained by the second rule: although in this case the curved boundary is composed of portions of only two parabolas, whilst in the other it is composed of portions of three parabolas.

Applying the formula already given when the curve is continuous through the seven points, viz., that opposite seven ordinates in the table, we have

$$\text{Area} = \left\{ 41(a_1 + a_7) + 216(a_2 + a_6) + 27(a_3 + a_5) + 272a_4 \right\}\frac{4}{140};$$

First and last ordinates.	*2nd and 6th ordinates.*	*3rd and 5th ordinates.*	*4th ordinate.*
24·00	23·67	22·63	20·78
0·00	13·26	17·89	272
24·00	36·93	40·52	4156
41	216	27	14546
2400	22158	28364	4156
9600	3693	8104	5652·16
984·00	7386	1094·04	
7976·88	7976·88		
1094·04			
5652·16			

7 | 15707·08

5 | 2243·87

$\frac{4}{140} = \frac{1}{35} = \frac{1}{7 \times 5}$

448·774 Approximate area.

This gives a result a little nearer the true area than either of the other methods, but perhaps not so near as one might have expected.

We could show that in all these cases the errors arise almost entirely on account of the parabolic curves not coinciding with the circular arc in that part of it near to P_7, whilst they very nearly coincide with it in the part near to P_1: it is evident, therefore, that were the ordinates near to P_7 more numerous, the errors would be diminished, and that even if the ordinates near to P_1 were placed further apart.

To illustrate this:—Let the ordinates drawn at distances 4 feet and 12 feet from P_1N_1 be expunged; and two others be drawn at distances of 18 and 22 feet respectively from P_1N_1. The number of ordinates would still be 7, but there will be three ordinates drawn, between which the common interval is 8 feet; and five ordinates between which the common interval is 2 feet. To each of these cases Rule 2 may be applied.

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Let AB and CD be drawn at distances of 18 and 22 feet respectively from P_1N_1.

Then $AB = \sqrt{24^2 - 18^2} = 15{\cdot}88$;

$CD = \sqrt{24^2 - 22^2} = 9{\cdot}59$.

The remaining ordinates have already been given. Consequently the area between P_1N_1 and $P_5N_5 = \frac{8}{3}\left\{24{\cdot}00 + 4 \times 22{\cdot}63 + 17{\cdot}89\right\}$; and the area between P_5N_5 and P_7

$$= \frac{2}{3}\left\{17{\cdot}89 + 4(15{\cdot}88 + 9{\cdot}59) + 2(13{\cdot}26)\right\};$$

$$= \frac{8}{3}\left\{\frac{17{\cdot}89}{4} + 15{\cdot}88 + 9{\cdot}59 + \frac{13{\cdot}26}{2}\right\}.$$

Therefore the approximate area of the whole quadrant which is equal to the sum of these

$$= \frac{8}{3}\left\{24{\cdot}00 + 4 \times 22{\cdot}63 + 1\tfrac{1}{4} \times 17{\cdot}89 + 15{\cdot}88 + \frac{13{\cdot}26}{2} + {\cdot}59\right\};$$

or writing them down as below in a form more convenient for calculation, we have,

Ordinates.		*Multipliers.*		
24·00	×	1	=	24·00
22·63	×	4	=	90·52
17·89	×	1¼	=	22·36
15·88	×	1	=	15·88
13·26	×	½	=	6·63
9·59	×	1	=	9·59
·0	×	¼	=	·0
				168·98
				8
				3)1351·84
				450·61 Approximation
				452·39 True area
				1·78 Difference.

This is a close approximation; but as in such a case in practice the ordinates would be more numerous, the result would be still nearer the true area.

The third Rule may also be applied, when the common interval between any sets of four equidistant ordinates varies. In the above example let ordinates be drawn at distances of 6 and 18 feet respectively from P_1N_1; these, with P_1N_1 and P_3N_3, make four equidistant ordinates at 6 feet apart, to which Rule 3 may be applied.

Also, having already given the ordinates drawn at distances of 20, 22, and 24 feet respectively from P_1N_1. These, together with the ordinate 18 feet from P_1N_1, form another set of four equidistant ordinates with a common interval of 2 feet, to which the third Rule may also be applied.

Ordinate at 6 feet from $P_1N_1 = \sqrt{24^2 - 6^2} = 23{\cdot}24$,

" 18 " $= \sqrt{24^2 - 18^2} = 15{\cdot}88$.

Therefore area between P_1N_1 and the ordinate at 18 feet from it $=$

$$\frac{3 \times 6}{8}\left\{24{\cdot}00 + 3(23{\cdot}24 + 20{\cdot}78) + 15{\cdot}88\right\};$$

Area between the above and P_7

$$= \frac{3 \times 2}{8}\left\{15{\cdot}88 + 3(13{\cdot}26 + 9{\cdot}59) + 0\right\}$$

$$= \frac{18}{8}\left\{\frac{15{\cdot}88}{3} + 13{\cdot}26 + 9{\cdot}59 + 0\right\}.$$

And the whole area, or the approximation to the area of the quadrant, is equal to the sum of these, or

$$= \frac{9}{4}\left\{24{\cdot}00 + 3(23{\cdot}24 + 20{\cdot}78) + 1\tfrac{1}{3} \times 15{\cdot}88 + 13{\cdot}26 + 9{\cdot}59 + 0\right\}.$$

Putting this expression in a form convenient for calculation,

Ordinates.		*Multipliers.*		
24·00	×	1	=	24·00
23·24	×	3	=	69·72
20·78	×	3	=	62·34
15·88	×	1⅓	=	21·17
13·26	×	1	=	13·26
9·59	×	1	=	9·59
0·0	×	⅓	=	0·0
				200·08
				9
				4)1800·72
				450·18 Approximation.

It appears, then, that the *second* and *third* Rules may be made to yield very close approximations to curvilinear areas if due care be taken to fix the positions of the ordinates with reference to the curvature; making the common interval between the ordinates smallest at that part of the curve which has the greatest amount of curvature between two ordinates; or where the variation of the directions of the curve at the extremities of consecutive ordinates is greatest.

And lest it should appear that one example is insufficient to show the general superiority of the second and third Rules, when the common interval is made to vary in some of the sets of ordinates, we will take one more example, and then leave the student to work out others for himself.

THE TONNAGE LAWS.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

Woolwich Dockyard, 7th March, 1859.

GENTLEMEN,—With reference to your editorial article on the "Tonnage Laws" in the MECHANICS' MAGAZINE of the 25th ult., No. 9, I feel myself called upon to offer a few remarks. You say—

"The main ingredient of the report (Report of the late Committee consisting of Messrs. Fairbairn, Atherton, Henderson, and Wright, on Shipping Statistics, presented to the British Association at Leeds, 1858,) is a laudation of the *Bremen*, and by the adoption of this report the British Association for the advancement of Science have really converted themselves into advertisers of the *Bremen* and all concerned in her construction, her engines, and her navigation."

I beg to state that the constructors of the *Bremen*, Messrs. Caird and Co., engineers and shipbuilders of Greenock, had nothing whatever to do with that vessel being referred to in the report, which was presented by Messrs. Fairbairn, Atherton, Henderson, and Wright, to the British Association at Leeds, in 1858, excepting that they complied with the request of the Committee. The *Bremen* was selected by the Committee to exemplify the system set forth in the report, whereby,

"The owners and charterers of ships, and the directors of shipping companies or agents by whom shipping affairs are conducted, should themselves have the means of ascertaining the relative dynamic merits and working condition of their ships, without any reference whatever to the professional assistance of builders or of engineers, but be enabled to judge for themselves whether the performance be good or bad by reference the data afforded by their counting-house records."

The *Bremen* was so selected, not because she was the production of any particular constructor, but as being the vessel which gave the highest co-efficient of dynamic performance of any vessel brought before the notice of the committee, and of which the statistical data of construction, including scale of displacement and scale of vertical sections, were also given in a complete form, and with permission to make the same public, as set forth in the report. Let me ask, What would have been said had our report been based on the asserted performance of a nameless vessel?

The animus of your editorial article is apparent. For my own part, I confidently, and without retracting one word, leave the report and the statistical statements set forth in the appendix as published in the journal of the Society of Arts on the 7th of January last, but not published in the MECHANICS' MAGAZINE, to the judgment of all who have paid any attention to the deficiencies of our present system of shipping registration.

It is only by the agency of publicity that any public abuse can be exposed and rectified. I maintain that there is no abuse of public interests greater in respect of its pecuniary magnitude, nor more insidious in respect of its character, than that which emanates from the deficiencies of our present system of shipping, shipping registration, and of shipping denomination called "Tonnage;" but I am confident in the hope that the great battering ram "Truth," if perseveringly worked, will shake to its foundations any combination of ribaldry and special-pleading delusion within which such abuses may be protected or take refuge. I confidently anticipate that the opportunities which have been afforded by the Society of Arts, London, on various occasions, and by the British Association at Cheltenham, Dublin, and Leeds, for putting this battering ram into operation, will eventually, in this matter of shipping registration, add another very important item to the list of services which these Institutions have rendered in the cause of public good.

I am, Gentlemen, your very obedient servant,

CHARLES ATHERTON.

[We do not like to refuse Mr. Atherton space for the above letter, but we think it unfair in him to address such a letter to us. We said nothing in the article to which Mr. Atherton refers that can be supposed to impute undue partiality to Messrs. Caird and Co., on the part of himself or his friends. On the contrary, we expressly noticed the prominence given to the *Bremen*, as strongly illustrating "the mischievous effects of the proposed action of the committee." Such effects are inseparable from the method of proceeding adopted by the committee. Where, then, is the "animus" which Mr. Atherton imputes to us? We are quite content to combat the arguments of Mr. Atherton; and we have neither the occasion nor the desire to import any charges of a personal nature into the discussion. We hope that Mr. Atherton will respect himself too much to do so. We entertain more respect for him than for another member or two of the British Association Committee; and we hope if that Committee is to grovel in personal altercations, he will, at least, keep himself above them. EDS. *M. M.*]

SUFFIELD'S MARINE ENGINE-ROOM TELEGRAPH.

ONE of these most useful and essential machines for communicating from the captain to the engineer in steam-ships, has recently been fitted (by the command of the Lords of the Admiralty) on board H.M.S. *Cressy*, to be tried in competition with others, as we have previously stated. The machines have lately been put through a series of severe proofs, under the direction and management of Captain Halsted, of the steam reserve at Sheerness. The results of the experiments with Suffield's telegraph, whilst the ship was lying at anchor, proved so eminently satisfactory as to induce Captain Halsted to take the ship to sea on Friday last. Captain Halsted worked the telegraph himself the whole of the day, and put it through the most severe tests, but the instrument proved completely successful, and will no doubt be reported upon accordingly to the Lords of the Admiralty,

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GREENWOOD'S IMPROVED STEAM BOILERS.

MR. JOHN GREENWOOD, of Rawdon, Yorkshire, has just patented an invention designed to supply a very great heating surface in steam boilers. For this purpose he forms the plates of the flues, or other heating surfaces of boilers, or of other apparatus for heating water, of plates with deep undulations, except at the parts where the separate plates are connected together, or to the angle iron by which they are held together; and he prefers that these undulations in the plates shall be of such an extent as to double the heating surface. He also forms the flue spaces of a deep undulatory form, in addition to the plates being of the undulating character referred to. Such undulating surfaces are also applicable when forming surfaces for the superheating of steam, or the heating of air. Fig. 1 of the accompanying engravings shows a plan, and Fig. 2, a vertical sec-

FIG. 1.

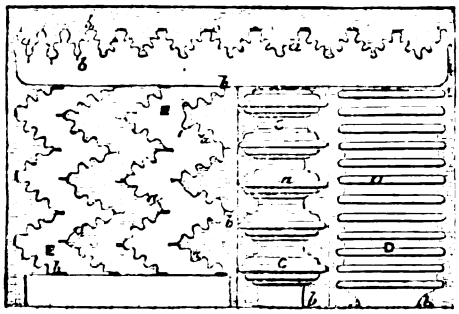
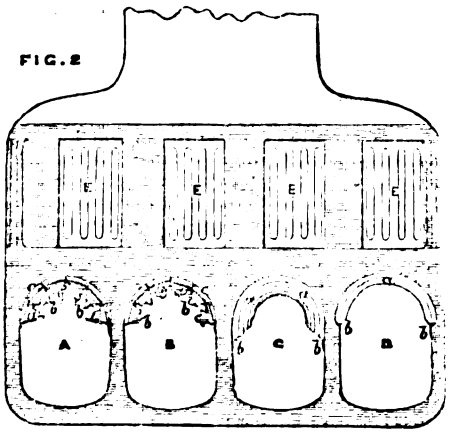


FIG. 2



tion in section of a boiler, with his improvements in different forms applied thereto. In Fig. 2, *A* and *B* show two furnaces of the boiler, with the upper or roof plates *a*, *a* thereof combined at *b*, *b*, so as to be of an undulatory character apart from the undulations of which each plate is composed; *c*, *c*, are stays, placed at intervals for giving steadiness to the parts. In the illustrations *C* and *D* (the variations of which are better seen by the plan view, Fig. 1) the undulations run in the direction of the length of the furnace; *E*, *E* are the flue spaces, formed undulatory, as shown in their general character, in addition to each undulation being composed of a series of smaller undulations.

THE BOMBAY WATERWORKS.—The following note needs no introduction:—"Gentlemen:—Our attention having been called to your able article in No. 7, February 11th, on the 'Bombay Waterworks,' we would add that the self-closing public conduits therein mentioned, as well as the slide valves up to 12 inches diameter, were manufactured by us, and that the conduits and valves are the patented inventions of our manager, Mr. Underhay.—CHARLES BOTTON and SON."

Parliamentary Proceedings.

CONDENSED FOR THE "MECHANICS' MAGAZINE."

THURSDAY, MARCH 3.

HOUSE OF COMMONS.

CIVIL SERVICE SUPERANNUATIONS.

Sir H. WILLOUGHBY asked what number of persons in the civil service (whether their remuneration be computed by day pay, weekly wages, or annual salary,) will be entitled to superannuation allowance, and at what charge to the public, under clause 2 of the Superannuation Bill.

Sir S. NORTHCOTE said the preparation of such a document would require a considerable time; but he hoped, in the committee, to lay down such general rules as would prove satisfactory.

THE WESTMINSTER CLOCK.

Mr. HANKEY asked whether the bells are now all fixed in the clock tower, whether the works of the clock have also been placed there, and when the clock will be in working order.

Lord J. MANNERS, in reply, read extracts from letters he had received from Sir C. Barry and Mr. E. B. Denison. Sir C. Barry stated that "the bells of the great clock were hoisted as soon as they were approved by the referees, and have been fixed more than three months." Mr. E. B. Denison said "the bells have been fixed in the clock tower; but they are now let down a little, to enable some pieces to be put into the frame (diagonal braces) to strengthen it. The clock is not fixed because the clock-room will not be ready for it until the weight-shaft is properly covered over, and the pendulum-room constructed in it, and an enclosed passage made through the air-shaft to give access from the clock-room to the west dial works. This must also be made of iron, because the air-shaft is, in fact, a chimney; and it must be made carefully, so as to be air-tight, or else the fumes of the ventilating fire will come into the clock-room. The clock-room will be ready for the clock in a week, and the bell-frame will be finished very soon, and therefore the clock should be driving the hands and striking in a few months."

THE NEW FOREIGN-OFFICE.

Mr. CONINGHAM asked when it was intended to exhibit the designs for the new Foreign-office.

Lord J. MANNERS said they would be exhibited as soon as the working drawings and the estimates of the expense of the new Foreign-office were completed. No vote of money would be taken till then.

COLONIAL AND FOREIGN WOOD.

Mr. MITCHELL drew attention to the very anomalous state of the duties on wood, and moved "That it is the opinion of this House that the duties on foreign and colonial wood should be repealed."

Mr. FENWICK seconded the resolution. For his part, representing Sunderland, which was very much interested in the question, he looked upon the tax as being not only, abstractly speaking, unjust, but practically injurious.

Sir S. NORTHCOTE said, under all the circumstances, he contended that no such strong case had been made out as to justify the duties on wood being treated in an exceptional manner, and made the subject of a special resolution condemning the tax. Besides, it was inexpedient, under ordinary circumstances, to anticipate by a resolution of that kind the financial statement of the Chancellor of the Exchequer.

Mr. WILSON said he would never vote for their repeal on the motion of an independent member, apart from considerations arising out of the financial state of the country.

Mr. HUDSON spoke against the duties.

Mr. LABOUCHERE would wish to see the duties repealed. He should not, however, vote for an abstract resolution pledging the House to the repeal of a tax until he had heard the financial statement.

Lord HARRY VANE suggested an alteration in the terms of the motion.

Mr. MITCHELL adopted the suggestion. The motion then stood thus:—"That it is the opinion of this House that the duties on foreign and colonial wood should be repealed as soon as the state of the revenue admits of it."

The CHANCELLOR of the EXCHEQUER: The addition to the motion renders it much more objectionable. I should be happy myself to put an end to this tax, but at present I am not in a position to hold out any hope of the kind. In a month hence, I shall call the attention of the House to the financial state of the country, and it will be open to those who represent the timber trade, or who are in favour of the abolition of this tax, to bring the subject before the House, when, no doubt, it will receive a fair consideration.

The House divided on the amended motion.

For the motion	77	
Against it	133	
Majority		—56

The motion was therefore lost.

FRIDAY, MARCH 4.

HOUSE OF LORDS.

REMOVAL OF THE ROYAL ACADEMY.

Lord LYNDHURST called the attention of the House to the Royal Academy, to the proposal to remove the establishment from the National Gallery to a new situation, and to the conditions of such removal. After an historical review of the Academy, he said the object of the academicians is, and always has been, to remain solely under the control and supervision of the Crown, and therefore they will accept the Government grant upon the condition that they on their part shall be allowed to expend an amount equal to the value of the site in the construction of buildings necessary for the Academy, to be permanently applied for the purposes of art. Thus the grant from the nation will be paid for by that equivalent, because both the land and the buildings to be erected upon it are to be devoted in perpetuity to a great public object.

The EARL of DERBY stated that the extent of the National Gallery is 13,000 square feet, while the superficial area of Burlington-house and grounds is 143,000 feet, or nearly eleven times as much. There are numerous claims on this valuable site, and engagements have been entered into for portions. I have here a list of societies which have received promises of that nature. They are the Royal Academy, the Patent-office, the London University, the Royal Society, the Linnæan Society, and the Chymical Society. But, besides these, the Astronomical, the Geological, the Antiquarian, the Ethnological, the Asiatic, and the Water Colours Societies, which are now located in Somerset-house, are claimants for accommodation in Burlington-house, while strong recommendations have been made to the Government for allotting a portion of the site to the Geographical and Statistical Societies. It is difficult to meet those various conflicting claims; but the principle on which the arrangement with the Royal Academy is to be carried out has been entirely agreed upon, the settlement of details being left as a matter for future consideration between it and the Government. The proposition made to them was that a considerable portion of the site of Burlington-house should be appropriated to their use, and should remain over to them in fee simple, upon condition that upon that site they should erect a building adapted to the purposes of the Academy, and not in its style and character incongruous with other buildings which may hereafter be erected in the same locality. I understand they desire to have half of the entire frontage of the present building facing Piccadilly, and also a large portion of one of its sides. That application for no less than half of a site occupying 143,000 square feet is one of rather an extensive character. Her Majesty's Ministers have deemed it right to ascertain, in the first instance, what amount of space the Royal Academy may reasonably be supposed to want, and, in the next place, before they allot them so large a portion of ground, to be assured that the amount of their funds is such as would enable them to cover, either now or at some future time, with buildings adapted to the objects of the institution, the whole of the site which they require. Her Majesty's Government are disposed to deal with them with the utmost favour and liberality.

Earl Stanhope said the Society of Antiquaries had no intention to make any claim upon the ground at Burlington-house.

SUBMARINE TELEGRAPHS.

Lord WODEHOUSE and other members made some remarks on telegraphs to the East, and in reply,

The EARL of DERBY said that, as to the Atlantic Telegraph Company, the Government had insisted as a first condition in the negotiations now pending that the monopoly of the company should be abolished, and that the Government should be at liberty to assist any company which might be disposed to undertake to lay down other lines. The principle adopted was to repudiate any monopoly, and to hold the Government free to agree with any other company if they should think it desirable to do so.

HOUSE OF COMMONS.

TENDERS FOR MARINE ENGINES.

Mr. H. G. LANGTON asked whether, as Government had thought it necessary to apply for tenders for the supply of marine engines from Liverpool, Scotland, and most of the eminent houses engaged in this particular business, Bristol was included among the places to which invitations for tenders had been made.

Sir J. PAKINGTON said the Government had no wish to exclude any locality from tendering.

THE NAVY.

Sir C. NAPIER moved that, as the First Lord of the Admiralty had stated that the coastguard ships are comparatively useless, the time had arrived when they ought to be replaced by efficient ships. He said the nine blockships, described by the right hon. baronet as comparatively useless, and now stationed at different ports on the coastguard service, were considered by merchant seamen as a disgrace to the country; they ought to be removed and their place supplied by efficient ships; this could be done with great ease.

Sir JOHN PAKINGTON said, I think the gallant admiral rather overstates what fell from me with regard to the blockships. What I stated was, that as line-of-battle ships, as sea-going men-of-war, they are useless ships; but they are by no means useless as floating batteries. They are very powerfully armed, and in the event of England's being engaged in any naval war, these ships, defective as they undoubtedly are, would be found extremely valuable as floating batteries for the protection of our harbours. I am, however, quite ready to admit that I do very much wish that, even for their present purpose, I could see these ships succeeded by more effective and more useful ones. But I must ask the gallant admiral to make some little allowance for the shortness of the time during which I have had to deal with these matters. It is the intention of the present Board of Admiralty that, at all events as the commissions of these ships expire, they should be replaced by stronger and more effective ships. At the same time I cannot think it is expedient simultaneously to exchange all these blockships for larger men-of-war. In the first place, looking to the wear and tear to which they are exposed, I was unwilling to expose one-third of our effective ships to such deterioration. By the end of the present year our line-of-battle ships will be nearly 80 per cent. stronger than I found them, and I shall then be more at liberty to deal with matters of this kind. Great expense would also attend the paying off and throwing out of commission nine ships of this class, and commissioning other ships in their places. Again, we cannot effect such an exchange without making a very considerable demand upon the labour of our dockyards, and I should be unwilling to throw it upon them merely to substitute—for that is all that I should have it in my power to do—screw 80's for these blockships.

Lord PALMERSTON: I think the right hon. baronet has

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overstated the difficulty of exchanging the one class of ships for the other. The only thing likely to happen is that a superior squadron should appear in the Channel, and that we should not have a fleet of equal force capable of taking the sea immediately and acting its part in the usual manner of naval engagements. For such a purpose the block-ships are useless, and therefore I would impress the expediency of accelerating the substitution of the one class of ships for the other.

Mr. CORRY remarked that the only ships which could be substituted for the steam guard-ships were the 80-gun ships, for nobody would think of putting our three-deckers to do outpost duty along the coast. Now, the 80-gun ships were all, with one exception, in the second-class steam reserve, and it would be necessary to mast and rig them before sending them to sea. The expense of fitting them out would amount to £144,000.

Mr. HORSMAN said, a heavy responsibility would fall on any Government or Board of Admiralty that delayed one single day to strain an effort to place the country once more in a state of maritime security. Let the House consider the mischiefs of an interruption to our commerce and manufactures by the command of the Channel by any other naval power for two or three months. He would ask them whether any expense necessary for the improvement of the navy was not a mere trifle compared with the enormous consequences which would follow such an event as he had alluded to.

Mr. H. BARING hoped the right hon. gentleman would reconsider his dilatory promise as to the block-ships.

Admiral WALCOT hoped the First Lord would direct his attention to getting the ships now in the dockyards finished off as soon as possible. It was essential that the House should, before sanctioning any further expenditure for ships, be satisfied that the Admiralty would build ships on a plan that would ensure speed.

The House then divided on Sir C. Napier's amendment—the numbers were,—

Ayes	74
Noes	37
Majority against the amendment ...	—37

The Speaker then left the chair, and the House went into committee of supply.

THE ARMSTRONG GUN.

General PEEL, in moving the Army Estimates, after dealing with general questions, said:—There was one feature of which the House had heard a great deal—he meant the introduction of Sir William Armstrong's gun. It was impossible for any one to predict what would be the result of the general introduction of that weapon into our army. In the course of the summer he appointed a committee to examine and report upon the different sorts of rifled ordnance which had been submitted to the Government. The report of that committee was entirely favourable to Sir William Armstrong's invention. The gun submitted to the Government by that gentleman was a breech-loading, rifled, wrought-iron gun, of peculiar manufacture, throwing a projectile which answered as either solid or hollow shot, as shell, or as common case. This projectile could also be modified so as to be used by naval batteries and on board ships, and to have a very great explosive effect. The gun had great durability, he having himself seen one which had been fired 1,300 times without the smallest injurious effect being produced upon it. The great advantages of this gun were its extreme lightness, the extent of its range, and its accuracy. An Armstrong gun throwing a projectile of 18lb. weighed one-third as much as the guns now in use discharging shot of that weight. The range of a 32lb. gun, fired with a charge of 5lb. of powder, was a little more than five miles and a quarter, while the precision of the gun was still more extraordinary. The accuracy of the Armstrong gun at 3,000 yards was as seven to one compared with that of the common gun at 1,000 yards; while at 1,000 yards it would hit an object every time which was struck by the common gun only once in 57 times; therefore at equal distances the Armstrong gun was 57 times as accurate as our common artillery. Its destructive effect, also, exceeded anything which had hitherto been witnessed. The carriages had been very much improved, and their introduction into the navy would greatly diminish the number of men required to work the guns. Having ascertained the superiority of the gun, the Government could have no hesitation in at once doing everything in their power to make themselves masters of it. Great as had been the ingenuity and talent displayed by Sir W. Armstrong in regard to this invention, they were exceeded by the liberality with which he at once presented to the Government the patent, for which they must have paid almost any sum of money which he liked to demand. He made no stipulations, and when his noble friend at the head of the Government asked him (General Peel) to think of some sum which might be presented to Mr. Armstrong, he was at once relieved from all difficulty by that gentleman proposing to accept a sum of £20,000 spread over 10 years, which should secure to the country his services as consulting engineer of rifled ordnance. For himself, as he had said, he made no stipulations, but for the firm to which he then, but no longer belonged, he made this arrangement, that if they erected extensive buildings for the manufacture of these guns, and did not receive sufficient orders to cover their expenditure, an arbitrator, who should be the Attorney-General of the day, should decide what compensation they should receive from the Government for the capital which they had laid out. He was convinced that the House would be of opinion that nothing could be more liberal than the manner in which Sir W. Armstrong had dealt with the Government; and would think that he well deserved the honour which, by her own special and personal desire, had been conferred upon him by Her Majesty. The manufacture of some of the larger of these guns was now being proceeded with by Sir W. Armstrong's late partners; it was also the intention of the Government to make some of them at Woolwich under the direction of that gentleman, and when they had got some of the largest size they would be tried against masonry and earthwork, till which was done it was impossible to say exactly what effect they would produce upon fortifications. One thing he might predict, and that was, that sooner or later they would supersede the whole existing armament of the country. He was afraid that the hon. member for Lambeth must make up his mind to a large expenditure on that account; but he was sure that he would not grudge any money the expenditure of which would be for the benefit of the country.

Mr. SIDNEY HERBERT thought the Government deserve the utmost credit for their immediate adoption of this unequalled invention. There are persons who say that to embark in a large outlay for introducing a weapon which is likely to be in a short time superseded by something better is impolitic. My answer is, "Nations cannot afford to wait in the hope of securing this something better of which you speak." The late Emperor Nicholas entertained, I believe, the idea that some invention would soon be brought to light in the scientific world by which railways would be completely superseded, and delayed in consequence the construction of those useful works. But in the meantime he lost Sebastopol, owing to the want of a railroad to connect it with Moscow. I have heard it stated that however admirable for military purposes Armstrong's gun may be, there is some doubt as to its efficiency in naval warfare. The ground upon which that doubt is based is, that a narrow bullet projected with the greatest velocity is that which does least injury to a ship. It passes through, making but a small hole, raises few splinters, and kills a comparatively trifling number of men; while a shot of large calibre, and whose rate of velocity is slower, does infinitely greater damage. The point was one on which scientific men alone can form a sound judgment, but it is, I think, one well worthy of attention when the applicability of Armstrong's gun to sea as well as to land service is to be considered.

Sir J. TRELAWNEY said this gun might revolutionize the whole art of war, and it would be very undesirable to incur an expenditure upon fortifications which might turn out wholly useless.

General CODRINGTON rejoiced to hear that energetic measures would be adopted for introducing the Armstrong gun into the service. England should have at her command, at whatever cost, the most destructive warlike weapons that could be invented. Paradoxical as it might sound, the introduction of such a weapon as the Armstrong gun would tend to diminish the destruction of life, for the greater the range of our guns the less necessary was it to expose the lives of our soldiers.

General DE LACY EVANS said he admired the disinterested patriotism of Sir W. Armstrong in making over unconditionally his admirable invention, commended strongly the adoption by the Government of this great improvement, by ordering the immediate construction of as many of these cannon as could possibly be obtained, and then gave his opinion that the Government was quite right in entirely disregarding the possible contingency of subsequent improvements being proposed.

MONDAY, MARCH 7.

HOUSE OF COMMONS.

HIGHWAYS BILL.

Mr. T. S. DUNCOMBE said he hoped the Under-Secretary of State for the Home Department would consent to let this bill go through committee *pro formâ*, with the view of having the numerous amendments, of which notice had been given, embodied in the Bill.

Mr. HARDY said the Bill had been already postponed for three weeks. The amendments were but trifling, and he hoped the House would allow the Bill to proceed without further delay.

DOCKYARD OPERATIONS.

In the Committee of Supply, Sir J. PAKINGTON asked for a vote of £12,000, which he brought forward in consequence of the strong recommendation from the Surveyor of the Navy that additional shipwrights and other labourers should be engaged in the dockyards during the present month, with a view to the increase of the navy.

The vote was agreed to.

ORDNANCE.—THE ARMSTRONG GUN.—THE WHITWORTH GUN AND RIFLE.—FORTIFICATIONS.

In the same Committee, Mr. MACARTNEY asked what amount of iron ordnance the gun factory at Woolwich was able to turn out in the year.

General PEEL said nothing could be going on more satisfactorily than the gun factory at Woolwich.

Sir C. NAPIER inquired how many Armstrong guns were ready for delivery.

General PEEL replied very few, but a considerable number were in process of manufacture. Machinery was being prepared for turning out as many as possible during the next year, and the government were establishing a factory at Woolwich as well as in the north.

Mr. R. N. PHILIPS asked whether it was intended to vote any money for Mr. Whitworth.

General PEEL replied that the Whitworth gun was tried at the same time and by the same committee as the Armstrong. There was certainly some defect in it then, for it burst; but he believed that Mr. Whitworth had made some improvements in it since. That gentleman had requested that his invention should again be submitted to the committee, and it would assuredly have a fair trial.

General CODRINGTON said it was due to Mr. Whitworth, one of the most eminent mechanicians in this country, to mention that he had given his time and talents freely and without remuneration to the improvement of the rifle. Important as Sir W. Armstrong's cannon was, yet the perfection of the rifle was a matter equally important.

Mr. MONSELL asked whether the Government intended to proceed with fortifications without considering the probable effect of Sir W. Armstrong's wonderful invention upon the present system.

Sir F. SMITH had no doubt that the penetration of Sir W. Armstrong's guns was much more considerable than that of the old ordnance, but the effect upon field-works would probably only be, that instead of making the parapet 18 feet thick, it must be made 20 feet or 22 feet thick. But there were other questions involved.

Lord PALMERSTON trusted the Government would not suspend those works for the immediate defence of Portsmouth and Plymouth which had been thought necessary. Sir W. Armstrong's guns were not yet in use.

General PEEL said, the first thing he did when the merits of Sir W. Armstrong's gun were reported to him was to appoint a committee, including some naval officers, to consider what effect this gun would have upon the system of fortifications. Experiments were now going on. The largest gun hitherto made upon Sir W. Armstrong's plan was a 32-pounder, but Sir W. Armstrong proposed to make cannons of much larger calibre, longer range, and greater weight of projectile.

TUESDAY, MARCH 8.

HOUSE OF COMMONS.

ATLANTIC TELEGRAPH COMPANY.

The CHANCELLOR of the EXCHEQUER, in answer to Mr. Berkeley, said, it is not the intention of the Government to grant any exclusive privilege to any telegraph company.

ENFIELD ESTABLISHMENT.

In answer to Mr. Newdegate,

General PEEL said that a balance sheet, showing the total cost and total production of the Enfield establishment from the period of reconstruction in 1854, had been prepared.

COMBINATION OF WORKMEN.

Mr. DRUMMOND obtained leave to bring in a Bill to amend and explain an Act of the sixth year of the reign of King George IV., to repeal the laws relating to the combinations of workmen, and make other provisions in lieu thereof.

The Bill was brought in and read a first time.

EXTRAORDINARY TIMBER.—At the meeting of the Institute of Civil Engineers, Feb. 22, some specimens of timber recently imported from the North West Coast of America, were exhibited by Mr. G. R. Burnell. It was observed that the quality and dimensions of this timber, which came from near Vancouver's Island and the district bordering upon British Columbia and California, appeared to be such as to justify rather more than the passing notices hitherto given in the technical journals of the metropolis. There were now lying in the Commercial Docks between fifty and sixty logs of this timber, upwards of 100 feet in length, and measuring at least 22 inches on a side. There was one log in particular, which was 129 feet long, die square, perfectly straight and sound, apparently free from dead knots or shakes, and measuring 39¼ inches on the side at the middle of its length. At the butt end it was nearly 4 feet square; and at the taper end it was about 2 feet 4 inches square; and it contained 1,302 cubic feet, or upwards of twenty-six loads. No experiments had been made on the specific gravity, or on the strength of this timber; but from the manner in which it floated, it would appear that its specific gravity was about the same as that of yellow pine. The strength would appear to be equal to that of the best crown memel, if an opinion might be formed from the way in which some planks had been bent, and the conditions of elasticity indicated under such circumstances. For bridge-building, roofing, and scaffolding purposes, it was suggested that this North Western American fir would be of great value, on account of its length, and its remarkably uniform character. Some light spars of the same kind of wood, about 119 feet long and 15 inches diameter at the butt end, had also been imported from the same coast. The price of the very long spars was, at present, about six shillings per foot cubic; this was high, but no doubt it would hereafter be diminished. The price of ordinary lengths was nearly the same per foot cube as that of the best crown memel deals. Attention was directed to the number and closeness of the annular rings, which indicated that the trees were of slow growth; and it was thence inferred that the wood would probably be durable. It was suggested that it would be desirable to make some experiments of an authentic character on the properties of this timber.

GEOLOGISTS' ASSOCIATION.—Rooms have been taken for this association at 5 Cavendish Square, which will be open every Monday for members. The meeting for reading papers is the second Monday. There were thirty candidates for ballot at the last meeting.

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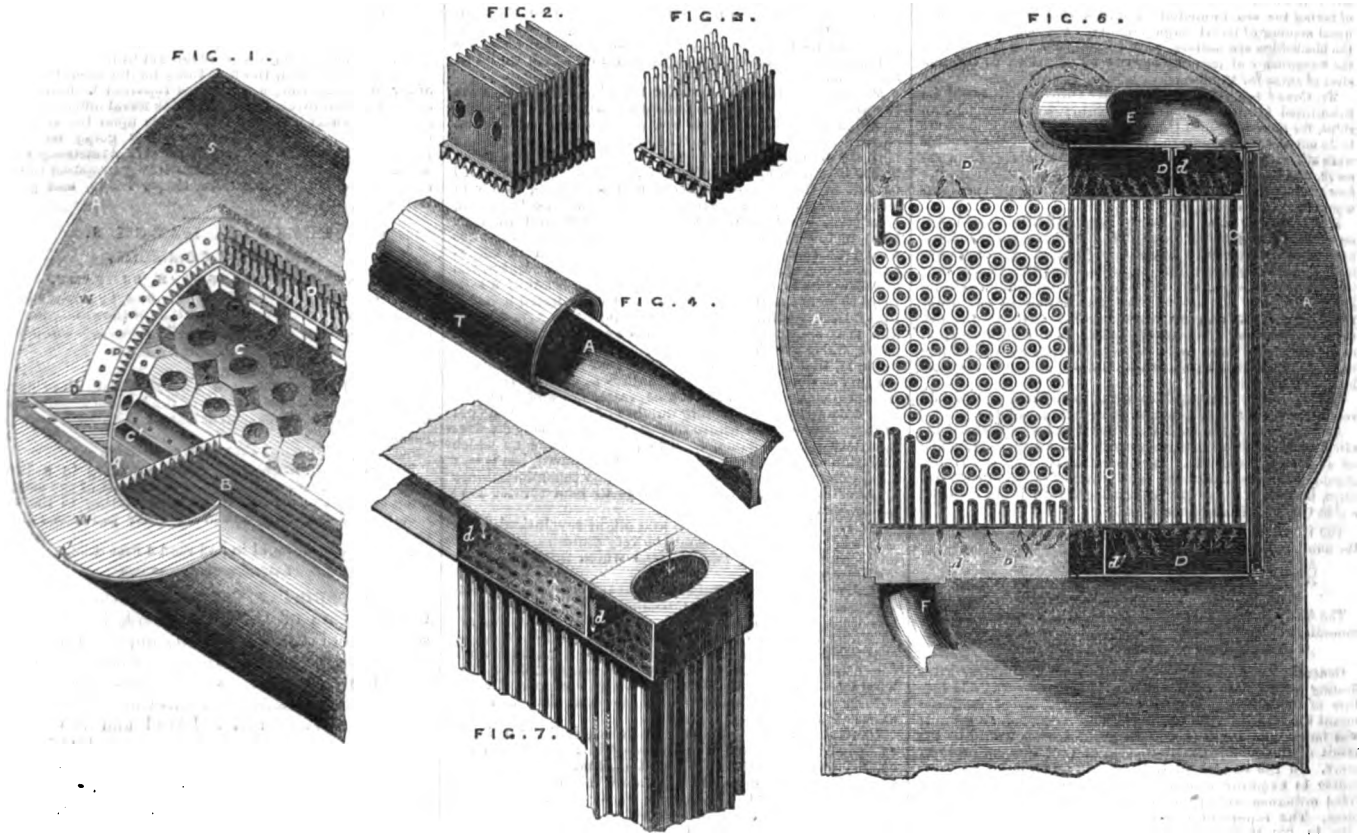
CONYBEARE'S PATENT APPARATUS FOR GENERATING, SUPERHEATING, AND CONDENSING STEAM.

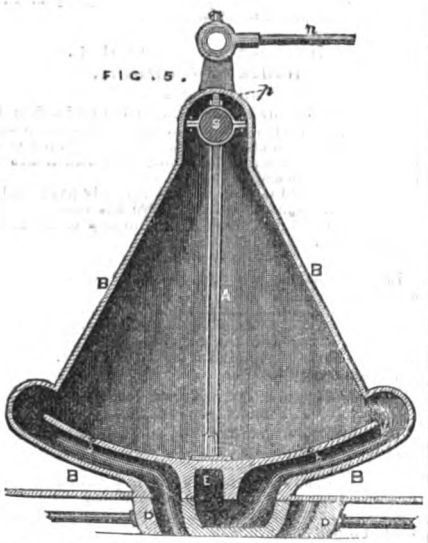


CONYBEARE'S PATENT APPARATUS FOR GENERATING, SUPERHEATING, AND CONDENSING STEAM.

Mr. H. Conybeare, C.E., has recently completed a patent for various improvements in apparatus for effecting the above object.

His invention consists, first, in the employment of removable heat-extractors and removable heat-distributors, whereby he increases the area and augments the efficiency, both of the heat-receiving and of the steam-generating surfaces of the boiler, without interrupting the continuity of the boiler plate, and thereby occasioning weakness and liability to leakage, and without obstructing the action of the scraper employed in cleaning the interior of the boiler of deposit. These heat-extractors consist of cellular or honeycombed surfaces of fire-brick or other suitable material, placed in immediate contact with the interior surface of the fire box or flues. The interior surfaces of the cells act as a continuation and extension of the metallic heat-extracting surface of the boiler in extracting caloric from the flame and heated products of combustion, and conducting and transmitting it to the boiler water. Where the flues are tubes of too small diameter to admit of the cellular lining of fire-brick above described, he arranges the heat-extractors so that the principal mass occupies the centre of the tubes, and is kept in its position by three or more projecting feathers —arranged like the feathers on an arrow—thus dividing the airway of the tubes into two, three, or more divisions, and thereby proportionately increasing the heat-extracting surface exposed to the escaping products of combustion. His removable heat-distributors he places in the interior of the boiler, and resting on and in immediate contact with the inverted surface of the metallic plate separating the boiler water from the furnace and the flues. These removable heat-distributors are made of metal or other suitable material, and so formed as to present a large heat-distributing surface to the boiler water without opposing any obstacle to the free circulation thereof.

Mr. Conybeare describes the following as the



best method with which he is acquainted of carrying this part of his invention into effect:—

Fig. 1 of the accompanying engravings is an isometrical perspective view of part of a furnace fitted with his improved heat-extractors and heat-distributors. This view is supposed to be taken from a point in front of and below the fire-bars, the under-sides only of which are seen. *A* is the inner, and *A'* is the outer shell of the boiler. *W* is the water, and *S* the steam space. *B B* are the fire-bars; *C C* the cellular or honey-comb heat extractors; and *D D* the heat distributors, several of which are shown separately in Fig. 2. These distributors are formed of a sole plate, from which rises a series of parallel leaves of metal as shown, which will offer no obstruction to the free circulation of the boiler water. Fig. 3 illustrates another mode in which they may be formed with advantage. Here they consist of a sole plate, from which rises a series of spikes or rods. The heat extractors are perforated both longitudinally and laterally, as shown, in order to allow the heat to penetrate them thoroughly and with facility. They are supported as shown at *C'*, Fig. 1. The heat-distributors, when formed as in Fig. 2, are likewise perforated to increase the facility with which the heat escapes from them to the water. They are supported as shown at *D'*, Fig. 1. In Fig. 4 is represented a view of the form of heat extractors which he applies to the tubes when the flues are too small to admit of the extractors before described. The heat-extractor *A* here has a turn in it, in order that the hot gases as they pass along through the tube T may be brought constantly into contact with the extractor.

Secondly:—The invention consists in the employment of improved forms of blowers, which he terms the quadrant and disc blowers, for providing the combustion chamber and flues above-mentioned with the amount of air required to perfect combustion, and thus enable the heat-extractors and heat-distributors to do their work in increasing the evaporative efficiency of the fuel employed.

His improved quadrant blower is illustrated in the transverse sectional view, Fig. 5. *A* is the piston, which is caused to vibrate about the shaft *S* by means of a rod *a*, leading from any suitable moving part of an engine, or otherwise, its vibrations being by preference synchronous with those of the engine. *B* is the casing, and *C* a fixed internal plate along which the packing of the piston moves. The piston is also packed above at the point *p*. *D* is a slide valve for alternately cutting off and establishing communication between the escape or blowing-passage, *E*, and the passages *b*.

The improved disc blower resembles the well-known disc engine in its general form and arrangement, and differs from it only in having either the surfaces of the disc or the conical surfaces covered with vulcanised india-rubber in order to secure efficient contact between them without considerably increasing the friction.

Thirdly:—The invention consists of apparatus for superheating steam in its passage from the steam-generating vessel to the working cylinder.

This part of the invention may be best carried into effect by the means illustrated in Figs. 6 and 7. Figure 6 is an end view partly in section of part of a locomotive boiler, with sets of vertical tubes for superheating the steam placed in rear of the ordinary boiler tubes. *A* is the boiler; *B B* are the boiler tubes; *C C* are the superheating tubes; *D D*, *D' D'* are steam cases into which these tubes open, and which, with the said tubes, are shown in perspective in Fig. 7. *E* is the steam pipe leading from the boiler to the superheating apparatus; *F* is the steam pipe leading from the apparatus to the cylinders of the engine; and *d d*, *d' d'* are partitions in the cases, *D D*, *D' D'*, respectively, for the purpose of causing the steam to descend the first set of the superheating pipes, ascend the second, descend the third, and so on until it escapes by the pipe *F*, as indicated by the arrows.

Fourthly:—The invention consists in fitting a valve or door at the throat of the outlet of the flue into the chimney for preventing (by its temporary closure) the cooling down of the furnaces when the fire door is open.

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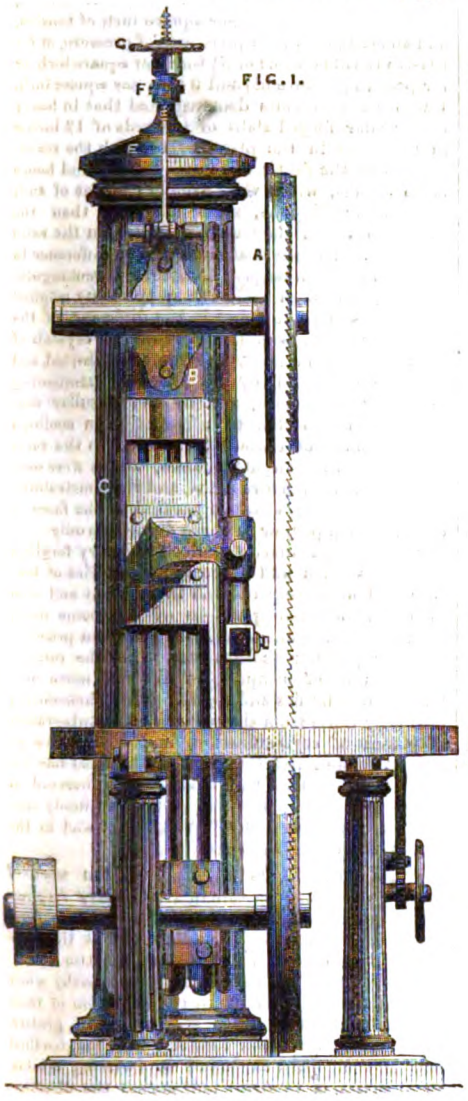
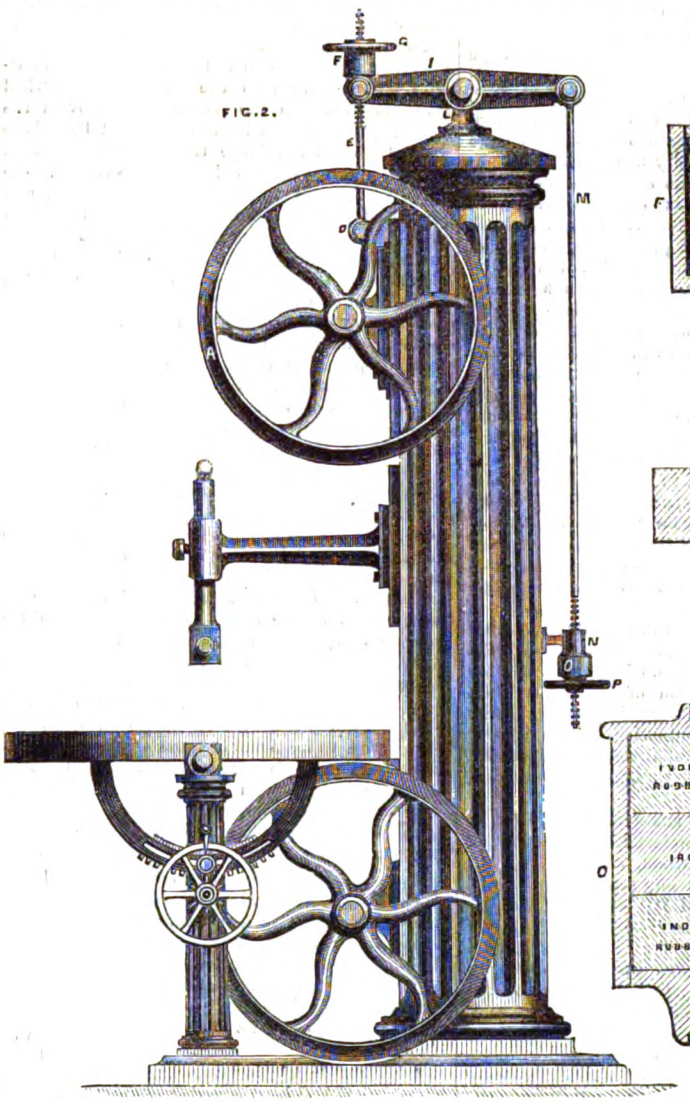
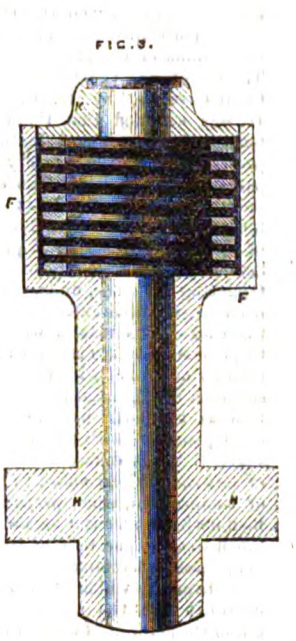
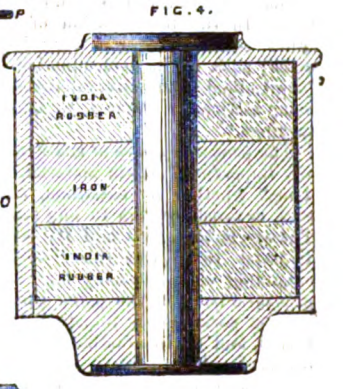
POWIS AND JAMES'S IMPROVED BAND-SAW MACHINES.









POWIS AND JAMES'S IMPROVED BAND-SAW MACHINES.

MESSRS. POWIS & JAMES, the well-known engineers, of Blackfriars-road, Southwark, are manufacturing band-saw machines, embodying a simple, but very valuable improvement. The object is to prevent the breaking or snapping of band-saws from any sudden strain, or otherwise, while at work, or from the cooling of the saws after ceasing to work; also, to allow of the ready adjustment of the bearings of the pulleys over which the saws are stretched.

According to one method of carrying the invention into effect, they connect to the bearing of the pulley over which the saw is stretched an upright rod or spindle, threaded at top. Over the thread or upper part of this rod they pass one arm of a lever, and adjust the rod to the height required by means of a nut, curved at bottom to suit any change of position in the lever, and to allow of the adjustment of the bearings of the pulley. Between the lever and the nut they sometimes place a box or other spring. The lever is centred upon a pin supported upon a pillar. The opposite arm of the lever is connected to a second vertical rod or spindle, the lower end of which is connected to a vulcanized rubber or other spring, and is carried down on the pillar, and is provided with a screw adjustment or not as may be deemed necessary. The bearing of the pulley before named being free to move up and down within certain limits, it follows that upon any strain upon or contraction of the saw, the spring will allow of the bearing yielding, and thus prevent the snapping of the saw.

The inventor of these improvements is Mr. H. Wilson, an engineer in the employ of Messrs. Powis and James. He does not limit himself to the precise arrangement of compound lever, with screw adjustment and spring compensation, or either, as just described, although he believes it best suited to the purposes of the invention; but he also secures the general method of so connecting the moveable bearing of a stretching pulley over which band-saws are stretched to a spring or springs, as to enable the saws to accommodate themselves to any sudden train, and to contract without snapping, whatever may be the particular arrangement of parts emsployed.

In the engravings annexed we have represented a machine in which a band-saw is mounted, according to the method of carrying the invention into effect which we have already described. Fig 1 is a front elevation, and Fig. 2 is a side elevation of the machine. *A* is the upper band-saw pulley, the bearings of which are bolted to the plate *B*; which slides up and down in a dove-tailed groove formed on the pillar *C*. The plate *B* has formed upon it the two lugs or projections *D*, between which is pinned the lower end of the rod *E*. The upper end of this rod is screw-threaded, and passes up through the spring box *F*, having screwed upon the top of it the pressure-wheel *G*. The spring-box *F* which is shown in section and enlarged in Fig. 3, is carried by means of the axes *H* in the end of the beam *I*, and is fitted with a helical spring, on which a loose cap, *K*, rests. The boss on the under-side of the wheel *G* fits into the cap *K*, and by turning the wheel round upon the threaded rod *E*, the moveable cover may be pressed down upon the spring, and the strain upon the band-saw be thus adjusted at will. The beam *I* is carried by brackets *L* on top of the pillar *C*. To the opposite end of it is pinned the upper end of the rod *M*. The lower end of this rod is screw-threaded and passes through a bracket *N*, fastened to the pillar *C*, and also through a spring box *O* and a pressure-wheel *P*. This spring box and pressure-wheel are fitted similarly, but in a reverse position to those already described. The spring, however, in this case consists of two rings of vulcanized india-rubber, one above and one below an iron ring, as shown in section in Fig. 4. With a machine thus fitted, when any excessive strain comes, however suddenly, upon the band-saw, the springs at the extremities of the rods *E* and *M* at once yield and prevent the breaking of the saw. The strain upon the saw may likewise be readily adjusted by turning either of the pressure-wheels as already explained. The saw is not shown in Fig. 2.

MR. BRUNEL has a great connection in the West. He is engineer to the Plymouth Great Western Docks, the South Devon Railway, the South Devon and Tavistock Railway, the Cornwall Railway, &c., &c. Voluminous are the reports issued from "18 Duke-street, Westminster." The Cornwall line is so far completed that a trip has been made over it to Truro, and the Royal Albert Bridge at Saltash is an accomplished fact. The expenditure on capital account amounted on the 31st of December last to £1,423,417. The end of April—or, say, May-day—will, it is expected, witness the opening of the undertaking (which has been twelve years on hand) for traffic. At the half-yearly meeting the speakers expressed great admiration of the Royal Albert Bridge, and of the successful manner in which Mr. Brunel had coped with the difficulties of the country. It was also stated that the bill for the construction of the Falmouth docks would, it was hoped, be passed early in the summer.

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WROUGHT IRON AND PUDDLED STEEL.

At the Institution of Civil Engineers, March 1, a paper was read "On the Co-efficients of Elasticity and of Rupture in Wrought Iron, in relation to the volume of the Metallic Mass, its Metallurgic Treatment, and the Axial Direction of its constituent Crystals," by Mr. R. Mallet, M. Inst. C.E. It was assumed that the two questions which formed the prominent feature of the author's present experimental inquiry had remained comparatively untouched. The conditions of manufacture and the resultant qualities had been hitherto too lightly passed over. In consequence of modern engineering requirements, masses of iron, of considerable magnitude, were produced by faggoting together, under heavy forge hammers, from large numbers either of bars, or slabs grouped together. The masses were not, however, found to possess ultimate strength in proportion to the number of bars of which they were composed, the strength of the mass became less in some proportion as the bulk became greater. The author dealt generally with three points of the inquiry, viz:—1. What difference did the same large bars of unwrought iron afford to forces of tension and of compression, when prepared by rolling, or by hammering under the steam hammer? 2. How much weaker, per unit of section, was the iron of very massive hammer forgings than the original iron bars of which the mass was composed. 3. What was the average, or safe measure of strength, per unit of section of the iron composing such very massive forgings, as compared with the acknowledged mean strength of good British bar iron. In the investigation of these questions, other subordinate, but very important points arose; such as the determination of the relative longitudinal and circumferential strength for equal sections of the iron, in massive cylindrical forgings.

The proper measure of the strength of iron, or any imperfectly elastic material, was the "work done," whether by extension, compression, rupture, or crushing, due to any force applied to it. The co-efficients Te and Tr were designed by Poncelet to express this "work done," by an extending or compressing force upon any elastic prismatic body, at the point where its elasticity became permanently impaired, and its form distorted, and at the further point where rupture occurred. It was shown that these co-efficients were the true measures of the safe and ultimate resistance of materials. The crystalline structure of iron was then considered, and quoting from the author's communication to the Royal Irish Academy (*Trans.*, Vol. 23, p. 1, 1855), it was shown to be a law that "Iron, whether in the state of cast or of wrought iron, has the principal axes of its integrant crystals arranged in the lines of least pressure within the mass." If consolidation from fusion took place undisturbed, as in cast iron, the principal axes would be arranged in the directions in which the heat-wave had passed outwards from the body in cooling, which would be perpendicular to its surface contour. The effects of rolling and of hammering masses of wrought iron of different contents were then treated of, and it was shown that what was termed "fibre" was the longitudinal extension of the principal axes of the crystals. The original development of these crystals, under the constraining forces due to change of temperature, &c., was, "cæteris paribus," proportioned to the time given for such development. Thus, in very large forgings, the crystals were generally extensively developed, in consequence of the length of time which the mass had been under the operations of heating and forging.

In order to fix the conditions of strength in wrought-iron under various circumstances, the author undertook to make experiments, under the authority of the Minister of War, and with the concurrence of the Royal Society, when making the forgings for the two 36-inch wrought-iron mortars constructed on his designs for the Government; he then selected specimens of iron, upon which the experiments of tension and compression were tried. The methods were then explained by which the specimens of iron were obtained from the large masses, and the apparatus was described by which the observations were made, when the specimens were undergoing the operations of extension and compression. In cutting and boring into the massive cylindrical forgings to obtain the pieces of iron from the various parts, it was invariably found that there existed, internally, large transverse rents, with jagged and crystalline irregular surfaces, the opposite faces of which were counterparts, and presented distinct evidences of having been torn asunder by contraction from the centre towards the circumference as the mass cooled. It appeared that this action was simply due to the contraction of the external shell, before the temperature of the centre had been perceptibly lowered; this in its turn was cooled, and in contracting produced these visible rents or fissures, and no doubt caused other minor dislocations which detracted from the general strength of the mass. This was evidently the cause of the difficulty of obtaining very large forgings of a cylindrical form quite sound. In solid cylinders, or conic frustra, it must occur *whenever the dimensions were such that the total amount of the contraction of the metal, in any one diameter, from its highest temperature down to that of the atmosphere, as fixed by the circumference of rigidity due to the outer cold shell, exceeded the limit of extension of the iron at rupture, due to the length of the diameter of the interior core, which cooled last.* This was the theoretic limit of size of forging beyond which internal rents must occur. The practical illustration was, that almost all cylindrical shafts of wrought-iron exceeding 12 inches in diameter, were found to have one or more of these rents in them, thus having their strength impaired. This reduction of strength was altogether distinct from any deterioration of quality of the metal, arising from its being alternately heated and cooled and hammered.

The remedy for this play of molecular forces was, to construct and work the large forgings hollow. This course had been pursued with success at the Mersey Iron Works, Liverpool. Both the internal and the external surfaces were thus cooled, and the extremes of internal strains were consequently avoided, and the hollow centre yielded more readily to the forcible compressive grasp of the exterior.

A minute description was then given of all the irons which had been experimented upon, divided into classes, and into the most analogous class was imported CLAY'S PUDDLED STEEL, a comparatively new material, which had been brought into this investigation for the purpose of comparison; and the results were such as promised to be of great practical importance. The general results were the separation of the several classes into two grand divisions: 1. The crystalline or sub-crystalline in fracture, which were always the result of manufacture by the hammer. 2. The fibrous or crystallo-fibrous, which were always produced by the rolling process, but which might be produced by careful and continuous elongation under the hammer. The very weakest wrought iron of all those experimented upon was found to be that cut transversely from the end of a very heavy cylindrical forging, which had been exposed to heat and percussion for nearly six weeks. Its weakness was not due to any metallurgical alteration in the constitution of the metal, but to the changes in its state of aggregation, induced by the process of forging, by the long-continued and unequal heating, and by the hammering. The conclusion deduced, by aid of certain numerical statements, was that practically the iron of very heavy shafts, forged guns, huge cranks, and other similar masses, might be expected to become permanently set and crippled at a trifle above 7 tons per square inch, and to give way by fracture at about 15 tons per square inch by tension, and to completely lose form at pressures of from 15 to 18 tons per square inch. Therefore it followed, that allowing a deduction of one-half, as sanctioned by practice, from the elastic limits of tension and of pressure, for the margin of safety, the iron of such forged masses should not be trusted, for impulsive strains, exceeding about 1¼ ton per square inch of tension, and about 4½ tons per square inch of pressure, or for passive tensile strains of 3½ tons per square inch, or for passive pressure beyond 9 tons per square inch. Further experiments demonstrated that in heavy rectangular forged slabs of upwards of 12 inches in thickness, in the plane of the slab the resistance to all the forces was much higher, and hence large cranks, which were usually cut out of such rectangular forgings, were stronger than the shafts to which they were attached, in the ratio of 8 to 6. The physical cause of the difference in strength between large cylindrical and rectangular forgings, although made from the same original material, was to be found in the difference of the molecular arrangement. The integral crystals of the cylindrical masses were strained, distorted, and partially separated, by the effects of hammering in various directions, and by the peculiar constraining forces due to contraction in cooling; whereas none of these forces acted to the same extent upon rectangular masses, which were only hammered in three directions, and the constraining forces of cooling were all parallel to the faces of the parallelopiped, or in three directions only.

A special peculiarity noticed in heavy forgings was the sudden and extreme inequalities of texture and of strength found in different and even in closely adjacent portions of the same mass, producing great uncertainty of result in practice. Another peculiar feature was, that the rates of extension or of compression did not move uniformly, but by fits and starts. This phenomenon obviously arose from the *per saltum* disintegration of planes of crystallization, and their more or less complete separation in a crystallized but yet ductile body. This had never been observed in fibrous irons, or in those in which the finely elongated crystals were all rolled parallel and in the line of the bar or the sheet.

Within the limits of practice, the work of passive resistance sustainable by heavy forgings was about one-half that of the faggot iron from which they were manufactured; but at the ultimate point of rupture they gave a better result. Heavy forgings were also more trustworthy when exposed to tensile strains in the direction of their length, or to transverse strains, as in girders, which ultimately were resolved into longitudinal strains, than when subjected to twisting strains, as in shafts, or to direct pull across the direction of length. These and other considerations induced attention to the apparently superior power of puddled steel to support the forces by which the ordinary forged masses of wrought-iron were fractured, especially as by the employment of smaller and lighter masses greater strength in shafts, &c., could be secured. One special peculiarity appeared to be, that in the heaviest pieces of this material the internal structure was as fine and close in the grain as it was in the smallest bar. The elastic limit was above that of the best wrought iron, and the elasticity was so much more perfect, that it might be trusted almost up to the elastic limit of about 15 tons per square inch, and in forged masses it possessed this strength nearly equally in every direction. Its extension (beyond the elastic limit) gradually enlarged up to the breaking point, which was often found to reach 48 tons per square inch.

Puddled steel appeared to combine the great strength of cast steel with the ductility and perfect elasticity of the best wrought iron. Its resistance to pressure was very remarkable, being more than double that of harsh crystalline wrought iron, and more than three times that of the best fibrous wrought iron in bars or plates. Thus it might be safely used under a passive strain or load, of 20 tons per square inch, after allowing a margin of one-half for security. Puddled steel would thus evidently become an important practical adjunct in the construction of machinery, in building vessels of light draught of water, and for artillery of the largest calibre. It

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possessed also the peculiarity of resisting corrosion much better than wrought iron plates, and thus had an additional value for shipbuilding. It was anticipated that it would ultimately be extensively employed for the boilers and even the fire-boxes of the locomotive boiler.

From this investigation nothing of a certain character could be concluded, as to any fixed relation between the strength and the specific gravity of the several sorts of iron experimented upon. the weakest irons—those from the heavy forgings—having generally the highest specific gravities, though always lower than their integrant faggot bars. Thus it appeared that specific gravity was a characteristic to which too great importance had hitherto been attached in relation to strength, both in cast and in wrought iron.

THE ARMSTRONG GUN.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—Having read in the *Times* of the 28th Feb., a detailed description of Armstrong's gun and projectile, taken from your Magazine, I beg to say that both are in all the most essential points complete copies of my gun and shot, which have been in the hands of the Government for upwards of 40 years, and that I am the original inventor. Some 45 years ago I invented a breech-loading rifled cannon (also small arms), and by direction of the authorities sent it to Woolwich for inspection, where it has remained ever since. I had a second 6-pounder gun cast, which remained at my own house till 1851, when I sent it to the Great Exhibition, and afterwards brought it under the notice of the late Duke of Wellington, who referred me to the Ordnance Office. In 1852 I laid the matter before the late Lord Raglan, who personally expressed himself highly pleased with the model, and directed me to send the gun itself to Woolwich to be examined by a board of officers. All this was done and the principle of my gun approved of, but the Board declined to recommend the Government to make a large gun and test the matter, although I offered to pay the cost if it failed. From this you will see that I have at this moment two breech loading rifled cannon at Woolwich, one of which has been there for forty years and the other since 1852, both of which may be seen by Mr. Armstrong or any other person. The chamber in my gun being a shade larger than the rest of the bore, the shot cuts its way out, and for this purpose my shot (samples of which are at Woolwich in the guns) are made of iron cased with lead. After loading, the breech in my gun is closed by a cast steel breech-piece, worked by a lever with the greatest facility, and prevents all escape of gas. I have also at Woolwich the model of a gun, showing how ordnance can be greatly increased in strength, and yet reduced to about one-half the usual weight of metal. This I accomplished differently from Mr. Armstrong. While he uses a steel tube and iron bands, I use an iron tube and steel bands, which being driven on to the gun red hot, contract and increase the strength twofold. I may also add that my guns are fitted with a bullet-proof screen, such as suggested by Captain Coles in the *Times* of the 28th February. This screen completely covers the gun, and protects the gunners from all danger. I have also invented a hollow lead shot (also at Woolwich) which possesses great advantages over the ordinary iron in naval warfare. When it strikes it flattens to some extent, and not only makes a hole double the original size of the shot, but instead of cutting a clean hole through a vessel which can be easily filled up, it tears the wood into splinters. I beg to apologise for the length of this letter, but as you have been the means of giving such extensive publicity to Mr. Armstrong's gun, &c., I hope you will in fairness accord me a similar space in your Magazine for this communication,

I am, Gentlemen, your obedient servant,

J. C. DANIELL.

Limpley Stoke, Bath.

LONDON FIRES IN 1858.

TWENTY-EIGHTH ANNUAL REPORT.

By Mr. WM. BADDELEY, *C.E., Inventor of the Portable Canvas Cisterns, Farmers' Fire-engine, Improved Jet-spreaders, &c.*

"The statistics of London fires are by no means devoid of interest, and the time may come when they will form an index to the social advancement of the people; for, in proportion as houses are built more and more fire-proof, and habits of carefulness become more and more diffused, the number of destructive fires will assuredly lessen."—*Knight's London.*

(*Continued from page* 154.)

AMONG the causes of fire the great number of accidents arising from the use of gas is very remarkable, and is a standing disgrace to the science of the age. And not only have these accidents been numerous, but in many cases serious, and in some fatal. A large proportion of these accidents have arisen from the hydraulic joints of gaseliers, and it is greatly to be desired that some efficient substitute for this simple and beautiful contrivance could be hit upon: for so long as water will evaporate, and people will forget to replenish, mischief will continually arise, and when gas and atmospheric air combine in due proportions an explosive compound is produced of the most destructive character.

A very serious explosion of gas took place at *Bell's Life in London* office, in the Strand, in July last; the street mains were being relaid and an escape of gas therefrom entered the cellar; in taking down a light a terrific explosion took place, by which two persons were very seriously injured.

In September the inhabitants of Haggerstone were alarmed by a tremendous explosion taking place at the Independent Gas Works. It appeared that a great escape of gas took place from the mains in the valve or regulating shed, and before any attempt could be made to stop the defect, the gas rushed into the smiths' shop where it ignited, and a fearful explosion was the result, five of the workmen being severely injured.

On the 14th of September an explosion of gas took place at the residence of Colonel Greville, Albert-gate, Knightsbridge, by which three persons were seriously injured; one of whom died after lingering three weeks in great agony. At the coroner's inquest the evidence went to show that the premises had recently been supplied with gas, the fittings having been put up by Mr. Edward Lewis, of Churton-street, Pimlico, under the superintendence of Mr. Joseph Wheeler, of Smith's-place, Chelsea, foreman to the gas company. The was a burner in a strong room on the basement floor, and there appears to have been an escape from some part of the fittings, of which the above-named parties were cognisant, and directed that the door of the strong room should not be closed. Why the defect was not remedied, and this caution rendered unnecessary, did not appear; the caution, however, was disregarded, and Elizabeth Bumplin, housemaid in the establishment of Colonel Greville, going to the closet with a light, an explosion took place, by which she was fatally and two other female servants seriously injured. After hearing the evidence the jury returned a verdict of "Accidental death," and considered that great blame attached to the gas-fitter.

Unextinguished tobacco thrown carelessly about is known to have occasioned no less than 41 fires last year, several of them of a serious character. A fire from this cause took place in February last at No. 13 Young Street, Kennington, by which the front drawing-room and contents were seriously damaged by fire and smoke, but the fire was unperceived by the inmates, and was self-extinguished during the night by its own smoke. The mismanagement of candles continues to prove a fruitful source of mischief; 251 of these accidents have been recorded during the year. Flues in various ways have caused nearly a hundred fires. Gas numbers 131. 47 fires are known to have been wilfully occasioned, and 29 are strongly suspected to have been so. With reference to this matter a writer recently observed that, "while over a hundred millions sterling are in what may be called Vulcan's London Market. it is no wonder that numerous ardent suitors will present themselves from time to time, eager to touch a part of this vast dowry for arson. It is true that the intention is only to convey the portion to legitimate suitors, but where the interests are so large, and the false appearances differ so little from the real, it is very difficult to maintain a just discrimination. In other and less sentimental words, where a hundred millions of money are put down, in the metropolis alone, as a premium for fires, it would be strange indeed if fires did not occur. The temptation is very great to a dishonest man to set his dwelling on fire, and the opportunities are almost complete. Every man's house is his castle, and within this fortress he can generally do what he pleases. The amount of property within its walls, and the combustable materials he may have collected there, are not easily proved, when both have been wholly consumed. The initiated in matters of this kind tell us, that the number of really accidental fires is a mystery whose exposition had better not be attempted. We have no desire to lift the vestal veil. Indeed it is altogether a very delicate affair. The recent trial of Mr. Roper, of Greenwich, shows how almost impossible is the solution of the problem of what is, or is not, an *accidental* fire."

The following tabular analysis exhibits in each instance the occupancy of that part of the premises in which the fire originated, illustrating the relative liability to fire of various trades, manufactories, and private dwellings:—

OCCUPATION.	Totally destroyed.	Seriously damaged.	Slightly damaged.	Total.
Apothecaries, no laboratories	...	5	7	12
Bakers	...	3	9	12
" Sea Biscuit	...	...	1	1
Barge and boat builders	1	2	...	3
Beer-shop keepers	...	4	5	9
Booksellers, binders and stationers	...	10	8	18
Brewers	...	1	1	2
Brokers and dealers in old clothes	1	10	7	18
Builders	3	3	5	11
Butchers	...	3	5	8
Cabinet makers	...	16	14	30
Cane dyers	...	3	...	3
Carpenters and workers in wood	2	23	26	51
Carriers	...	1	1	2
Chandlers	1	5	7	13
Charcoal and coke, dealers in	...	2	1	3
Cheesemongers	...	1	1	2
Chemists, manufacturing	...	3	1	4
Churches	...	2	2	4
Coach makers	...	2	4	6
Coal merchants	...	2	1	3
Coffee roaster	...	...	1	1
Coffee-shops and Chop-houses	...	8	5	13
Colour makers	...	1	1	2
Confectioners and pastry-cooks	...	1	4	5
Coopers	...	3	2	5
Cork-cutter	...	1	...	1
Corn-chandlers	...	7	1	8
Curriers and leather-dressers	...	...	3	3
Distiller	...	...	1	1
" Tar	1	...	2	3
Docks	1	1	...	2
Drapers, linen, woollen, and mercers	2	29	28	59
Druggists, wholesale	...	1	1	2
Eating-houses	...	1	2	3
Engineers, mechanical	...	2	2	4
Fancy box-makers	...	1	2	3
Farming-stock	...	4	...	4
Feather merchant and dresser	...	1	...	1
Firework makers	1	2	...	3
Founders	...	1	2	3
Furriers and skin-dyers	...	2	...	2
Gas works	...	2	...	2
Grocers and tea-dealers	1	9	9	19
Hat makers	...	7	4	11
Hospitals	...	2	...	2
Hotels and club-houses	...	...	7	7
Ice-merchant	...	...	1	1
Japanners	1	4	...	5
Laundresses	...	1	4	5
Leather (patent) manufacturer	...	...	1	1
Lucifer match makers	...	2	1	3
Marine stores, dealers in	...	4	8	12
Mast and block maker	...	...	1	1
Mattress maker	...	1	...	1
Milliners and dress makers	1	6	7	14
Musical instrument makers	...	2	2	4
Nurseryman	...	...	1	1
Oil and colourmen	...	2	7	9
Oil works	...	...	2	2
Orphan asylum	...	...	1	1
Carried over	16	209	219	444

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Occupation.	Totally destroyed.	Seriously damaged.	Slightly damaged.	Total.
Brought forward	16	209	219	444
Painted baize manufacturers	1	1	1	2
Paper stainers	...	1	1	2
Pawnbrokers	...	1	1	2
Photographists	...	3	1	4
Pipe maker	...	1	...	1
Plumbers, painters, and glaziers ...	...	1	1	2
Potteries	...	1	1	2
Printers, letter-press	...	1	7	8
,, copper-plate	...	...	1	1
Printing-ink manufacturer	...	...	1	1
Private dwellings	4	55	302	361
Public building (Gen. Post Office)	...	...	1	1
,, place (Anatomical Museum)	...	...	1	1
Rag merchants	1	5	3	9
Railways	...	4	1	5
Rope makers	...	2	3	5
Sail makers	2	1	...	3
Sale shops and offices	1	16	34	51
Saw mills, steam	...	3	1	4
Scale-board cutters	...	2	...	2
Ships	...	1	2	3
,, steam	...	1	...	1
Ship chandlers	...	1	1	2
Schools	1	3	1	5
Soot merchant	...	...	1	1
Stables	...	8	13	21
Straw-bonnet makers	...	2	1	3
Sugar refiner	...	...	1	1
Tailors	...	11	8	19
Tanners	...	1	3	4
Tarpaulin maker	...	1	...	1
Theatre	...	...	1	1
Timber merchants	1	4	1	6
Tinmen, braziers, and smiths	...	5	10	15
Tobacconists	...	7	5	12
Toy shops	...	...	2	2
Under repair or building	3	1	1	5
Unoccupied	1	2	11	14
Upholsterers	...	2	...	2
Varnish makers	...	2	1	3
Victuallers, licensed	1	15	42	58
Wadding manufacturer	...	1	...	1
Warehouses	...	2	1	3
,, Manchester	...	3	1	4
,, foreign fancy	...	...	2	2
Waterproof canvas maker	...	...	1	1
Weavers, mat	...	1	3	4
,, trimming	...	1	...	1
Wharfs	...	2	...	2
Wine and spirit merchants	...	2	2	4
Workshops, not hazardous	...	...	2	2
Total	32	385	697	1114

(To be concluded in our next.)

ASSOCIATION OF FOREMEN ENGINEERS.

On Saturday night last the ordinary monthly meeting of the Association of Foremen Engineers took place, and after four new members had been elected, and the usual routine business was disposed of, Mr. Joseph Newton, Chairman of the Society, proceeded to read his promised paper on the "Influence of mechanical science and mechanical men on the age in which we live." As this was the first occasion on which Mr. Newton had conducted the duties of the office to which he had been recently elected, the paper, to a great extent, might be called an inaugural address. In it the progress of mechanical inventions during the first half of the nineteenth century was very fully traced, and the mighty power exercised in the world by mechanical science at this hour was lucidly demonstrated. The unparalleled advantages which England possesses in her rich stores of mineral wealth, and which tends to make it the school of the mechanical arts, the author also referred to, and said that the very formation of the land—its geological formation, that is—made it of necessity the world's workshop. The persevering industry of the sturdy workers who converted the raw material which Providence had so largely scattered around us into finished machines and apparatuses for the comforts of mankind, was next noticed; whilst the necessity which unhappily exists for the diversion of so much scientific ingenuity and mechanical skill to the preparation of warlike implements was deeply deplored. Our space, however, will not permit us to extend the notice of Mr. Newton's interesting paper, which was well received by the numerous and intelligent audience who listened to it, and which now drew forth a vote of thanks at its conclusion.

We may say that a feeling allusion was made during its delivery to the fact that employers had not as yet extended that amount of sympathy to the Association which might have been expected, and which was ardently desired by its members. Mr. Newton trusted that the day was not distant when they would number many heads of firms as honorary members, for their interests were all quite identical, and they—the members of the Association—discussed no questions of which employers might not have complete cognizance.

It was announced that Mr. Keyte would read a paper on that evening month, on "The best mode of producing heavy castings in iron," and the sitting came to an end.

THE ENGINEERS OF THE ROYAL NAVY.

The following memorial comes to hand as we are on the point of going to press. We most willingly give it insertion, but must necessarily defer any remarks we may have to offer upon it until next week:—

"To the Lords Commissioners of the Admiralty for Executing the Office of Lord High Admiral of the United Kingdom of Great Britain and Ireland.

"*The Memorial of the Inspectors of Machinery Afloat, Chief and Assistant Engineers of the Royal Navy.*

"Humbly Sheweth—

"That your Memorialists have not the same privileges extended to them as Officers of corresponding rank, viz.: Deputy Inspectors of Hospitals, Masters, Surgeons, and Paymasters, inasmuch as these Officers are allowed to retire after a certain number of years and with superior rank.

"That your Memorialists would beg to bring before your Lordships' notice the fact of First Class Assistant Engineers being appointed in charge of Ships bearing Captains and Commanders, although these Ships have a Master, Surgeon, and Paymaster; this necessarily keeps Chief Engineers on half-pay, and at the same time prevents the possibility of Assistant Engineers getting their promotion after a reasonable time. Upwards of 96 First Assistants are now serving, whose period of service exceeds ten years. The average period of Senior First Assistants now employed is about 13 years, dating from the first entry into the service as Engineers; and from the rate of promotion for the last two years it will take from 20 to 25 years before the whole of the present First Class Assistant Engineers can possibly obtain their promotion.

"That part of the Second Masters' time served, and the whole of the Assistant Surgeons', is allowed to count when promoted, whereas your Memorialists only date from the time of their being made Chief Engineers, although a great number were First, Second, and Third Engineers for many years previous to the Regulation of 1847. First Class Assistants also, when promoted on the present scale to Chief Engineers, have none of their time allowed.

"Your Memorialists would likewise beg to represent that there is no pension allowed to the widows of First Assistant Engineers, as is the case with Assistant Surgeons, after 10 years' service, although the various changes of temperature to which Engineers are subjected, as also the great physical exertions required in the performance of their duties, cause a much greater wear and tear of constitution, and, therefore, more deaths in proportion, than with any other class of Officers.

"Your Memorialists humbly trust, that the importance of the Steam Branch of the Service is such as will induce your Lordships to take their case into your favourable consideration, and, as in duty bound your Memorialists will ever pray, &c."

LIST OF NEW BOOKS.

Bakewell's Man. of Elec., 3rd edit., 3s. 6d.
Bohn's Scien. Lib.: Index of Dates, Part II., 5s.
Boole's Differential Equations, 14s.
Encyc. Britan, 8th edit., by Traill, Vol. XVII., 24s.; Vol. I. re-issue, 24s.
Maxwell's Essay on Stab. of Motion of Saturn's Rings, 6s.
Notcutt's Hand-book of Microscope and Microsc. Obj., 2s.
Parkin's Caus. and Prev. of Disease, 5s.
Petermann and Milner's Atlas of Phys. Geog., 15s.
Phillips's Manual of Metallurgy, 3rd edit., 12s. 6d.
Ramsay's Geol. Map of England and Wales, 25s.
Riddle (J.) On Navig. and Naut. Astron., 7th edit., 7s.—Tables, 4s. 6d., cl.
Riddle's Navigation and Nautical Astronomy, 7th edit., 2 vols., 11s. 6d.
Rouse's Practical Man, with Tables, &c., 8th edit., 8s. 6d.
Taylor's Builder's Price-book, 1859, 4s.
Todhunter's Plane Trigonometry, 5s.

New Army Blank Cartridge.—The General Commanding-in-Chief has sanctioned the adoption of a new pattern blank cartridge, proposed by the Superintendent of the Royal Laboratories, for assimilating the method of loading with blank to that of loading with ball cartridge, and cartridges of this description are now ready for delivery. They are composed like, the service ball cartridge, of an inner bag, containing the powder; mock bullet, consisting of a paper bag, with a muslin bottom, filled with fine grain powder; and an outside bag to contain both. To insure the flash of the discharge igniting the powder in the mock bullet, and to prevent its being projected from the musket entire, a portion of the bottom of the outside bag is cut away. No portion of the paper requires to be torn off.

NOTICES.

We have thought it advisable to dispense with the "Notes" of our Country Correspondents, replacing what was most valuable in them by a column or two of Gossip, by which means we shall gain more space for the mass of scientific matter which every week presses for publication. None of our readers will, we believe, disapprove of the change.

The Mechanics' Magazine will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to E. A. Brooman, at the Post Office, Fleet Street, London, E.C.

The demand for Mr. E. J. Reed's paper—

On the Modifications which the Ships of the Royal Navy have Undergone during the Present Century, in respect of Dimensions, Form, Means of Propulsion, and Power of Attack and Defence,"

has been so great that the Journal of the Society of Arts, the Mechanics' Magazine, and all other Scientific Journals in which it appeared in December last, are now out of print. The demand still continuing, it has been deemed desirable to reprint it in a separate form. An 8vo. edition of it, in large type, and on fine paper, has, therefore, been prepared, and may now be had at the Office of this Magazine, price 1s.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of insertions less than 13; for 13 insertions, 4d. per line; and for 52 insertions, 3d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

OUR WEEKLY GOSSIP.

The death of Mr. Thomas White, the founder of the dockyards at Cowes, Isle of Wight, is announced. Mr. White is succeeded by his sons, Messrs. J. and R. White, who at present employ about 400 men and apprentices. The deceased gentleman was in his 86th year.

It is stated that the Harbour of Refuge Commissioners, in their forthcoming report, will recommend two Scottish Ports—Wick and Peterhead—as desirable points for the expenditure of some of the public funds. The Commissioners are said to be prepared to recommend, on these and some Irish and English ports, an outlay of £2,000,000.

The ceremony of opening the "Tyne Docks," at Jarrow Slake, which have been constructed by the North-Eastern Railway Company, has taken place with becoming pomp. The piece of plate voted by the Directors, with £1,000, as a testimonial to Mr. Harrison, the engineer, was presented at the dinner.

Glycerine, though comparatively a new discovery, is most extensively used in the arts; and scarcely a month passes without developing some new mode of application, confirmatory of its value. The spent lees of the soap makers (from neutral fats) contain on an average fully 2 per cent. of glycerine, 1½ per cent. of soda, and 8 per cent. of common and other salts. By a process just patented by Mr. Reynolds, a London chemist, the glycerine can be separated from saline and other matter at a very trifling cost, the expense of the process being in some instances covered by the value of the regained salts.

At the risk of wearying some of our readers with the incessant sound of guns, we must, we presume, jot down the current gossip respecting them. The steam-transport *Contest* has just landed at Woolwich pier 16 heavy siege guns manufactured by the contractors at the Lowmoor works. A similar number has been disembarked weekly from the same firm for many weeks past, together with a corresponding number from other contractors. None of the guns cast in the standard foundry of the Arsenal have been issued for service. They are ordered to be retained for experimental purposes.

Sir William Armstrong's gun—over which the Woolwich officials continue to make themselves excessively ridiculous—was brought out again on Monday in the Royal Horse Artillery square for

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drill practice. The entrances to the square were strictly guarded by extra sentries and non-commissioned officers of the corps, who were ordered to exclude, without exception, all persons not wearing the uniform of officers of the garrison. At the termination of the drill the gun was restored to its temporary shed and secured from observation and inspection by lock and key. "A party of Engineer officers proceeding to the literary and scientific institution of the garrison were informed," says the *Times*, "by the sergeant on special duty at the gate that they could not be allowed to pass. He, moreover, added that the General himself would not be admitted out of uniform. These restrictions are sanctioned by the commandant of the garrison." Sir William Armstrong will begin, we fear, to lament his share in all this contemptible child's-play.

Mr. John Anderson, F.R.S., inspector of machinery to the War Department in Woolwich Arsenal, has been very judiciously appointed assistant-engineer of rifled ordnance, to carry out, in conjunction with Sir W. Armstrong, the manufacture of the new guns for the Royal Artillery. Mr. Anderson, whose scientific direction of the machinery department of the Royal Arsenal has been marked by various productions for which he was most liberally rewarded by Government grants and otherwise, was a short time ago presented with a compensation of £3 000 by the Council of the Board of India for his invention in the manufacture of leaden bullets. He is a very fit man for the new appointment. More civilian appointments are also spoken of as about to take place in the Laboratory and the other manufacturing departments of the Arsenal.

Accounts continue to reach us of successful experiments with Sergeant Warry's breach-loading cannon. We examined this gun at Brompton a few days since, but found it advisible to defer giving a detailed description of it for a few weeks. On the same day we had the satisfaction of being shown over the model-room and libraries of the Royal Artillery at Brompton, by colour-sergeant Clark, whose soldierly courtesy was only to be equalled by his intelligent acquaintance with the admirable collection of models and books there brought together. The reading-room, which the non-commissioned officers of the force have fitted up for themselves, is an exceedingly pleasant apartment. In that apartment, curiously enough, we first observed that the *Times* had reproduced our remarks on the Armstrong gun, thus giving them to that vast military class which a scientific journal can hardly hope to reach. We were gratified to learn—and indeed to observe for ourselves—that Colonel Sandham, the gallant chief officer of Artillery at Brompton, took an unaffected interest in the educational appliances with which the officers and men under him have been furnished.

On Tuesday week a lecture was delivered at the United Service Institution—Major-General S. Stanhope in the chair—by J. Macintosh, Esq., "On the Use of Combustible Materials in the New Strategies of War." The lecture was a statement of those devices with which our readers are now familiar as forming Mr. Macintosh's new system of warfare. It was attended by the Earl of Shrewsbury, Lords Overstone, Ingestre, and Ranelagh; Lieut.-General Sir W. Codrington, K.C.B., General Cannon, Vice-Admiral Ryder Burton, Major Farrell, Captain Stopford, R.N., and many members of the naval and military professions.

It is difficult to see what will be the end of the dispute about the dams in the Nene. Some eminent members of the Chancery bar are reported to have expressed an opinion that the members of the acting committee of the Nene Valley Commissioners are personally liable for the repayment of £37,000 alleged to have been misappropriated in the execution of works in the upper division before the works in the lower division of the river were completed. It is stated that actions are about to be commenced against the Commissioners on behalf of the individuals who were imprisoned on warrants, on a charge of felony, for removing the dam at Waldersea, after the local magistrates had made an order for its being taken away.

With reference to the Plymouth Great Western Docks, it may be interesting to give the following particulars. The Milbay pier, which was the first portion of the work constructed, projects from the extreme eastern point of the harbour of Milbay, with a water frontage of 400 feet, and is from 40 ft. to 90 ft. wide. Coal stores are erected on a portion of this pier, adapted to supply steamers with coals with despatch, and the depth of water at the pier is from 18 ft. to 40 ft. below low water spring tides. Within the pier—about 100 ft from it and sheltered by it—is an iron pontoon, 300 ft. long and 40 ft. wide, with a depth of water from 12 ft. to 24 ft. below low-water spring tides. The stores of this pontoon are capable of containing 4,000 tons of coal, and this portion of the harbour is employed in the accommodation of steamers. There is a large inner or floating basin at the extreme end of the bay, containing an area of 13 acres of water, surrounded by spacious quays. Within the floating basin, at the south-western end is a graving dock, 367 ft. long.

The new telegraph line to the Continent, by way of Cambridge and Norwich, is not yet in operation, but is being actively carried out. At Newmarket, the wires are carried underground through the town, and also on each side of it for nearly a mile.

The latest bit of gossip that has reached us is to the effect that Sir William Armstrong applied, two days since, for another patent for improvements in the construction of cannon and projectiles. We refrain, at this early stage of his protection, from hinting even at the nature of the improvements. In due time, however, they shall be produced. The application has been made rather with the view of preventing others from interfering with Sir William's proceedings, than with that of securing privileges for the inventor.

GRIFFITHS' SCREW PROPELLER.—Mr. Griffiths writes as follows:—"Mr. Isherwood in his 'Engineering Precedents for Steam Machinery,' as quoted by you in your number for Feb. 18, seems to labour under the delusion that by rounding the corners of a common screw propeller, and providing it with a spherical boss, he has made a Griffiths' propeller. This also seems to be a prevalent error in this country, and is the plan frequently followed to evade my patent rights. They are, indeed, infringements, worse than useless as regards the perpetrators, but damaging in their effects to me, as they are calculated to give an erroneous idea as to my propeller and its capabilities. The result of these alterations is to destroy the common screw, without gaining any of the advantages to be obtained from the use of my patent screw propeller, in which the broader part of the blade is placed near the boss, at which place the blade of the ordinary screw is reduced to its smallest proportions. A reference to No. 5 of your New Series, where my screw is figured, will show your readers that what I state is correct. Careful experiments have convinced me that the centre of the screw is the most effective propelling part. In the abortions made by cutting away the common screw my propeller is merely caricatured, as forms are distorted in shadows.—ROBT. GRIFFITHS, 69 Mornington-road, Regent's-park, N.W., March 3, 1859.

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated December 18, 1858.

2898. I. Ketchum, of Liverpool, Merchant. Improvements in the method of roasting meat, poultry, game, by basting the same, and in the method of manufacturing the necessary apparatus for so doing.

Dated January 22, 1859.

200. L. A. Drouin, of Paris, Joiner. Improvements in covering joinery work with metals or metallic alloys, and apparatus for the purpose.

Dated January 29, 1859.

270. J. J. A. de Bronac and A. J. M. Dcherrypon, Civil Engineers, of Paris. A new or improved process for treating metallic sulphurets, phosphurets, arseniurets, antimoniurets, and particularly sulphuretted ores of lead, antimony, copper, silver, zinc.

Dated February 1, 1859.

284. R. Needham, of Dukinfield, Engineer. An improved water-gauge for steam-boilers.

Dated February 5, 1859.

336. T. R. Averst, of Newenden, Kent, Book-keeper. Improvements in breech-loading guns and other fire-arms. A communication from J. H. Sears.

Dated February 8, 1859.

353. W. Waller, of Chesterfield, Mechanical Engineer. Improvements in agricultural or farm implements or apparatus. Partly a communication from W. Rogers.

Dated February 9, 1859.

368. G. Bower, of Saint Neot's, Huntingdon, Gas Engineer. Improvements in apparatus for the manufacture of illuminating gas.

Dated February, 10, 1859.

376. W. A. Covert, of Long Island, New York. An improved self-acting railway switch. A communication from C. L. Spencer.

Dated February 11, 1859.

386. H. Bruce, of Currie, Midlothian, Paper Manufacturer. Improvements in apparatus for the manufacture of paper.

Dated February 12, 1859.

396. C. R. Moate, of Old Broad-st., Metal Broker. Improvements in the manufacture of nuts, screw bolts, spikes, and other headed fastenings. A communication from J. Gibbs, of Alexandria.

Dated February 15, 1859.

417. C. L. Roberts, of Clerkenwell. The manufacture of an improved cigar.

419. F. Walters, of Sheffield. The application of the waste heat from puddling furnaces.

421. J. Paterson, of Wood-st., City, Manufacturer. Improvements in brace buckles and loops, and in braces.

423. G. Bedson, of Manchester, Manager. Improvements in joining wire for telegraphic and other purposes.

Dated February 16, 1859.

424. J. F. Tourrier, of Manchester-st., Manchester-sq. Preventing oscillation of the last carriage of a railway-train, and giving rigidity and steadiness throughout the train.

425. M. Crawford, of Liverpool, Ship Chandler. An improved anti-fouling metallic varnish applicable to ships' bottoms and other similar purposes.

426. S. Bailey, Mining Engineer, of Wednesbury. Certain apparatus for preventing the skip in mine operations being pulled over the pulley on which the rope or chain works, to which such skip or cage may be attached, as well as preventing the skip or cage re-descending until put in motion for that purpose.

427. R. Cookson, of Layton Hawes, near Blackpool, Gentleman, and C. W. Homer, at Castle-hill, near Northwich, Civil Engineer. Improvements in machinery for making bricks, tiles, tubes, and other articles of plastic materials, and in the mode of joining drain pipes.

428. C. E. Wright, of Nottingham, Commercial Traveller. Improvements in means or apparatus employed in the nursing or treatment of infants.

429. R. J. S. Pearce, of Fleet-st., Machinist. Improvements in weighing and dynamic machines.

430. P. M. P. Bourjeaard, of Davies-st., late Surgeon in the French Navy. An improved apparatus for supporting the womb.

431. W. E. Newton, of Chancery-lane. An improved mowing machine or grass harvester. A communication from J. P. Adriance.

432. A. V. Newton, of Chancery-lane. An improvement in the construction of brushes. A communication from I. W. Shaler.

433. W. E. Newton, of Chancery-lane. Improved machinery for making bricks. A communication from A. Mitch, of Berlin.

434. W. H. Horstmann, of New York. Telegraphic cables and the mode of constructing the same and laying them down.

435. J. J. Russell, of Wednesbury. Improvements in machinery used for heating and welding the edges of the plates used in the manufacture of cylinders and other articles.

436. W. A. O'Doherty, of Eastcheap. An improvement in black-lead pencils and pencil cases. A communication from D. D. Sweet.

437. J. Seguin, Doctor of Medicine, of St. Maurice, France. Improvements relating to the employment of moving power arising from the tides and its application to manufacturing, agricultural, and other purposes.

439. J. Breeden, of Birmingham, Manufacturer. New or improved machinery for the manufacture of taps or stop-cocks, and fittings for gas, steam, and water pipes.

440. J. Eason, of Oxford-st. Improvements in apparatus applicable to tanning, dyeing, and obtaining extracts from vegetable, animal, and mineral substances.

Dated February 17, 1859.

441. S. T. Cooper, of Upper Clapton, Gentleman. Improvements in the use and application of artificial light.

443. H. Y. D. Scott, of Brompton Barracks, Captain Royal Engineers. An improvement in the manufacture of cement.

444. B. Saillard, of Lamb's Conduit-st., Electrotyper. An improved mode of obtaining printing-plates from collodion pictures.

445. P. E. Fraissinet, of Paris, Civil Engineer. A new or improved structure of iron, applicable for paving, flooring, bridges, gratings, girders, and other like purposes.

446. T. Cattell, of Euston-sq., M.D. Improvements in treating and purifying gutta percha.

447. F. W. Emerson, of New Charlton, Mining Engineer. Improvements in the treatment of certain ores of lead, and obtaining from them valuable primary and secondary products.

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449. J. H. Johnson, of Lincoln's-inn-fields. Improvements in apparatus for propelling and steering vessels and other floating craft. A communication from J. Eton.

Dated February 18, 1859.

450. J. J. Cole, of Essex-st., Strand. Improvements in venetian and other suspended blinds, and in the method of hanging and working them.

451. C. Garton, of Bristol, Brewer. An improved method of treating cane sugar, in order to render it fitter to be employed in brewing, distilling, and wine and vinegar making.

452. H. Swaisland, of Clerkenwell, Mathematical Instrument Maker. Improvements in box sextants.

453. G. Wallis, of Stretton, Stafford, Artist. A new or improved method of engraving, applicable to the production of printing surfaces and the ornamentation of metallic and other surfaces.

454. G. Kammerer, of Lombard-st., Merchant. Improved gearing for gins or horse mills, applicable for grinding, winnowing, and other purposes requiring motive power. A communication from Messrs. Lotz, of Pouancé, France.

455. W. Clark, of Chancery-lane. Improvements in emptying cesspools, and in raising other fluid and semi-fluid matters. A communication from P. T. Joly, jun., of Paris.

456. W. Clark, of Chancery-lane. Improvements in pressure gauges. A communication from L. Droissart, of Paris.

457. J. H. Johnson, of Lincoln's-inn-fields. Improvements in the manufacture of textile fabrics and in the machinery or apparatus employed therein. A communication from A. de Chavagneur, of Paris.

Dated February 19, 1859.

458. P. A. J. Dujardin, of Lille, France, Physician. Improvements in the printing apparatus of railway telegraphs.

459. A. R. L. de Normandy, of Judd-st., Analytical Chemist. Improvements in an apparatus for obtaining fresh water from salt water.

461. W. Clay, of Liverpool, Iron Manufacturer. Improvements in the manufacture of deck and other beams and of angular and other bars of various forms.

463. S. Wheatcroft, of New North-road, Engineer. Improvements in the method of, and the means for, uniting lace to blond and other fabrics, and also in the apparatus used for manufacturing or converting the same into bonnet and cap fronts, rouches, and such like similar articles of millinery.

464. C. F. Vasserot, of Essex-st., Strand. An improved apparatus for manufacturing the strands of wire-ropes. A communication from J. B. Pieux-Aubert.

465. C. F. Vasserot, of Essex-st., Strand. An improved carding machine. A communication from V. Madeline-Morin.

467. F. P. J. Van den Ouwelant, of Paris, Gentleman. Improvements in apparatuses to be applied to fire-places for obtaining a more complete combustion of the fuel employed therein.

Dated February 21, 1859.

468. G. Paul, of Glasgow, Mechanic. Improvements in spindles and flyers.

469. O. Blake, of Blackwall. Improved machinery or apparatus used in the manufacture of glass.

470. G. McCulloch, of Manchester. Improvements in machinery or apparatus for spinning, doubling, and throwing silk, and doubling other fibrous materials.

471. T. Wilson, of Birmingham, Engineer. Improvements in the manufacture and construction of ordnance.

472. A. Belpaire, Engineer, of Brussels. Improvements in the reversing gear of locomotive and other steam engines.

473. G. Humphrey, of Deptford, Engineer. Improvements in meters for measuring fluids and gases.

475. R. Jobson, of Wordsley, Iron Founder. Improvements in supplying water or other fluid to axletree boxes and other journal bearings, to lubricate the same.

477. R. W. Johnson, of Oldbury, Worcester, Railway Carriage Builder, and W. Stableford, of the same place, Manager. Improvements in axle boxes.

Dated February 22, 1859.

479. T. Smith, of Chatteris, Cambridge, Watchmaker. Floating wheels for driving machinery.

480. W. Soelman, of Bennett-st. Improvements in the construction of propellers.

481. J. Grimond, of Manchester, Manufacturer. Improvements in the treatment and preparation of jute and other fibrous materials, and in machinery or apparatus employed therein.

482. J. Curtis, of Drury-lane. The manufacture of military sash net, and machinery to be employed therein.

484. J. Hine, of Clerkenwell, Cabinet Maker. An improved book slide.

485. E. Lund, of Manchester, Gentleman. Certain improvements in the manufacture of fabrics or textures to be used in the construction of umbrellas and parasols.

486. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. A method of fixing tannin upon textile fibres, and the employment thereof in dyeing black and dark colours. A communication from M. Verguin, of Lyons, France.

487. T. R. Harding, of Leeds, Hackle Pin Maker. Improvements in the manufacture of card surfaces to be used in preparing fibrous materials.

Dated February 23, 1859.

489. A. W. Smethurst, of Chorley, Lancaster, Cotton Spinner. Improvements in machinery for driving looms for weaving.

491. W. Ashton, & Heaton Norris, Lancaster, Manager. Improvements in gas regulators.

493. U. Scott, of Camden Town, Civil Engineer. Improvements in carriages, and various parts of the same, which parts may be applied to vehicles of any description.

495. S. R. Samuels, of Nottingham. Improvements in twist lace machines.

497. G. Turnbull, of Calcutta, Civil Engineer. Improvements in the permanent way of railways.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

524. F. Brignolcs, of Duke-st., Adelphi. The disinfection and rectification of alcohols, by the separation of the essential and other oils from the alcohol. A communication from St. Cyr Prieur, of Avignon, France. Dated February 26, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, March* 8, 1859.)

2375. M. Mason. Stands or stages.
2384. M. Mason. Printing machines.
2386. C. Wicland. Time keepers.
2389. J. Luis. Boring machine. A communication.
2392. J. Kinsey. Steam engines and pumps.
2393. C. Cheyne. Floors and ceilings.
2405. T. Railton. Cap fronts.
2408. B. Foster and P. Smith. Spinning and doubling.
2418. J. Wright. Propelling. A communication.
2419. G. Zanni. Magneto-electric machines.
2422. L. J. Lewis. Fastenings.
2423. J. Morris. Printing fabrics.
2433. J. Cariss. Switch box and gear.
2434. E. Maynard. Telegraph cables.
2435. C. Perley. Disconnecting boats.
2438. M. A. F. Mennons. Railway brakes. A communication.
2442. R. C. Smith. Buoy.
2444. M. L. J. Lavater. Cartridges.
2458. J. Fowler, jun., R. Burton, and D. Greig. Applying power to ploughs.
2465. C. Mather. Drying yarns.
2471. T. Till. Nails, &c.
2472. T. Briggs. Mattresses, &c.
2478. S. Davey. Blasting powder.
2489. J. Jackson, A. Fisher, and J. J. Harney. Strips of steel.
2490. J. Platt. Spinning and doubling.
2501. J. F. Amblet and A. Polart. Elastic fabrics.
2505. J. L. Jullion. Paper.
2508. J. Felix. Castors.
2510. W. Clark. Signals. A communication.
2513. A. V. Newton. Obtaining extracts. A communication.
2532. M. Benson. Rails for railways. A communication.
2538. T. F. Cocker. Wire and strips of steel.
2540. J. G. Martien. Iron.
2547. J. Courage and F. Bennett. Furnaces.
2561. A. Dick. Yellow pigment.
2594. J. Platt and H. Chubb. Bricks or tiles. Partly a communication.
2595. W. Clark. Tanned hides. A communication.
2622. W. Clark. Purifying phosphates of lime. A communication.
2629. A. V. Newton. Transmitting motive power. A communication.
2650. S. W. Johnson and J. Varley. Pressure and vacuum gauges.
2666. A. V. Newton. Bolts and Rivets. A communication.
2685. E. Dixon and J. Fisher. Iron tubes.
2695. J. Tangye. Hydraulic presses.
2787. J. Jobson. Stoves and fire-places.
2792. J. Dawson. Raising the nap on cloths.
2859. J. Webster. Copper and zinc.
2898. I. Ketchum. Roasting meat.
27. C. B. Blyth. Treating fibrous materials.
83. W. Tillie. Shirts and fronts.
216. J. Fowler, jun., R. Burton, D. Greig, and J. Head. Agricultural implements.
227. J. White. Facilitating respiration.
275. T. Wilson. Fire-arms.
309. W. Clayton and J. Goodfellow. Metallic pistons.
348. T. Moss. Paper and ink.
353. W. Waller. Farm implements. Partly a communication.
365. J. Crossley. Steaming yarns.
374. J. Young. Knobs and roses.
386. H. Bruce. Paper.
401. H. Gardner. Preparing fibres.
413. J. Copcutt. Obtaining light.
426. S. Bailey. Mine Cages.
439. J. Breeden. Stopcocks, &c.
440. J. Eason. Tanning, dyeing, &c.
452. H. Swaisland. Box sextants.
459. A. R. L. de Normandy. Obtaining fresh water.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed March 4, 1859.

2006. W. H. Child.
2027. B. Hockin.
2031. A. Lamb and J. White.
2041. J. Rowley.
2059. W. Toshach.
2066. J. L. Hinks.
2077. J. Turner.
2401. G. M. Casentini and J. O. Barnard.
2804. J. V. Scarborough.
2984. H. C. Vion.
50. J. H. Johnson.

Sealed March 8, 1859.

1811. W. Smith.
2043. C. N. Kottula.
2044. J. Tatlow and H. Hodgkinson.
2056. F. A. E. G. de Massas.
2058. D. Cheetham.
2071. W. Thomson.
2113. H. Barrow.
2175. J. Morrison.
25. R. Tempest and J. Tomlinson.
75. F. Lehr.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

528. J. Reading.
534. F. Kaselowsky.
543. J. E. Hodges.
545. J. E. Hodges.
549. T. Lambert.
567. A. Newburger.
570. J. Downie.
576. H. Cooke.
609. G. Rees.
626. R. W. Winfield, J. Simms, and T. Lloyd.
631. C. Randolph and J. Elder.
761. J. Mc Lean.

PATENT ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

1856. 761. J. McLean.

LIST OF SPECIFICATIONS, &c.

Published during the week ending March 4, 1859.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
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Note.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

ABRIDGED SPECIFICATIONS OF PATENTS.

The abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

Steam Engines, &c., 1571, 1604.

Boilers and their Furnaces, 1592.

Roads and Vehicles, including railway plant and carriages, saddlery and harness, &c., 1550.

Ships and Boats, including their fittings, 1554, 1561, 1576, 1602.

Cultivation of the Soil, including agricultural and horticultural implements and machines, 1549, 1591, 1620, 1622.

Food and Beverages, including apparatus for preparing food for men and animals, 1556, 1560, 1578, 1586, 1615.

Fibrous Fabrics, including machinery for treating fibres, pulp, paper, &c., 1555, 1579, 1596, 1603, 1619, 1624.

Buildings and Building Materials, including sewers, drain-pipes, brick and tile machines, &c., 1625.

Lighting, Heating, and Ventilating, 1557, 1565, 1567, 1570, 1580, 1589, 1598, 1599.

Furniture and Apparel, including household utensils, time-keepers, jewellery, musical instruments, &c., 1552, 1564, 1568, 1570, 1572, 1588, 1611.

Metals, including apparatus for their manufacture, 1551, 1569, 1575, 1608, 1613.

Chemistry and Photography. *None.*

Electrical Apparatus, 1573, 1587, 1605, 1606, 1607.

Warfare, 1593, 1595, 1623.

Letter Press Printing &c. *None.*

Miscellaneous, 1550, 1553, 1558, 1559, 1562, 1563, 1566, 1574, 1576, 1577, 1581, 1582, 1583, 1584, 1585, 1590, 1597, 1600, 1601, 1606, 1609, 1610, 1612, 1614, 1616, 1617, 1618, 1621.

1549. C. N. Kottula. *Improvements in the manufacture of manure.* Dated July 9, 1858.

This consists in the employment, in the manufacture of manure, of a compound of dissolved resin, or resin saponified with alkaline lye and lime, whether the resin be dissolved or saponified, and the materials be combined at the first, or at any subsequent stage of the manufacture. *Patent completed.*

1550. F. H. Edwards. *Improvements in pneumatic springs for railway carriages and other purposes.* Dated July 9, 1858.

This consists in the use of an air-cushion contained within a metallic cylinder, having its inner end closed, such cushion being acted upon and compressed by a plunger of such form as is calculated to restrict the area thereof exposed to unsupported pressure, and to maintain that area invariable during the whole travel of the plunger. *Patent abandoned.*

1551. J. M. Rowan. *Improvements in manufacturing wrought-iron wheels and bosses, or centres, and in the*

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mode of, and furnaces for, heating the same during such manufacture. (A communication.) Dated July 9, 1858.

This relates to a method of forming parts of wrought-iron wheels or hubs or bosses for screw propellers, and consists in making the butts of the spokes for the hubs of wrought-iron wheels of an angular, curved, or zig-zag form, so as to ensure a lap-welded hub, when they are brought and welded together; 2, to the mode of, and apparatus for heating the parts of wheels or bosses that are to be welded together, and consists in heating those parts all over simultaneously by causing the heat to act from above and below alternately. *Patent completed.*

1552. W. E. NEWTON. *Improvements in the construction of umbrellas and parasols.* (A communication.) Dated July 9, 1858.

This relates to a mode of constructing the frames of these articles of wire, and consists in forming the ribs with their eyes of single pieces or lengths of wire. The eyes of the ribs and stretchers are formed by bending or turning up the wire. *Patent completed.*

1553. A. PORECKY. *Improvements in the manufacture of certain articles of whalebone, horn, tortoiseshell, and other corneous matters, or the artificial imitations thereof.* Dated July 10, 1858.

This consists, 1, in making busks for ladies' stays from any of the materials mentioned or included in the title of this invention. The inventor takes strips of such material, to which he gives a fluted or corrugated form, thereby imparting thereto the necessary strength and elasticity, though of smaller bulk and less weight than usual, and at the same time forming channels through which perspiration may pass off, and air be admitted to the body. 2. In making from the materials above mentioned various articles, as walking sticks, whips, fishing-rods, penholders, &c., to do which he takes strips of such materials, and bends, presses, or forms them into a plain, fluted, ornamental, flexible or rigid tube, or some longitudinal section thereof. The said hollow articles may then be either wholly or partially filled with a suitable composition, or they may be left unfilled, thereby allowing of their sliding one over the other like a telescope. *Patent abandoned.*

1554. G. H. WAIN. *Improvements in reefing and furling sails.* Dated July 10, 1858.

The patentee claims the application of a revolving spar or roller made fast to any portion of the sail, which spar is made to turn round and furl up the sail, in two directions, "with the application of every such spar for every such purpose." The peculiar arrangement of ropes or other haul-yards for giving the required rotary motion to the revolving spar, and the combination and general arrangement of machinery and parts described, and for the purpose set forth. This invention is not described apart from the drawings. *Patent completed.*

1555. W. LANGSHAW. *Improvements in machinery or apparatus for wearing fancy looped or knotted fabrics.* Dated July 10, 1858.

This consists of an improved needle with improved mechanism for working the loom. The patentee employs double bearded swivel-hooked needles, each double hook working on a pin, so that when one side seizes fresh yarn, the other side gives off a loop without any impediment. The improved mechanism consists of certain improvements in the modes of giving the pattern to the fabric in the taking-up motion, and in the general arrangement of the loom. He also employs improved temples, consisting of two or more rollers or pulleys having projecting spikes which pass through the fabric and keep it extended, the pulleys revolving as required with the passage of the work. *Patent completed.*

1556. J. F. WATSON and V. B. FADEUILHE. *Improvements in the preparation of cocoa and chocolate, and also of nutritive compounds from the seeds of the plant called Soja hispida and Cicer arietinum.* Dated July 10, 1858.

This consists in mixing with cocoa, &c., dried milk. It also consists in combining the flour produced from the seeds of the *Soja hispida* and the *Cicer arietinum* with cocoa, &c., and dried milk, or with the juices of meat. *Patent abandoned.*

1557. P. BURRELL. *Improvements in ventilating sewers and other receptacles of sewage.* Dated July 10, 1858.

Here pipes are laid along the lines of sewers just above them, and at intervals connexions of small diameter are made between the interior of the sewers and the pipes. The pipes are arranged in connexion with apparatus for withdrawing the air and gases from the pipes into the apparatus, which consists of vessels similarly constructed to gasometers, and moved up and down by suitable power. The gases may be forced through water, with such chemicals therein as will arrest the valuable products in the gases; or the gases may be subjected to fire, to decompose them. *Patent abandoned.*

1558. W. NORTHEN. *The application of stoneware or earthenware, coloured or plain, to improved and original designs.* Dated July 12, 1858.

A complete specification of this invention was filed with the application, and an abridgement of it was published at page 620, No. 1846, of the MECHANICS' MAGAZINE. *Patent completed.*

1559. J. LOACH and J. COX. *Certain improvements in ornamenting glass with perforated metallic and other plates.* Dated July 12, 1858.

This consists in producing ornamental panes for windows by a middle, perforated, or open-work plate or sheet. Also in a mode of ornamenting certain articles by a perforated plate or sheet placed or secured on the back or inside of the plate or other glass cut or finished to the shape and size required. *Patent completed.*

1560. J. MACINTOSH. *Improvements in apparatus for the manufacture of articles of confectionery.* Dated July 12, 1858.

This relates to the manufacture of "pan goods," the necessary action being produced by the rotation of the primary driving gearing. The pan does not revolve, but receives a powerful differential action, which rolls the articles in the pan to all sides and shapes them with great rapidity and accuracy. *Patent abandoned.*

1561. M. A. F. MENNONS. *An apparatus for stopping leaks in ships.* (A communication.) Dated July 12, 1858.

This consists of a double coil of waterproof tissue, or metallic gauze, rendered impermeable, which coil being suspended to the sides of the vessel is unrolled by lines arranged and worked from the deck. *Patent abandoned.*

1562. M. A. F. MENNONS. *Improvements in the construction of fire engines and similar apparatus.* (A communication.) Dated July 12, 1858.

A complete specification of this invention was filed with the application. The invention is not described apart from the drawings. *Patent completed.*

1563. R. A. BROOMAN. *Certain new or improved machinery for the manufacture of wire heddles.* (A communication.) Dated July 12, 1858.

This consists of a pair of revolving cylinders, with appurtenances for drawing in the wire, gripping, twisting, and discharging the same, whereby the heddle is made and discharged automatically. The invention is not fully described apart from the drawings. *Patent completed.*

1564. D. S. WILTON. *Improvements in pianofortes.* Dated July 12, 1858.

Here each string is wound round and fastened to a lever with a projecting curved surface on which the string rests. The lever moves on one end, which rests on a ridge or projecting plate fixed to another plate at the upper part of the pianoforte, and into which the tuning screw enters. Through the lever a tapering slot is formed for the tuning screw, on which screw there is a collar, between which and the lever a washer is introduced. This arrangement suits upright pianofortes, but a modified arrangement is applicable for horizontal pianofortes. *Patent abandoned.*

1565. N. DEFRIES. *Improvements in apparatus for measuring gas.* Dated July 12, 1858.

To keep the water to a constant level in a gas-meter, there is a vessel containing an additional supply of water affixed to the meter, from which a pipe with a covering valve descends to facilitate the filling and refixing of the water-supply vessel to the gas-meter. The pipe of the supply vessel descends into a water chamber so that the water in the meter and the chamber will at all times stand at a like level. In the event of the water in the meter and chamber falling below the proper level, water will descend from the vessel containing the additional supply, provision being made for the passage of air from the outer atmosphere into such water vessel when the water falls too low; but the flow of air from the atmosphere into the additional water-supply vessel is shut off as soon as the proper water level is obtained in the meter. *Patent completed.*

1566. J. TAYLOR. *Improvements in the manufacture of blocks for the construction of sewers, drains, and arches.* Dated July 12, 1858.

Here blocks of clay or brick earth are produced by expressing through moulding dies of the following form:—The inner surface is concave, and the sides are inclined to correspond with the section of the circle it is intended to produce by a series of such blocks. The outer surface of each block is formed with a longitudinal rib. In using such a block to produce a section of a sewer, a mould such as is now employed is used; one of the blocks is introduced therein, then the mould is filled in with bricks, and cement run in. By these means the number and extent of joints interior of a sewer, &c., will be greatly reduced. *Patent abandoned.*

1567. T. EARNSHAW. *Improvements in the manufacture of night lights.* Dated July 12, 1858.

Here a stand is made for each night-light of plaster of Paris, on which it can safely be burned without the bottom of the night-light being immersed in water. *Patent completed.*

1568. E. CHARD. *Improvements in pianofortes.* Dated July 13, 1858.

This consists in communicating motion to the hammer direct from the key by a hinged lever sticker. Also to a mode of insulating the sounding board by suspending it direct from the springs or wires. *Patent abandoned.*

1569. J. WEBSTER. *An improved manufacture of certain kinds of metallic ingots.* Dated July 13, 1858.

Here the inventor makes a case or hollow ingot of the form it is intended the finished ingot shall have, the said hollow ingot being made of the metal it is intended the surface of the rolled plate shall have. The case is closed on all sides excepting one. He pours into the ingot through the open side the metal to form the interior of the plate. He then closes the opening with a piece of the same metal as the surface of the ingot. When rolled the plate of metal is coated entirely with the desired metal. *Patent abandoned.*

1570. J. A. FUSSELL. *A new or improved method of ornamenting chandeliers, pendants, and brackets for gas and other lamps, which method of ornamenting is also applicable to curtain bands.* Dated July 13, 1858.

This consists in applying small mirrors or pieces of looking glass to parts of chandeliers, pendants, &c., the said mirrors being inserted and fixed in a framing formed in the article, and defended at the back, so as to prevent any injury to the silvered surface. *Patent completed.*

1571. J. TRAVIS and T. and F. SUGDEN. *Certain improvements in lubricating the valves and pistons of steam engines.* Dated July 13, 1858.

The inventors use a vessel for holding a reserve of oil, &c., and to this vessel connect on the lower side a valve or tap made to slide, rotate, or reciprocate, by a connexion with some moving part of the engine, by the working of which valve or tap, the oil, &c., passes in small quantities, at given intervals, from the vessel, the valve or tap receiving the same and delivering it into the outlet pipe below. They connect the outlet pipe to the conduit pipe, whereby the steam is conveyed from the boiler to the engine, or to the steam passage of the valve box or boxes, so that the oil, &c., is partially vapourised, mingling with the current of steam, and is thereby carried along and deposited upon the valve facings and interior surface of the cylinder. *Patent abandoned.*

1572. J. EDWARDS and T. NEWEY. *Improvements in the manufacture of blind furniture.* Dated July 13, 1858.

This relates to a method of fastening the tassel cord to blinds. The patentees take a hollow acorn, or other design made of wood, bone, &c., made to unfasten in the middle by a screw, and having a hole made in one end to allow the tassel cord to be passed through, and a screw fixed into the other end whereby to fix it to the blind. The tassel cord is passed through the hole from the outside, and a knot tied in the end, which knot is then drawn inside. The design is then put together, the tassel cord being suspended from it. *Patent completed.*

1573. J. J. FIELD. *A new method of supporting and carrying telegraph wires, ropes, and cables.* Dated July 13, 1858.

This consists in supporting telegraph wires, ropes, and cables in the air by balloons or vessels containing light gaseous fluids. *Patent completed.*

1574. G. BUCHANAN. *Improvements in sugar-cane mills.* Dated July 13, 1858.

This relates to the construction of the standards or side-frames of sugar-cane mills for carrying the rollers; the mode of drawing out the lower rollers, the iron tie bars at the sides of the standards, the flanges at the ends of rollers, and other details not described apart from the drawings. *Patent completed.*

1575. A. SHANKS. *Improvements in machinery for planing, slotting, and shaping metals.* Dated July 13, 1858.

The inventor gives motion to the cutting tools by hydraulic appliances, in lieu of toothed gearing, cranks, racks, and screws. *Patent abandoned.*

1576. W. BEADON. *Improvements in the manufacture of bags for corn and other articles, and sails for ships.* Dated July 13, 1858.

This consists in combining metal wire with the yarn, &c., of which the bags, &c., are made. *Patent abandoned.*

1577. R. WILSON and A. HORWOOD. *An improved pipe joint.* Dated July 13, 1858.

Here the inventors insert the ends at the two pipes into an india-rubber tube, and on the outside of the tube they affix metal clips or clasps, and screw them with set screws to press the tube around the pipes. *Patent abandoned.*

1578. E. J. MAUMENE and L. B. JAUNAY. *An improved method of and apparatus for the production of sparkling wines.* Dated July 14, 1858.

Here the wine is placed in metallic vessels, where it remains while froth or effervescence takes place. *Patent abandoned.*

1579. C. DE POORTER. *Improvements in hand or power looms.* Dated July 14, 1858.

This consists; 1, in applying directly shuttle driving rods to power loom battens. 2. In a process for stretching out the warp and woven cloth on the hand or power looms by a contrivance the effect which is to maintain the warps in a regular tension during their unrolling from their beam, and to roll up with a like tension the cloth as it is woven, by yielding to the warp threads at the moment they open for the shuttle's passage. 3. In applying to hand or power looms several new processes, which allow weaving by merely raising and lowering many kinds of tissues which have been produced only on the old hand looms by using either cording, Jacquard apparatus, or drawing the blades by the help of a great many treadles. 4. In new processes for working or effecting the raising, lowering, or stoppage of the shuttle boxes, &c. 5. In applying a steady and motionless stretcher to any loom working with a regulator. 6. In transforming the old ribbon or lace loom into a new one, by doing away with all the partial warp or ribbon beams or rollers with their pulleys and counterpoises, and giving to such looms a single warp beam and a single cloth rolling beam as in common looms, and by subdividing the warp thread in a reed in as many portions as each ribbon is to contain of these threads, and applying the improved stretcher on both beams.

1580. W. WOODCOCK. *Certain improvements in apparatus for warming air.* Dated July 14, 1858.

This consists in casting pipes of metal, with wings radiating transversely from their outer surface, so as to cause a current of air, when such pipes and wings are heated, to pass upwards between the wings. *Patent completed.*

1581. R. BURNS and J. REA. *Improvements in machinery for grinding bones and other hard substances.* Dated July 14, 1858.

This refers to a previous patent of the patentee, and consists in relieving the cutting bar when interfered with by hard matters mixed with the substances to be cut; also in a peculiar mode of setting the knives in the cutting cylinders of bone machines. The invention is not described apart from the drawings. *Patent completed.*

1582. J. COWAN. *An improved screw-nail.* Dated July 14, 1858.

This refers to screw nails that may be driven into timber, &c., and withdrawn by a screw driver. *Patent abandoned.*

1583. F. CHAPUSOT and V. AVRIL. *Improvements in producing a more or less perfect vacuum, and applying the same to industrial purposes.* Dated July 14, 1858.

This invention is based on the equilibrium existing in a barometric tube between the chamber and a column of liquid. It consists in the use of a large barometric chamber, and filling the same with water or other liquid, then drawing off the liquid through an outlet pipe with stop cock, so as to produce a more or less perfect vacuum in the vessel. The same may be applied for emptying cesspools, cleaning harbours, and various other purposes. *Patent abandoned.*

1584. J. JONES. *Improvements in meters for measuring liquids.* Dated July 14, 1858.

Here the meter is so arranged that the valve, by which the flow of the liquid is governed, is caused to move by the re-action of the pressure of the liquid within either of the chambers when it is fitted on instruments in connection with the valve. *Patent completed.*

1585. E. OWEN. *Improvements in distilling.* Dated July 14, 1858.

This consists in submitting the body to be distilled when in a liquid condition, and in a state of minute division, to

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the action of steam, or some heated gaseous vapour. *Patent completed.*

1586. T. WHEELER. *An improved combination of machinery for cutting, slicing, grating, and pulping turnips, mangold wurzel, and other roots.* Dated July 14, 1858.

This consists in casting suitable openings in a conical disc or discs set at any angle, or in flat discs or cylinders. To these apertures suitably shaped knives are fixed. The patentee uses a roller consisting of a worm or thread fixed upon a cone, and made at convenient angles, so as to work the conical disc. There are various modifications included. *Patent abandoned.*

1587. J. MACLEAN. *Improvements in machinery or apparatus for laying or submerging telegraph cables in water.* Dated July 14, 1858.

Here the cable is passed direct from the ordinary or any other paying-out apparatus. It is then passed beneath a grooved wheel carried by the deck of the vessel, and thence ascends over a grooved wheel on the top of a long vertical traversing shaft, the lower end of which is set in a vertical tube or guide carried by the vessel. This shaft and wheel is retained at its highest elevation by counterweights suspended from chains attached to the shaft at the top. It next passes beneath a second grooved wheel upon the deck, again rises and passes over the upper grooved wheel of another compensating weight and spring arrangement, then passes beneath another grooved wheel at or near the level of the vessel's deck, finally reaching the water at an angle of about 45 deg.

1588. T. WHEELER. *Improvements in washing, wringing, and mangling machines.* Dated July 14, 1858.

This invention was described and illustrated at page 90, No. 6, of the MECHANICS' MAGAZINE (New Series).

1589. H. W. WIMSHURST. *An improvement in store grates.* Dated July 14, 1858.

This consists in supplying a fire with fuel from a hopper under the fire. The fuel is forced upward into the centre of the fire, and the ashes find egress on each side. *Patent abandoned.*

1590. J. RHEINAUER. *Improvements in the bearings for axles and shafts in order to lubricate and exclude dust from such bearings.* (A communication.) Dated July 14, 1858.

The lubricating apparatus consists of a piece of wood placed in an oil vessel under the axle, &c., within the bearing, and the upper surface of this piece of wood is caused to press against the axle, &c., by springs. Over the lubricating block, which is grooved to receive it, a wick of felt, &c., is laid, and its two ends descend into the oil, the oil being sucked up by the wick and applied to the axle, &c. The bottom of the groove in the lubricating block is furrowed to assist the transmission of the oil to every part of the wick. The apparatus for the exclusion of dust is specially applicable to the bearings of railway carriages, and consists of a ring of felt, &c., enclosed between two metal rings attached to the end of the bearing; the axle passes through the rings, and dust is thereby excluded. The lubricating apparatus is modified according to the purpose to which it is applied. *Patent completed.*

1591. J. FOWLER, JUN. *Improvements in apparatus used when ploughing, tilling, or cultivating land by steam power.* Dated July 14, 1858.

This consists, 1, in a method of combining winding capstans or drums with portable steam engines. 2, in apparatus for taking up the slack of the rope behind the implement. *Patent completed.*

1592. C. W. WILLIAMS. *Improvements in locomotive and other boilers for giving them increased power in generating steam.* Dated July 15, 1858.

This consists of certain arrangements for causing the heated products of combustion passing through the flues or tubes to be changed from their direct onward course, and to take an oblique one, thereby occasioning an action more impinging on the interior surface of the tubes or flues, by which more heat will be passed to the water. *Patent completed.*

1593. R. BRAZIER. *Improvements in repeating fire-arms.* Dated July 15, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1594. J. ASHMAN. *Improvements in artificial legs and arms.* Dated July 15, 1858.

This relates to constructing artificial limbs of textile fabric cemented by glue, &c., and covering certain portions of such limbs with animal skin, to give to such parts the appearance of natural skin; also to means of actuating the joints. Provisional protection has not been granted to the inventor. *Patent abandoned.*

1595. C. P. ASTON. *Improvements in breech-loading arms.* Dated July 15, 1858.

This consists in forming a cup-like seat in the breech to receive the rear end of the barrel or barrels. He causes the barrel to slide to and fro in a direct line with the breech, and prefers to form the percussioning in the breech. *Patent completed.*

1596. W. A. GILBEE. *Improvements in the mode of covering cotton, woollen, and other thread with silk, and in the apparatus connected therewith.* Dated July 15, 1858.

Here the cocoons are placed in a vessel containing water and wind round a thread of cotton, &c., from a bobbin in front of the vessel; the thread enters the water and passes out through the cocoons, being guided by an iron wire placed transversely in the water, where it forms a hook at the required part to keep the thread perpendicular with an eye in a suitable plate or stem. When the cotton thread has been joined by the cocoon thread it passes through a hole or eye, and at the same time rolls over a spindle receiving a rotary motion round itself. This motion is obtained by a hollow cylinder put in motion by a strap or band. *Patent abandoned.*

1597. H. BEVAN. *A new or improved machine for effecting or facilitating arithmetical operations.* Dated July 15, 1858.

This consists of a series of strips of metal, each strip having marked upon it two vertical rows of figures separated by a broad line. Each row is divided by a horizontal division into groups, such group consisting of ten. There are as many groups as there are places of figures in the multiplier; that is, one group for the units in the multiplier, another group for the tens, and so on. *Patent abandoned.*

1598. A. H. J. BASTABLE. *Improvements in apparatus employed in the production of light.* (A communication.) Dated July 15, 1858.

This invention consists in protecting the cylinder of lime, &c., (used for producing light by throwing a jet of gas, &c., thereon) by a metal case. The cylinder projects upward beyond the end of the case, and the jet strikes the portion of the cylinder above the case. *Patent abandoned.*

1599. T. BARTLETT. *Improvements in stoves, fire-places, and furnaces.* Dated July 15, 1858.

Here the fire is lighted in an upper compartment, and a portion of the grate, with one or more of the fire-bars, is opened, and coal is supplied to a lower compartment, which will progressively become ignited. The gases and products therefrom will rise up through the well-ignited fuel in the upper compartment of the stove, and be burned. *Patent completed.*

1600. P. FAIRBAIRN. *An improvement in lathes.* (A communication.) Dated July 15, 1858.

This relates to "dead centre lathes," and consists in fitting to the front of the driving head dead centre a seat to receive change brushes or bearings capable of being used as a fixed support for the outside journals of the axle of the article to be turned. The axle being thus supported it will be free to revolve. The article itself is to be driven at its circumference from the face plate by a pin, element driver, &c. The driver can turn round without interfering with the axle carrier. *Patent abandoned.*

1601. W. E. NEWTON. *An improved mode of giving alarm in cases of fire in houses, ships, or other buildings.* (A communication.) Dated July 15, 1858.

This consists in attaching combustible threads to grenades, suitably placed so that on the threads taking fire an alarm will be given by the explosion of the grenades. The threads are to be protected from damp by enclosing them in tubes of gutta percha, &c., perforated with small holes to facilitate the combustion of the threads. *Patent abandoned.*

1602. W. BETTS. *Improvements in the manufacture of capsules, and in the apparatus to be employed therein.* Dated July 15, 1858.

Here the inventor takes a mould having on it a male screw formed on the neck of the bottle to which the capsule is to be applied; the capsule being placed on this screw-mould, the mould and capsule are rotated and moved in a lateral; a small disc is then pressed against the capsule, which forces it into the indentations of the screw-mould, and at the same time embosses the raised portions of the screw, and a stiff screw capsule is produced. *Patent abandoned.*

1603. T. LEIGH. *Improvements in machinery or apparatus for sizing warps.* Dated July 16, 1858.

This consists in applying to the ordinary sizing machines or tape lers one or more steam chests for drying the warps. *Patent completed.*

1604. F. PRIESTLEY. *Improvements in condensing steam engines.* Dated July 16, 1858.

This consists in drawing off the condensed water and air from the condensor by creating a vacuum in the air-pump, barrel, or cylinder without any piston, or in a suitable closed vessel, by the alternate admission and condensation of steam. The water when drawn from the condenser, and that formed by the condensation of the steam in the vessel itself is blown through, the same by the steam, and the steam and cold water for condensation are alternately admitted by suitable valves, whereby the air-pump and piston-rod, and the crank for working the same, are dispensed with, and a saving of power and cost, and of space occupied, thereby effected. *Patent abandoned.*

1605. C. DE BERGUE. *Improvements in submarine telegraph cables, for submarine purposes; and in the machinery for manufacturing such cables; and also in the machinery to be used in paying such cables out of ships at sea.* Dated July 16, 1858.

This invention was described and illustrated at page 157, No. 10, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

1606. M. VOSS. *Safely submerging ocean telegraph cables and other heavy bodies in rivers, lakes, and seas, by means of inflated buoys and connecting gear.* Dated July 16, 1858.

Here the submersion of the cable is effected by buoys or air-cases, for the temporary suspension of portions of the line. *Patent abandoned.*

1607. P. ARKELL and A. MELHADO. *Improvements in the submerging of telegraph cables.* Dated July 16, 1858.

This invention was described and illustrated at page 157, No. 10 of the MECHANICS' MAGAZINE. (New Series.) *Patent completed.*

1608. A. P. PRICE. *Improvements in the treatment and smelting of certain ores or compounds of tin, and of tin, and of certain alloys thereof.* Dated July 16, 1858.

This invention consists chiefly in employing carbonaceous or bituminous matter for the above purposes. *Patent completed.*

1609. C. S. PUTNAM. *An improvement or improvements in the apparatus for hardening vegetable gums, oils, and other substances susceptible of being hardened by steam.* Dated July 16, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1610. T. F. CHORLEY. *Improving the form of banker's cheques and other similar documents, with the view of preventing fraudulent dealings therewith.* Dated July 16, 1858.

This consists in printing on banker's cheques, &c., the words "uncrossed cheque," which are to be torn off if the cheque is passed through a bank, and left on if payable to bearer. *Patent abandoned.*

1611. W. A. B. BUSSETT. *Improvements in military capes or cloaks.* Dated July 16, 1858.

The capes are so formed that several may be combined and form a tent. *Patent completed.*

1612. T. HART. *Improvements in taps or cakes, and in apparatus for regulating the flow of fluids.* Dated July 17, 1858.

This relates to a patent granted to G. Buchanan, 3 Dec., 1850, and is not described apart from the drawings. *Patent completed.*

1613. J. SPENCE. *An improvement in the manufacture of tin plates and terne or leaded plates.* Dated July 17, 1858.

This consists in manufacturing such plates from sheets of steel, iron, or puddle steel and coating them with tin or alloy. The said sheets are rolled from a finished piece or bar, or from a piece of the puddled bar in its first stage of manufacture. *Patent completed.*

1614. J. T. SMITH. *A new or improved manufacture of coke.* Dated July 17, 1858.

This consists in mixing small coal with tar and setting fire to it in the open air or in a retort. *Patent abandoned.*

1615. W. WILDES. *An improved arrangement or arrangements of machinery for reducing vegetable matter to pulp.* Dated July 17, 1858.

This consists in driving rolls or cylinders at different speeds, or in driving rolls or cylinders of unequal diameters at the same speed. *Patent completed.*

1616. R. A. BROOMAN. *Improvements in apparatus for the reception of fecal and sewage matters, and in the treatment of fecal matters.* (A communication.) Dated July 17, 1858.

This consists in collecting the sewage, &c., in a suitable vessel, causing the precipitation therein of all solid matter, treating such solid matter with sulphate of lime, working it up in a brick machine, drying it and reducing it to powder to be used as manure. *Patent abandoned.*

1617. W. PIDDING. *Improvements in securing and forming envelopes.* Dated July 17, 1858.

Here the inventor seals with wax the outside of the ends of the tongues of envelopes without connecting them by the wax with the remaining portion of the envelopes. He also forms envelopes of two or more pieces of paper so that waste paper may be used in their manufacture. *Patent abandoned.*

1618. W. A. LLOYD and E. EDWARDS. *Improvements in aquaria tanks and similar receptacles for aquatic animals and plants.* Dated July 17, 1858.

These tanks are formed with a dark chamber, which is not intended to contain animals or plants, but the fluid it contains communicates with the fluid in the space holding the animals and plants. *Patent completed.*

1619. J. J. DESMARES. *A new process for oiling wools.* Dated July 19, 1858.

This consists in combining with a given weight of pure olive oil one-fifteenth part of liquor ammonia, and oiling the wools with this compound. *Patent abandoned.*

1620. C. F. VASSEROT. *An improved artificial manure.* (A communication.) Dated July 19, 1858.

This manure is composed of straw, green forages, such as trefoil, peas, &c., lime, salt, and water. *Patent abandoned.*

1621. C. BRAY. *Improvements in ice safes.* Dated July 19, 1858.

The outer case of this safe is made of wood, lined with felt, and closed by a cover. This outer case contains another case of wood, lined with metal, also closed by a cover. In the upper part of this inner case there is a metal box for ice. This box is perforated at bottom, and has a cover. Underneath this ice box are several metal cylinders for bottles of wine, &c., over which the water which drains from the ice trickles. The ends of the cylinders pass through to the outer case, and are each closed separately. The series of cylinders is closed in by a hinged flap on the outer case. Against one side of the box is a metal cistern for water, and in the other are shelves for articles to be cooled. *Patent abandoned.*

1622. H. SMITH. *An improvement or improvements in the manufacture of harrows.* Dated July 19, 1858.

The patentee claims, 1, joining the bars constituting the frame of the harrow, by hollow bolts passed through holes at the crossings in the bars, the protruding ends of the bolts being expanded and riveted upon a collar or washer previously placed upon the hollow rivets, the hollow rivets, in addition to joining the bars of the harrow, containing the holes in which the tines or tangs are fixed. 2. In fixing the tines or tangs in harrows, by forcing them either by percussion or by pressure into taper holes formed in the hollow bolts by which the framing of the harrow is held together. *Patent completed.*

1623. C. REEVES. *Improvements in repeating fire-arms.* Dated July 19, 1858.

The patentee claims, 1, the mechanism for raising the hammer or cock, and liberating the raised hammer or cock by pressure upon the trigger, and the mechanism for holding the hammer or cock at half and full cock, and of liberating the cocked hammer when the said hammer has been cocked by pressure upon the comb of the hammer. 2. The method of constructing and fixing the axis on which the revolving barrel of a repeating fire-arm rotates, by making the axis a quick threaded screw engaging in the anterior part of the frame in which the revolving chamber works, so as to advance or recede in the frame when the axis is made to rotate. *Patent completed.*

1624. T. GREENWOOD, J. BATLEY, and J. SALT. *Improved machinery for preparing silk to be spun.* Dated July 19, 1858.

This relates to machinery for opening the cocoons or waste silk, and consists in the use of two opening cylinders and of a machine denominated the "separating spreader." The silk is fed to this machine by the feed cloths or bands. *Patent completed.*

1625. J. W. WILSON. *An improved preparation of materials to be used for roofs and other parts of buildings, and for various purposes for which wood is now generally employed.* Dated July 19, 1858.

This consists in combining together, by some adhesive material, shavings or thin sheets of wood arranged in layers one above another. These sheets are to be corrugated by corrugated rollers. *Patent abandoned.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, MARCH 18, 1859.

THE SHIPS OF THE ROYAL NAVY.

WHETHER Lord CLARENCE PAGET is really anxious for the truth, or whether a seat at the Board of Admiralty would be much more likely to satisfy him, it is not for us to inquire; but it *is* for us to assert that the course which he is pursuing will lead him far more surely to the latter than to the former. Lord as he is, and acquainted as he ought to be with what is just and honourable, he has yet to learn that errors, perversions, and misrepresentations are disgraceful weapons in the hands of public men.

It is, and has long been, perfectly manifest to us that the greatest enemies to our administrative reforms are the men who incautiously and inconsiderately attack our administrative departments. Their broad and sweeping charges excite public indignation, only that it may be baulked by official justifications. Thus the true friends of reform are trifled with, and their hope of useful change is perpetually destroyed.

We shall not now follow Lord PAGET through those figures of his which no one can either contradict or verify without access to information not yet published. Indeed, we shall not even enter upon the question of the cost of ships at all, because in the Department of the Surveyor of the Navy a return is now being prepared for the House of Commons which will settle that question much more completely than we could possibly do. We will merely advert, and that briefly, to those portions of his lordship's speech which referred to what he was pleased to call "the reckless alterations of new ships;" and that we may not misrepresent him, we will quote his words as reported in the leading journal. He said:—

"Almost every ship was altered. Take the case of a three-decker, the *Howe*, 121 guns. She was laid down only last year or the winter before, but the dockyard people were now pulling her down to put a new bow upon her. Had any great improvement been made in the bows of ships within the last two years? Nothing of the kind had taken place. Another case was that of the *Immortalité*, a 51-gun frigate, now being built at Pembroke. That unfortunate ship had gone through a great deal of trouble. She was first of all lengthened amidships. Last year, orders went down from the Admiralty to lengthen her five feet by the bow. Certain parties—he did not know who, but he had no doubt persons at Pembroke—thought that to lengthen a frigate five feet by the bow would be to make an imperceptible alteration, and would have no effect whatever. We lengthened yachts 14 or 20 feet by the bow. But the authorities were inexorable, their orders were reiterated, and the poor ship was lengthened five feet by the bow. The result was, as might be naturally supposed, that either the First Lord himself, with his fine nautical eye, or some other member of the Admiralty Board, saw upon visiting her that she was not fit to go to sea, and ordered her to be pulled down again and lengthened 15 feet. Such instances of official blundering would be amusing if they were not so costly. The *Orlando*, the *Mersey*, and, indeed, almost all that class of ships, had been treated in a similar manner; but, not to detain the House, he would now ask their attention to a case which was almost incredible. Some time ago a frigate, the *San Fiorenzo*, was being built either at Deptford or Woolwich. She was a great favourite with the London folks, who used to visit her in large numbers, and a beautiful model she was.

Sir J. PAKINGTON.—Where is she now?

Lord C. PAGET.—The First Lord asked where she was now. Why, she had vanished into thin air—gone, he hoped, to another and a better world. (Great laughter.) He would not trouble the House with any more of these cases. The *Lyra*, the *Racer*, and other noble vessels began life at 450 tons, but they gradually grew in size until they arrived at 750 tons, when they were launched. Was not that a reckless expenditure of money?"

Now, let us consider the facts of each of the cases here adduced in the order in which the vessels are named—the *Howe*, the *Immortalité*, the *Orlando*, the *Mersey*, the *San Fiorenzo*, the *Lyra*, and the *Racer*; and in doing so, it is absolutely essential to remember that we are dealing with a period when the introduction of steam has been imperatively demanding the "re-construction" of such vessels as were originally designed and laid down as sailing ships. Of the first case adduced—that of the *Howe*—we have but little to say, because it happens that the alteration to which she has been subjected was never altogether approved by ourselves. That alteration, however, in the vessel has by no means involved the "pulling down" of the ship, as Lord PAGET implies. And if no great improvement has been made in the bows of ships during the last two years, facts have been observed which induced the Admiralty to consider a further increase in the fineness of the bows of our large screw ships desirable; and it was in consequence of this, and not from mere wantonness, of course, that the change in the bow of the *Howe* is being made. For the lengthening of the bow of the *Immortalité*, Sir CHARLES WOOD was responsible, and has since made in the House of Commons the following statement respecting it:—"The fact is," he says, "the ship was in frame, and it was only necessary for the purposes of the alteration that a few bolts should be removed; the whole of the extra expense being the mere cost of additional labour. I may add that the reason why the change was made was to secure the advantage of her having fine lines at the bow." This statement is, we can assure our readers, perfectly true, and we need only add that the first lengthening of the ship amidships was absolutely essential to her conversion from a sailing ship into a screw. With regard to the *Orlando* and the *Mersey*, we have only to offer an unqualified contradiction to Lord PAGET'S assertion. These vessels have never been lengthened or interfered with in any such way since their keels were first laid. The *San Fiorenzo*, or as much as ever existed of her, "vanished" certainly, but not, we fear, into either another or a better world. The facts respecting this ship are very simple. Before the use of the screw became general, she was laid down at Woolwich as a sailing frigate 188 ft. 9 in. long. After she had been put into frame, and before her planking was nearly completed, it was proved advisable to discontinue building sailing ships of war. In order to convert her into an efficient screw ship, it would have been absolutely necessary to lengthen her nearly 50 ft.—46 ft. 3 in. was the additional length decided upon. But unfortunately the slip at Woolwich would not admit of the extra length being added, and from the extreme narrowness of that dockyard at the building end of it, the slip itself could not be lengthened. In most dockyards the fore end of a slip might be carried forward without difficulty, but the Woolwich slip was already within a few feet of the dockyard wall, and the wall itself is all but touched by the houses of the town. The projection of a slip 50 ft. into the Thames for a considerable period was, of course, altogether impracticable. The only course left, therefore, was to take down the frame of the ship, and apply its timbers in the construction of some other vessel; and this is what was done. That those timbers afterwards served under another name than *San Fiorenzo*, can scarcely, we presume, be deemed a calamity. So much for the "case which was almost incredible."

It only remains for us to notice what was said of the *Lyra* and the *Racer*. Of this portion of Lord CLARENCE PAGET'S speech we have scarcely patience to speak. Will it be believed that all he said about these noble vessels beginning life, and gradually growing in size from 450 to 750 tons, was based upon the simple fact that the names *Lyra* and *Racer* were first appropriated *on paper* to vessels of one class, and that it was afterwards found convenient to transfer those *names* to vessels of a larger class? The vessels *Lyra* and *Racer* themselves have undergone no kind of alteration whatever.

Now, we put it to any honest, any candid, any sensible man whether, with these facts before us, we have not a right to ask if it is sheer incapacity, or wanton mischievousness, or something worse than either, that is at the bottom of those remarks of Lord PAGET'S which we have quoted? As to the expectation of any public advantage arising from his speech, we should almost feel disposed to spurn any benefit which was obtained for us by a speech so false, or by a man so extravagant. The truth appears to us to be that Lord PAGET has been whispering with dockyard men and officers, and seeking from them the materials for an attack upon the Admiralty. Information thus obtained would be very useful to a man who knew how to estimate it—how to discriminate between what was worthy of regard and what was the mere prejudice of men some of whom are but too willing to play the critic over matters which they but imperfectly comprehend. But for a man who is at once a Member of Parliament, a Lord, and an Admiral, to gather statements from such sources, and then to gravely reproduce them, in the hearing of the entire world, as facts which deserve to be implicitly credited, and which should induce immediate administrative changes—this, we say, is to abuse the privileges with which he is endowed by each and all of his high offices.

It would not be easy to calculate the mischief which has been wrought by the speech upon which we are commenting. There is not one of the noble lord's charges which has not been, or will not speedily be triumphantly replied to, and there the matter will end. And yet, is it to be for a single moment supposed that no evils, no errors exist in the administration of our dockyard affairs? Not by us, certainly, nor, we presume, by many others. But the vital evils which do exist Lord PAGET has passed silently by, and has expended all his remonstrances upon errors and absurdities of his own. And so, we fear, on naval affairs the public interest will for a long time to come continue to be to a certain extent sacrificed. The first essential of any reform of those affairs from without is, that they shall be taken up by a man who will have the patience to discover the truth, the courage to adhere to it, and the manliness to scorn the use of such weapons as Lord PAGET delights, apparently, to wield.

In the debate on the speech in question, Mr. CORRY reverted to a matter which we should not fail to notice here. Last year Lord PAGET furnished the Admiralty with the design of a frigate which was to prove infinitely superior to the vessels designed by the Surveyor of the Navy. We lost no time, as our readers will recollect, in showing how sad a blunder his lordship had made in his calculations. Mr. CORRY, on Friday last, told us that his lordship's design was referred to the Surveyor of the Navy, who sent in the following report on it:—

"From the above estimate it appears that the displacement is too small by 615 tons. Hence the ship would be immersed two feet beyond the draught of water given, and the greatest transverse section would be increased from 645 square feet to 720; and that when all the guns, as was intended, were fought on one side, the inclination of the ship would leave only 4 feet 3 inches for the height of the midship port in smooth water, and that to carry, as proposed, 1,000

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tons of coals, it would be necessary to stow 600 tons on the lower deck."

And this brings us to notice the principal feature of last Friday's debate—viz., the unanimity with which the reputation of the Surveyor of the Navy was supported by many of the most distinguished speakers. To say that Lord PAGET'S speech was not an attack upon Sir BALDWIN WALKER is to talk nonsense. Had Lord PAGET taken the trouble to ascertain where the Surveyor's duties ended, and to have shown to how great an extent that officer's wishes and intentions are at times interfered with by shifting Boards of Admiralty, there might have been room to doubt his hostility to the Surveyor. But as it was, he permitted the full weight of his strictures to fall upon the Surveyor. And this we deem the worst feature of the whole affair; because, Sir BALDWIN WALKER has really managed the navy with unexampled judgment. We are quite aware that he has been most efficiently and constantly aided by a scientific staff of naval architects whose equals as a body are nowhere to be found out of the Government service. None would, we believe, assert this more cordially than the Surveyor himself. And herein lies one of his greatest merits. Instead of thinking lightly of, and disregarding the counsels of his scientific assistants, and enforcing crotchets of his own in place of their science—as ninety-nine admirals out of a hundred would have done—he has given full scope to the skill of those gentlemen, and has anxiously supplemented it by his own great knowledge and experience as a seaman. The consequence is, we have a navy which, whatever defects it may possess, is superior to all the navies of the world—a navy which is, as we have before said, and as Sir CHARLES WOOD repeated on Friday last, "the embodiment of all such sound and well-tested improvements as have hitherto been found compatible with the purposes for which ships of war are designed." And we say unhesitatingly that the man who, in the face of these facts, could permit himself to speak in public as Lord PAGET spoke on Friday last, deserves either the contempt or the pity rather than the approval of his country. This we say without wishing to deprecate any criticism which is just and instructive. On the contrary, we admit that evils exist, and we shall probably take an early opportunity of pointing out the nature of some, at least, of them.

THE TUBAL CAIN OF OUR COUNTRY.

IN the busiest streets of London we often meet a man whom we never see without blushing for our country. Had English statesmen been pure, that man would have been a millionaire; had they been wise, he would have been a peer of the realm. As it is, he lives in a single room, and is sometimes sorely troubled to retain even that. At the age of seventy-five, he has still to seek his daily bread, and is but barely saved from receiving it from the hand of charity. Hidden in obscure corners of the kingdom are three sisters of his, even more aged, and still poorer than himself. Yet the father of that hapless family gave untold millions to England, and contributed more than any other man to that material progress by which she gained, and still keeps, her pre-eminence. The aged son who still survives is RICHARD CORT, of Islington—the father was HENRY CORT, whom the first journal of the world lately named the Father of the British Iron Trade, and the Tubul Cain of our country.

It is no exaggeration to say that the inventions of HENRY CORT were the main agents by which the marvellous physical progress of this country has been attained. Before those inventions were introduced, Great Britain was mainly dependent upon foreign countries for its iron. Had our dependence continued, how would it have been possible for us to have entered upon any one even of the great works of modern times—such as the construction of steam engines, the replacement of hand manufactures by machinery, and the formation of railroads, electric telegraphs, iron ships, iron bridges, and iron buildings? It would manifestly have been impossible. But with the inventions of CORT came our emancipation. He taught us how to use the treasures of our own land for our own purposes, and how, thereby, to carry our useful arts far in advance of all that had ever been imagined. No doubt exists on this point. It has been openly attested by hundreds of the most eminent engineers, manufacturers, and men of science in the kingdom; Members of Parliament by scores have cordially acknowledged it; Cabinet Ministers have not hesitated to admit it; even the Queen has openly recognised it. Yet the aged family of this man are still permitted to creep on to the tomb, not utterly penniless and pensionless, it is true, but with only just sufficient crumbs from the tables of this opulent nation to keep them alive, and thus to prolong their poverty and shame.

Three years ago the total make of rolled iron produced by CORT'S machinery was computed at thirty millions of tons; and the saving to the consumers of iron as compared with the previous cost of foreign iron, averaging £20 per ton, has been computed by one of the most experienced and impartial judges, Mr. W. FAIRBAIRN, at SIX HUNDRED MILLIONS STERLING. This sum is represented as the pecuniary value of HENRY CORT'S inventions to the British nation in a memorial to Viscount PALMERSTON, presented by Lord STANLEY in 1857. The same memorial was strongly recommended by Lord STANLEY to the Earl of DERBY in 1858, signed by many of the most eminent scientific, practical, and parliamentary authorities, including two Cabinet Ministers. When a man is known to have directly enriched his country by six hundred millions of money, it becomes unnecessary to inquire in what other ways he has done it service. And in this case it would be absolutely impossible to measure, or even to trace, the innumerable services which one man has indirectly rendered us. Wherever wrought iron, in any form whatever, is used by us, there we are indebted to him; for his inventions have never yet been superseded. Nor can the full extent of the nation's debt to the CORT family be at all understood until it is known that HENRY CORT himself was not only unremunerated, but also robbed of a small private fortune and the whole of his patent property by Government officials, with whom, in his dealings with the Navy Board, he became associated. The great services which he rendered to the Royal Navy were rewarded by total ruin.

In return for all his inventions, labours, wrongs, and sufferings, and in consideration of the £200,000 of which he was defrauded, HENRY CORT'S widow and children have during the last seventy years received from the Government some two or three thousand pounds. The sums subscribed during the same long period by iron manufacturers, most of whom have made their fortunes by means of his inventions, fall considerably short of £2,000. Altogether the family has had less than £5,000. And even this sum has been received and expended in inconsiderable items, chiefly in the shape of pensions, which we are positively ashamed to mention in detail. And now, in their extreme old age, they are left to struggle on with the bare means of subsistence only—the son without even them, for he has had to sacrifice even this small pension in his efforts to obtain justice for himself and his sisters.

Now, we ask if the present condition of this family is not a great disgrace to us? Not to the press certainly; for, from the *Times* downwards, every newspaper in the land has done its best to serve them. But is it not a disgrace to the nation? And especially is it not a disgrace to those who, by a little self-devotion and energy, might have had justice done? Many have *promised* to aid in securing some suitable provision for the family. Lord STANLEY excited great hopes in this manner: but the cares of an empire in India have left him no opportunity for seeking justice, even for the family of the man who helped so much to make the British Empire what it now is. Mr. DISRAELI also undertook to consider the matter when he entered upon his present duties. Mr. ROEBUCK likewise commenced with energy the generous work of bringing the facts before Parliament; and when we remember what interests he represents—and still more, when we remember that he is the representative of that illustrious man, Dr. ROEBUCK, whose scientific labours so greatly aided the renowned WATT—we know not where to look for a person who could more fitly undertake such a work. Further, Lord PALMERSTON and Lord DERBY each promised to afford something more than temporary relief to the family. But, after all, nothing worthy of the circumstances has yet been seriously attempted.

It is not our desire, simply because we represent mechanical interests, to treat great questions with partiality, or to depreciate the claims of what are called "the professions." But we confess that we see something ominous in the fact that while soldiers, and sailors, and lawyers, and clergymen, are perpetually enriched and ennobled for very moderate services, no riches and no honours—nay, not even the common necessaries of life—are bestowed upon many inventors, nor even upon this family of one of the greatest inventors that God ever gave to this nation. Her Majesty has, it is true, conferred knighthood upon the inventor of a gun, and Ministers have added to the dignity a pleasant appointment; but a case or two of this kind cannot redeem our honour all the time we trample without pity upon the son and daughters of a man without whose inventions we could have had neither the arts nor the manufactures, neither the fleets nor the armies that now belong to us.

Is there no man, in or out of Parliament, who will take the matter up, and heartily endeavour to wipe away the stain of this dishonour? Casual and momentary aid is not all that is needed. There has been much of that afforded already. Ironmasters and engineers have subscribed trifling sums abundantly; Members of Parliament and Cabinet Ministers have given their good words to the cause; and Prime Ministers have contributed donations from the Royal Bounty Fund. But the wrong, and the suffering, and the shame, still endure. What is needed is the personal action of some man or men of influence, first to decide upon what ought to be done for this family, to the head of which we owe so much, and next to assume the responsibility of getting it effected. We sincerely hope that all the liberality of the nation will not be expended upon foreign exiles, and that while so many are turning philanthropists, some, at least, will not cease to be patriots. We do trust history will not have to record that, at the moment when our iron manufacture was most enriching us, and was even adding to our innumerable benefits that of a fleet of impregnable war-ships, the son and daughters of the

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man who created that manufacture died neglected, indigent, and broken-hearted in our midst.

THE SHIPPING INTEREST.

The motion of Mr. Lindsay for a committee of the House of Commons to inquire into the burdens that press upon the shipping interest having been granted, this important subject will now receive the careful investigation which the considerations involved in it demand. Common justice requires that the British shipowner should be fairly dealt with by his countrymen, and in return they have a right to a "reciprocity" of regard—to use the phraseology of the shipowners—from him.

The complaints of the shipowners against unjust exactions (for we can give no milder appellation to processes by which the shipowner is mulcted for the lighting, paving, aye, and beautifying the streets of a town which derives its wealth and status solely from his patronage and enterprise), have but to be dispassionately represented to the country to insure a remedy. The general sense of the House of Commons will be too powerful for the opposition of such members as hold their seats on the "Lever principle" of *aut* Galway *aut nihil*," and who go to Parliament avowedly pledged to vote against everything that in any way touches the selfish interests of their local constituency. But if such points are conceded in justice to the shipowners, other demands, for exclusively protective privileges as opposed to the public good, must be as firmly resisted. The rights of property being respected, its obligations must not be forgotten, and we cannot shut our eyes to the evident purport of Mr. Crauford's speech, and one of the great objects in view in obtaining a revision of the various passenger and shipping acts at present in existence, viz., the limiting of the liability of owners to damages for loss of life, for which, as carriers of passengers by sea, they are (under Lord Campbell's Act) equally amenable with carriers of passengers on land. We cannot forget how perseveringly they have brought their influences to bear on the Board of Trade, with the proposed object of doing away with, or limiting by the merest consideration, this liability; but, thanks to the firmness of that department of the Government, their importunities on this point have been uniformly unsuccessful. It is true shipowners occasionally advanced in support of their pretensions for exemption their want of control over their servants when away at sea, and the hardship of making the owners the sufferers when accidents arise through their servants' carelessness under such circumstances. But what servant can be held to be under the control of his employer when once out of his sight? By the same rule the railway proprietor should be held harmless. And while asking for protection against the consequences of the negligence of their servants, can they show that they themselves conform even to the salutary regulations that the Government have been compelled from time to time to make compulsory on them, by legal enactment, with a view to guard the public against the consequences of the owners' neglect of the most obvious and necessary appliances on shipboard for the safety of life? Do not their very servants make public complaint of such neglect in respect of themselves, and are not many of the precautions that every feeling of humanity would suggest for ensuring the preservation of human life, and which the constantly-recurring liability to accident at sea renders imperative, not only entirely disregarded in scores of instances, but knowingly and wantonly withheld for the sake of the saving of a few pounds? In the important provision of boat accommodation, how do matters stand? By Act of Parliament, under fines and penalties (see Passenger Act, 1855, clause 27, which is seldom, if ever, enforced by the Government Officers when infringed), owners are compelled to make some provision in this respect; but the inefficiency of boats in equipment, condition, and capacity of accommodation, is generally the first theme for reprehension that the press have to descant upon when recording any serious desaster to the passengers of a ship at sea. Who can forget the *Amazon*, the *Birkenhead*, the *Victoria*, the *Arctic*, or later, the *Austria*? Scarcely a boat could be lowered to save from death the affrighted hundreds who vainly sought such a refuge. What would be the position in a court of law of any railway company through whose wanton neglect of an efficient code of signals or effective breaks, life had been thus sacrificed? And what Utopian board of directors would ever hope to pass an Act of Parliament by which, in the event of loss of life through accident to the train, the pecuniary compensation to the sufferers should bear a proportion to the value of such train—which is perfectly analagous to what shipowners require when they ask that their liability should be compassed by the value of the ship and cargo? Proof that they had complied with the requirements of the law made and provided, and that they had employed careful and efficient servants, would be their best, and, we imagine, only argument in extenuation of damages; and till shipowners can use the same, they are in justice liable to the consequences of neglect.

Pecuniary damages have conduced more than anything besides to greater care and improved management on railways, and a consequent diminution of loss of life; and when the pockets of owners are made to suffer for faults of a like nature, we may expect a better state of things. In self-defence they will impress on their captains and officers *their criminal responsibility* in the event of their failing in their duty to keep in proper order and make available their life-saving appliances; or, if need be, summarily to punish them for neglect. When human ingenuity was unable to suggest remedies in mitigation of human sufferings at sea, it was a different matter; but now that the value of the life-boat is known, and the safety with which it may be launched is an established fact, surely no ship whatever ought to be allowed to put to sea without a "Standard Life-Boat," fitted with an efficient means of lowering it; and we hope to see not only a clause to this effect inserted in any new act, but to see it, when it becomes the law of the land, rigidly enforced for the good of the community.

But the shipowners ought not in justice to be singled out as the only class on whom the obloquy of wanton indifference to life at sea rests. The Admiralty authorities and the officers of the royal navy must bear their share. Till the last year or so no provision was ever thought of in any of Her Majesty's ships for mitigating known and acknowledged causes of casualty amongst the men. The seaman who fell overboard when the ship was under weigh, *might* have a chance of being saved if he could swim well enough to keep himself afloat until the ship was "rounded to" (a work of some twenty minutes), when a boat could be lowered by the old tackles to pick him up; and of the sad exceptions such instances formed to the aggregate numbers of the lost, the recollection of every naval officer of experience in the service must be painfully sensible. How often, too, was the loss of the "man overboard" accompanied by fatal results to those who bravely attempted the rescue, solely through the faulty machinery they had to handle? Even now, after the strongest evidence of some of their most efficient officers, and their public recommendation that a remedy might and ought to be generally applied throughout the service for this evil, only a partial application of anything of the kind has been made in the Royal Navy, although some departments of the Government—the East India Board, the Emigration Commissioners, and the Transport and Convict Services—compel every ship that falls under their supervision to carry *two* lifeboats ready fitted for instantly lowering them on an emergency. Thus we have this strange anomaly—that while the House of Commons has legislated for a public requirement at the instigation of one branch of the Government, another department, and that the very one to which we look for a precedent in such matters, neglects to comply with its provisos, or only does so to a limited extent. Such an exception helps materially to retard the progress of a public movement, meant solely for the public good, and we sincerely hope it is but temporary.

As a corroboration to our present arguments we would refer to a letter on this subject that appeared a few days since in the *Times*, from Mr. Clifford, which goes far to prove what we have advanced. From that document we extract the following paragraph of a letter addressed by Captain Castle, of the *Sarah Sands*, to Mr. Clifford, which paragraph affords us great encouragement to insist upon the views we have stated above. This truly gallant officer says:—

"In reply to your inquiries as to the use made of your boat-lowering apparatus (fitted by order of the Government) in the steam transport *Sarah Sands*, I am happy to tell you that, immediately after the discovery of the ship being on fire, the ladies and children, with the boats' crews and provisions, were ordered into the lifeboats fitted with your gear, and lowered by it without the slightest accident, although there was a heavy sea running at the time. I would not have attempted lowering a boat with such a freight in it by the ordinary method, as it would have been attended with too great risk, and an accident to those poor helpless creatures at such a moment would have been followed by great confusion on board, whereas confidence was inspired in all by the ease and safety with which it was done. I am only very thankful I had it on that trying occasion," &c.

ROYAL NAVAL ENGINEERS.

Before the introduction of steam into ships of war, a ship's company comprised but two classes—gentlemen, and men before the mast. But with the steam engine a new class of persons went on board, and had to find a place for themselves—mainly by some law of moral gravitation, we presume. As a general rule, these new men were of a very different stamp to the gun-room and ward-room officers of a man-of-war. While the former came forth from apprenticeships in workshops and factories, the latter were, for the most part, gentlemen by birth and station. The utter want of affinity between the two classes will, therefore, be readily understood. Nor has the progress of time improved the relations between them to any very great extent. Indeed, as if to aggravate the evil, the Admiralty have unwisely admitted many men of a very inferior stamp into the service as engineers. Yet there must beyond doubt speedily be a closer approximation than heretofore between these classes, or something worse. It is not possible to keep the engineers in their present positions, although those positions are much better than they once were. However unpleasant it may be to born gentlemen to be told it, there is undoubtedly a far larger *demand* for engineers than for them; and when men know they are required, they will and must have their claims attended to. The white-

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handed midshipman may be doubtful of his destiny, but the greasy-handed engineer must rise. That may sound very sad to some, but it is perfectly true. On shore the same thing may be observed daily. The young gentleman, with his Greek and Latin mysteries, his elegant accent, his charming manners, too often finds a blank future before him, and not unfrequently has to seek his only chance in Australia or San Francisco. On the other hand, no decent man with a fair knowledge of steam engines in his head, or even with a tolerable capacity of managing a steam boiler, is ever at a loss for employment or recompense. Everywhere the blast of the steam engine is blowing fine gentlemen into limbo, and by the vacuum which it leaves behind it, is drawing other men upwards, even from the lowest spheres.

Now, what are the naval engineers just now asking for? We turn to the memorial published in our last number, and we find their demands are exceedingly moderate and perfectly just. They ask first to be allowed, in their several classes, to retire after a certain number of years, like masters, paymasters, and surgeons, with a step in rank. They ask next that all steam-ships which carry a master, a paymaster, and a surgeon, may likewise carry a chief engineer, and not, as now, an assistant engineer in charge. The present system, although it may be thought to give a momentary advantage to the assistant, keeps down the number of chiefs on active service, and is a drag upon the promotion of engineers throughout the navy. They ask next that they may share the privilege which masters and surgeons enjoy, of having a portion of their time before promotion count for service in their new rank. Three years of the "passed" second master's time, and the whole of the assistant-surgeon's time, counts for increase both of full-pay and half-pay. Why should not the same advantage be given to the engineer? Lastly, the memorialists ask that the widows of first assistant-engineers —whose term of service in that capacity averages no less than thirteen years—should be entitled to pensions after a certain number of years' service like those of assistant-surgeons. In support of this request they very properly advert to the *fact* that "the various changes of temperature to which engineers are subjected, as also the great physical exertions required in the performance of their duties, cause a much greater wear and tear of constitution, and therefore more deaths in proportion than with any other class of officers."

Such are the requisitions of the memorialists. It will be seen that all they ask for is a real and *bonâ fide* assimilation of their case to that of masters and surgeons—an assimilation the propriety of which the Admiralty have themselves recognised. It will be our business to show hereafter that there are other changes, not enumerated in the memorial, which the naval engineers have a just right to look for. We have not time or space for setting these forth this week, although we have gathered a mass of facts together for the purpose from the "Navy List" and "Navy Estimates." We shall not, however, fail to pursue the subject without delay.

Meanwhile, as we number many thoughtful captains and other high officers among our readers, we would have them understand that in urging the claims of engineers we only desire for them what is right and proper. We would have those gentlemen remember not only the defects but the merits of the class. Lamenting as we do the grave deficiencies, in point of both education and morals, of many of the men whom the Admiralty have most unwisely entered in that class, we are, nevertheless, anxious that the class itself should not thereby suffer. And, certainly, the business of the engineer is by no means in itself an inferior one. It does, it is true, involve, in its lower grades at least, much of that actual work of the hands which so many affect to despise. But it is not in England, and in this day, that this can be sustained as a ground of objection to a man, or to a class; for however new the process may be to us, it is unquestionably from our *working* men that our future aristocracy has already begun to spring.

ECONOMY OF THE DOCKYARD FACTORIES.

IN looking up facts relating to naval engineers, we have been struck with the extraordinary discrepancy that exists between the costs of the supervision of our factories at the various dockyards. In order to make the matter clear, we have brought the facts of the case together in a tabular form, which speaks for itself. The most glaring discrepancies are observable in the three cases of Woolwich, Sheerness, and Chatham. At Woolwich, the supervision of 520 men costs in salaries £1,825 per annum, while at Sheerness, 556 men (36 more than at Woolwich), have to be managed on very much less than half that sum, viz., £870. In other words, there is at Woolwich a chief engineer officer, who receives £650 per annum, and has £1,175 spent on assistance besides; while at Sheerness, the corresponding officer has to perform heavier duties upon £500 per annum, with £370—less than a third of £1,175—for assistance. We do not for a moment suppose that there are too many officers at Woolwich, or that any of them are too well paid; both suppositions are very far from our thoughts. But we are certainly at a loss to conceive why the engineer at Sheerness yard—who has, in fact, the responsibility of creating as well as managing the factory there —should be placed at the amazing disadvantage which these figures imply. Comparing Chatham and Sheerness, that disadvantage appears even worse. The chief engineer at Chatham actually receives £50 per annum more for superintending 177 men with no factory at all, than the engineer at Sheerness receives for superintending 556 men with a large factory. These are the kind of facts which, among others, are too palpable, we presume, to strike the senses of such reformers as Lord CLARENCE PAGET. While speaking of this subject, we may as well ask why it is that "Chief Engineer and Inspector of Machinery" is written against the names of all the heads of the dockyard factories save one —that of Sheerness—which bears the scanty appellation of plain "Engineer" only?

Abstract Statement taken from the Navy Estimates for the ensuing financial year, 1859-60; showing the cost of Professional Management of the several Steam-engine Factories (including the Metal and Wood Mills at Chatham Yard) in proportion to the number of men employed therein.

Number and Description of Officers.	Salaries. Single.	Salaries. Total.	Description of Workmen.	Total Number of Men.	Amount per head for Prof. Supervision.
AT KEYHAM.	£ s.	£ s.			
Chief Engineer and Inspector of Machinery	650 0				
Assistant to Chief Engineer	400 0				
Foreman of Factory	222 10				
" Boiler Makers	180 0				
		1452 10	Steam-engine Factory Men	625	£2 6 5½
AT PORTSMOUTH.					
Chief Engineer and Inspector of Machinery	650 0				
Assistant to Chief Engineer	400 0				
" Inspector of Machinery	250 0				
Foreman of Factory	225 0				
" Boiler Makers	200 0				
		1725 0	Ditto ditto	739	£2 6 8
AT WOOLWICH.					
Chief Engineer and Inspector of Machinery	650 0				
Assistant to Chief Engineer	400 0				
" Inspector of Machinery	350 0				
Foreman of Factory	225 0				
" Boiler Makers	200 0				
		1825 0	Ditto ditto	520	£3 10 2
AT SHEERNESS.					
Engineer	500 0				
Foreman of Factory	202 10				
" Boiler Makers	167 10				
		870 0	Ditto ditto	556	£1 11 8
AT CHATHAM.					
Chief Engineer and Inspector of Machinery	550 0				
Conductor of Metal Mills	300 0				
		850 0	At Metal and Wood Mills & Millwrights' shop	177	£4 16 0

SIR JOHN PAKINGTON ON NAVAL SCIENCE.

AT the recent anniversary meeting of the United Service Institution, Sir John Pakington, the First Lord of the Admiralty, who occupied the chair, spoke as follows:—"Never was there a moment when the cultivation of science in connection with the navy was more important to the greatest interests of this country, considering, as one illustration of this position, the extraordinary increase which has taken place in our men-of-war. Perhaps you will allow me to mention, as a remarkable instance of this fact, a statement which it was my duty to address to the House of Commons in speaking of the navy a few evenings since. Only ten years ago, I think, as nearly possible, speaking in round numbers, the construction of a 50-gun frigate cost £50,0000; in the year 1855 the construction of a 50-gun frigate cost rather more than £70,000; and in the year 1858 the construction of a 50-gun frigate cost upwards of £90,000. Now, these are striking and remarkable facts, and they serve to explain many points of which the public is naturally desirous of explanation, but when you find, with respect to the same class of ship, that is to say, a ship that passes by the same name, a ship that is still called a 50 gun frigate, the cost of the construction rising in this ratio in the short period of 10 years, it becomes evident that a great and rapid change is taking place, and that the application of science—and science of the highest order—becomes more and more important with respect to that class of vessels. What is true with respect to a frigate, is of course true as to other descriptions of vessels. I only mention this as an illustration. Then we have to bear in mind the universal application of steam of late years in a new mode and at a gigantic cost. Huge sums of public money have to be expended in those directions; therefore, of course, the cultivation of science becomes all important. At this moment we are about to embark in another wholly new description of construction. I allude to those floating 'cuirassiers.' We are going to have vessels coated with iron. The vessels can only be constructed, or, at least, they can only be made beneficial to the public service when they are constructed, by the most careful application of the most scientific principles. I throw these observations out, gentlemen, merely to show I am sure every man in England who has at heart the welfare of the services, must value an institution which has for its object the promotion of science

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in connection with them. As I speak, it occurs to me that there is another important element of improvement common alike to the army and the navy, namely, the great and rapid improvements which are now taking place in our ordnance and artillery. And let me here advert, in terms of well-merited eulogium, not only to the great science, not only to the great skill, but I must, in truth and justice, add to the noble and patriotic spirit of Sir William Armstrong. Here again, gentlemen, we have the most abundant proof which must convince every man, be he soldier, be he sailor, or be he civilian, that our welfare as a nation, and the success of our great and powerful arms most essentially depend upon the successful cultivation of science, and therefore any institution which tends to encourage and promote science must be a national benefit."

THE CONSERVATION OF FORCE.

WE proposed offering an observation or two this week upon the paper by Professor Faraday, which appeared in our last number. We find, however, that an exceedingly able contemporary, the *Athenæum*, has so clearly expressed our views on the subject, that we may very well save ourselves the time and trouble of writing down our thoughts on this question. The *Athenæum* says:—

"We need not pay much attention to the additional remarks which Mr. Faraday has made on his *conservation of force* principle. Whether he still continues to attribute his principle to mechanical philosophers in general, he will not allow us to know. We cannot make out the smallest acknowledgement of even any comprehension of the balance which exists in the ordinary principle; on the contrary, we have no doubt that Mr. Faraday has either not read any warning on this subject, or has not understood it. Far from clearing up his views, the additional remarks render them more obscure. He says that he fears he has not stated his views with sufficient precision. And he proceeds thus:—

"'The word force is understood by many to mean simply "the tendency of a body to pass from one place to another", which is equivalent, I suppose, to the phrase "mechanical force". Those who so restrain its meaning must have found my argument very obscure. What I mean by the word "force", is the cause of a physical action; the source or sources of all possible changes among the material particles of the universe.'

"Who, in the name of wonder, is it that calls the tendency of a body to change place by the name of force? It has long been known that a body, say at rest, has no tendency to pass from one place to another, except what it derives from the action of an external cause. The more or less of tendency to change place is the measure of the more or less of force applied: but it is not the force itself. All this is known to every attentive college student, and is only unknown to those who have no notions of mechanics at all. Are we to understand by the paragraph quoted, that Mr. Faraday supposes he has been read by some who were thinking only of the ordinary forces of statics and dynamics, without taking into account those molecular forces, as they are called, which are assumed to exist in treating of heat, chemistry, &c.? If so, he has stated his meaning in very difficult terms. And on this supposition, we have only to say that it would be wise to study the ordinary laws of accessible force, and thence to import knowledge into the much less known subject of molecular actions. If a person talking of force generally feel that he must be obscure to those who take him as speaking only of the forces which are comparatively well understood, how can he hope to be less obscure to those who take him to be also speaking of what is less understood?"

LIST OF NEW BOOKS.

Delomme (E.) Project for Purification of Thames, 6d.
Glenny's Gardener's Every-day Book, new edit., 5s.
Glenny's Gardening for the Million, 6d.
Miller's (Hugh) Sketch-book of Popular Geology, with Preface by Mrs. Miller, 7s. 6d.
Photographic (The) News, Vol. 1., 8s. 6d.
Roger's Geology of Pennsylvania, with General View of the Geology of U.S., £2 2s.

HARBOURS OF REFUGE.

WE have but little to do in noticing the report of Her Majesty's Commissioners on Harbours of Refuge beyond presenting an abstract of the statements which it contains, for all considerations respecting the practical construction of breakwaters, which chiefly interest mechanical men, are left for discussion in a supplementary report to be produced some weeks hence.

The Commissioners state that they have visited the districts of the coast forming the subject of the inquiry, and have there held public meetings at which all the parties interested were afforded the opportunity of being fully heard. They have further obtained in London such additional evidence as it was inconvenient to receive at the outports. After noticing that the annual loss of property from casualties on our coast has been estimated at £1,500,000 sterling, with an average loss of life amounting to 780 persons annually; and before entering in detail upon the grounds on which they have selected the sites for harbours, they advert briefly to the principles that have guided them in arriving at their decisions. The harbours to which their attention has been principally drawn are those "which are required upon such parts of the coast as, being much frequented, are without any adequate place of safety into which vessels can run if overtaken by storms." That such harbours are of great service is sufficiently attested by the use made of them at Holyhead, Kingstown, and Portland, in which 200, 150, and 110 vessels respectively have taken refuge at one time during the last few weeks. But harbours of this discription differ very widely in character from those rendered necessary for the purpose of saving life by the entire want of other than tidal and bar harbours on extensive lines of coast exposed to heavy on-shore gales, and largely frequented by the class of shipping least capable of keeping off a lee-shore; and as these have especial claims on attention, the Commissioners distinguish them by the name of LIFE HARBOURS, leaving to those first mentioned that of REFUGE HARBOURS. On any line of coast the greater number of such ports the better; and therefore the best system to adopt is the improvement of the existing ports, if they are in sufficient number, and if such a course is practicable; but if otherwise, then that the sites for Life Harbours (of which facility of access and sufficient shelter are the only essential requisites) must be sought at that spot on the coast which is most generally accessible from every part of it, evidently if it be straight at its central point, and if a bay, at its head.

The tenor of the evidence received by the Commissioners, especially as respects colliers, points very strongly to the important conclusion, that a considerable number of vessels are sent to sea in a state more or less unseaworthy. They are therefore of opinion, that if on the one hand the public money is to be expended in the construction of Life Harbours, and when every allowance has been made for casualties capable of prevention, loss of life and property, amply sufficient remains to enlist both our judgment and our feelings in that course, on the other hand it is necessary to consider whether any further measures can be taken, either of a public or private character, to ensure that the vessels are seaworthy in their hulls, well-found aloft, sufficiently manned, not overloaded; and that in no case want of seamanship, of sobriety, of vigilance, and losses apparently fraudulent, escape without adequate investigation. Of 1,700 voyages made in fifteen years by vessels in the employ of a Glasgow firm, largely engaged in the colonial and foreign trade, only thirteen resulted in shipwreck, and of these wrecks not one occurred on the coasts of the United Kingdom. This fact strongly corroborates the conclusion, that by far the larger proportion of losses occur among the comparatively inferior vessels frequenting the coasts, and that few happen amongst the generally superior class of vessels proceeding abroad, consequently that it is for the former Life Harbours are chiefly required. Intimately connected with losses at sea, and well worthy therefore of every additional measure which can be taken for its improvement, is the character of the seamen; placed in a not very favourable point of view, by the statement that the same firm has lost during the last six years not less than £20,000 by desertion. But, say the Commissioners, desertion, and most of the other evils justly complained of, "can be traced to causes for which the seamen are by no means solely responsible."

When there is an entire or virtual absence of local interests at the place which the Commissioners select for the site of a harbour, and therefore when the benefit of it is confined exclusively to the passing trade, they consider that benefit to be solely national, and that the expense of its construction should be defrayed from the public funds; and they recommend that the cost of maintenance should be met by a moderate due on the vessels engaged in any trade which may be conducted in it; and in default of this, by an annual vote for the purpose. Where there are local interests of considerable amount at the place selected, they consider that benefit to be partly national and partly local, and in all such cases recommend that the expense of its construction shall be defrayed partly by a grant, and partly by funds raised in the locality. The expense of maintenance in this case is to be a first charge on the harbour dues.

Where there is a small amount of benefit conferred on the passing trade, and the local interests are very large at a port preferring claims for assistance, they consider the benefit to be purely local. They are of opinion that the various harbours recommended should be constructed in whole or in part at the public expense, and as they are national undertakings, a passing toll should not be levied for their erection or maintenance.

The following tabular statement contains a list of all the harbours proposed by the Commissioners, and also the cost of their construction:—

Site.	Grant.	Sum to be raised in the locality.	
		Total.	Of which provided.
	£	£	£
Wick	125,000	125,000	25,000 by British Fishery Society.
Peterhead	100,000	200,000	
Carlingford	50,000		
Waterford	50,000		
Douglas, Isle of Man	50,000	50,000	32,000 by Island Harbr. Comsion.
St. Ives	400,000		
Padstow	40,000		
Tyne River	250,000	750,000	300,000 by Tyne Improvemt. Commission.
Hartlepool	500,000	500,000	
Filey	800,000		
	2,365,000	1,625,000	357,000
Sums proposed by Select Committee of the House of Commons	2,000,000		
Excess	£365,000		

From the foregoing statement it appears that the amount of grants which they propose is greater than that originally contemplated; but they are of opinion that the excess in question is amply justified, since through its means they are to obtain additional harbour improvement to the value of upwards of £1,268,000 raised locally, and that the security for life on the coast, will not merely be extended in a corresponding degree, but is shown to be very inadequately provided for in any other way. It would not be advisable to restrict the annual vote for the construction of these harbours to less than £250,000 per annum, if any regard is to be had to the rate of progress as effecting economy of construction, and they are of opinion that the whole of the works they have recommended should be completed within ten years from the present time.

It is placed beyond doubt, the Commissioners further say, that much benefit may be effected by granting, on good security, loans for works, such as piers and harbours of ascertained public utility, where the work to be performed is beyond the means of individuals and of local associations, and they are of opinion, that there are numerous eligible sites for harbours, where an outlay of inconsiderable amount, compared with the advantages to be secured, would render them safe havens for commercial shipping. In many of these there is no prospect of sufficient pecuniary profit to induce an outlay by individuals or companies. They, therefore, recommend that, in addition to the grants proposed by them, a system of furnishing *loans* in aid of local efforts for harbour improvements should be introduced; and they suggest that some machinery analogous to that set in motion by the *General Inclosure and other Acts*, should be established to enable the parties interested in the projected improvements to submit their plans to the consideration of a Board in London, the special function of which Board should be that of facilitating the construction of such harbours.

In conclusion, the Commissioners say it would be idle to deny that the questions under their consideration have touched very closely the commercial interests and rivalries of neighbouring ports, and the pecuniary interests of large and wealthy districts of country in their neighbourhood, and that corresponding feelings

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have been very keenly excited. But they indulge in the hope that all those to whose cordial assistance they have been so much indebted during the prosecution of their inquiry will be influenced both by patriotism and humanity to lay aside such feelings, and to join heartily in promoting those measures which may result from their labours, without which they can meet with but partial success. They commend the good work to Her Majesty's protection, in the firm conviction that, if fairly carried out in the spirit of their recommendations, it will prove not the least noble of the many works of benevolence which will illustrate the history of Her Majesty's reign.

LAYING-OFF;
OR,
THE GEOMETRY OF SHIP-BUILDING.
No. IV.

IT will be readily seen that however fair a sheer drawing on the ordinary scale may be, the expanded drawing on the mould loft floor will require to be faired again, and the various sections on the three planes re-adjusted; for any error occurring in the measurement of the drawing will appear on the floor multiplied by 48. In effecting this re-adjustment, an artifice is adopted which greatly reduces the labour. This consists in shortening all the horizontal projections by drawing the projections of the transverse sections closer together, and making them, say, 3 inches apart, instead of 30 inches—the ordinary *room and space*. All the breadths, or the distances of the intersections of the several projections from the axis remain unaltered, so that they may be measured in the body, and set off in the half-breadth, or *vice versâ*, just as before. Two important advantages arise from this arrangement—the first is, that the quantity of ground to be travelled over in drawing the lines is greatly reduced, and the second, that when the points in the several curves to be drawn are brought so close together, any unfairness can be immediately detected. If, for example, in Fig. 13, page 139, the distance of the point *c* from the axis were too small, it might be difficult to perceive the error were the intervals between the points *a b c d e* great; but if they are brought near each other, it would be impossible to force the batten through the false point. That this mode of operation is admissible may be seen if we reflect that it only amounts to obtaining projections upon a new horizontal plane inclined at a very considerable angle to the plane of the water's surface, so that although the distances between the points—measuring parallel to the axis—are reduced, they all occupy their proper relative positions.

The most suitable lines which can be chosen for this contracted half-breadth plan are diagonals. Level lines are sometimes taken, but they will not detect an error so readily as the diagonals, because they are not so nearly at right angles to the transverse sections which they are required to correct. When the breadths taken from the body are found to produce fair *level* diagonals in the half-breadth, the transverse sections may be assumed to represent the correct form of the ship at the positions which they respectively occupy. We must consider here a point of great importance in completing this operation of fairing, viz., the mode of determining where the lines should end at the rabbets of stem, keel, and sternpost.

We have represented in Fig. 15 a portion of the stem and keel, showing the rabbet or groove in which the ends of the plank are buried; *a* is the front of the stem, *b* the under-side of the keel; *c* is a portion of the fore edge of rabbet of stem, and *d* of the lower edge of rabbet of keel, *i.e.*, *c d* is the line in which the outer surface of the planking and the sides of the stem and keel meet. At this joint there is a seam which requires to be firmly caulked; this makes it necessary to work the planks a little longer on the inside than on the outside to prevent the ends from being forced off from the bottom when the oakum is driven in. This need not be considered in ending the lines; it is sufficient to suppose all the ends of the planks to be cut off square, in which case, the inner edge of the butts will be a continuous curve represented by the dotted line *e' g'*, and known as the middle of the rabbet. This line continued through the stem, keel, and stern-post, will form the boundary of the inner surface of the planking, or the outer surface of the timbers, which is the surface requiring to be dealt with on the floor. As all the sections of the ship will end at this line, it will be better to consider how it may be

FIG. 15.

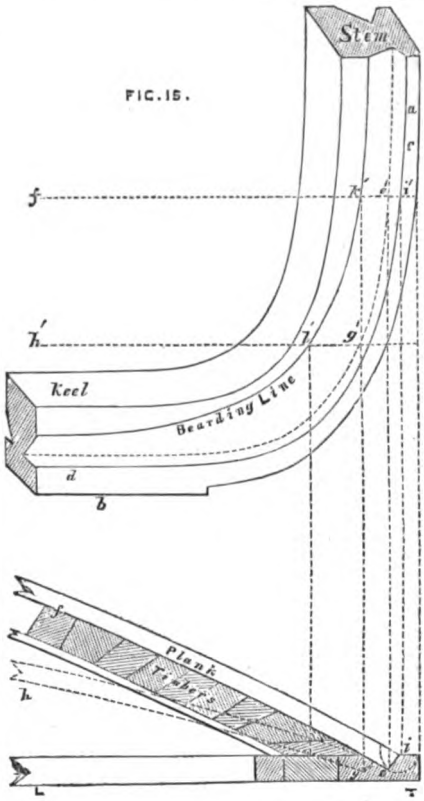
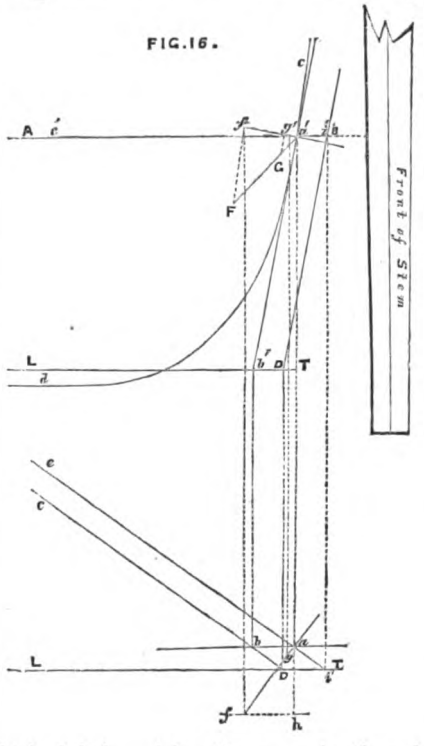


FIG. 16.



obtained before giving the approximations by means of which it may be dispensed with. The only line given to guide us is *c d* (Figs. 15 and 16) continued throughout the ship. This line, it will be seen, is quite arbitrary, while that which we seek is dependent upon it, and upon the form of the ship. For example, where the bow is very sharp the middle and the fore edge of the rabbet will fall very near together, and will separate again as the bow becomes more bluff. To determine this line, it will be necessary to find several points in it in the following way.

Draw a short level line *A B* at the place where it is desired to find a point in the required line, and let the line *A B* meet the fore edge of rabbet in the point *a'*. It must be observed that the stem tapers from the under-side of the 'lower cheek' to the 'fore-foot', as shown (Fig. 16), so that the horizontal projection of the point in the fore edge of the rabbet corresponding to *a'* will be *a*, lying in the line *a a'* drawn perpendicular to *L T*, and at a distance from the axis equal to the half breadth of the stem at the height of the level line. Now, what we desire to do is to set in from the point (*a*, *a'*) the thickness of the plank, say four inches, in a direction at *right angles* to the surface of the planking at (*a*, *a'*) because 4-inch planking measures more than four inches in any direction not square to its surface.

We see that a small portion of the surface of the bottom at (*a*, *a'*) is a plane containing a short piece of the line *c d*, and also of the level line *A B*. If we can discover this plane, it will be easy to draw a line through (*a*, *a'*) perpendicular to it, and upon such line to set off the 4 inches. Draw then, the line *a' b'* coinciding with *c d* at *a'* and extending down to *L T*, which is drawn at a distance equal to the thickness of the plank of bottom above the lower edge of the rabbet of keel, and is called technically the *upper* edge of the rabbet of the keel. It forms a convenient base line or axis, but it represents nothing in the ship. The line *a' b'*, thus drawn, will be the vertical projection, and *a b* drawn with the taper of the stem the horizontal projection of the tangent to *c d* at *a'*. We must now find the projections of the tangent to the *level* line at *a'*. For this purpose a penning batten must be passed through the points obtained on the sections for the level line, and brought down to touch the back of a circle swept from *a*, with a radius equal to the thickness of the plank. This will give us a very close approximation to the direction of the surface, and a line *a e* drawn parallel to the foremost portion of the approximate level line may be assumed to be the horizontal projection of a tangent to the outside of the planking in the section *A B*, and at the point (*a*, *a'*); the vertical projection of this tangent is *a' e'*. The horizontal trace of the plane which contains these lines, must contain the horizontal traces of the lines. Now, (*a e*, *a' e'*) has no horizontal trace, and that of (*a b*, *a' b'*) is *b*. Moreover, the horizontal trace of a plane containing a line parallel to the plane of projection must be parallel to the horizontal projection of the line, from which we conclude that *C D* drawn through *b*, parallel to *a e*, is the horizontal trace of a plane containing the lines (*a b*, *a' b'*) and (*a e*, *a' e'*). Again (*i*, *i'*) the vertical trace of (*a e*, *a' e'*), must lie in the vertical trace of the plane we seek; this trace is, therefore, *D i'* or *D B* and the tangent plane to the surface at (*a*, *a'*) is *B D C*. From *a'* draw *a' f'* perpendicular to *B D*, and from *a* draw *a f* perpendicular to *D C*; then (*a f*, *a' f'*) is a line drawn from (*a*, *a'*) perpendicular to the plane *B D C*. It may be of any length. Having determined its length by marking the point (*f*, *f'*), we must proceed to *rabat* it in order to discover the true distance between (*a'*) and (*f f'*). This true distance is the hypothenuse of a right-angled triangle of which the base is *a' f'*, and the perpendicular the distance which one end of the line is *within* the other, *i.e.*, *d*, so that if we draw *f' F* perpendicular to *a' f'* and equal to *a h*, and join *a'* and *F*, *a' F* will be the true length required. It is on this line *a' F*, which is a *normal* to the surface at *a'*, that the thickness of the plank is to be set off. Set off then *a' G* equal to the thickness of the plank, and draw *G g'* perpendicular to *a' f'*. It will be seen that if *a' F* were swung back about *a' f'* until it reached its proper position—perpendicular to the surface of the planking—*a' G* would be a line across the

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square butt of the plank, and also perpendicular to the surface. We know, moreover, that it represents the proper thickness of the plank, and we therefore conclude that it is a point in the middle of the rabbet. If G is such a point, g' must be its vertical projection, for $G\,g'$ is drawn perpendicular to $a'\,f'$, and, therefore, perpendicular to the plane of projection. Or, looking at it in another way, the length of the vertical projection of any portion of the normal must always be to the length of the portion projected as $g\,f'$ is to $a'\,F$, and $f'\,g'$ bears that proportion to $g'\,G$. Any number of points like g' having been discovered by a similar construction the curve joining them would be the middle of the rabbet in the sheer; the corresponding point g in $a\,f$ would be in the middle of the rabbet in the half-breadth, and a point in the body at the same height as g', and at the same distance from the axis as g would be in the middle of the rabbet in body; so that by means of a series of such points curves could be obtained in all the plans. Having discovered these curves, if it be required to end the level line $e'\,f'$ (Fig. 15), we have only to draw from e' where it meets the middle of the rabbet, $e'\,e$, meeting the middle of the rabbet in the half-breadth in e, and this point e will be the end of the horizontal projection of the level line. Or again, to end a diagonal line, set up from the base line in the sheer the height at which the diagonal crosses the middle of the rabbet in the body, and thus discover the ending in the sheer; let fall from this a perpendicular to the middle of the rabbet in the half-breadth, and we have the ending of the horizontal projection of the diagonal. If the diagonal is rabatted or expanded, the expanded line will end at a point squared out from the one just found, and at a distance from the axis equal to the length of the portion of the diagonal intercepted between the axis and the middle of the rabbet in the body. If a transverse section is to be ended in the body find the height at which it crosses the middle of rabbet in the sheer, and a point at the same height in the middle of the rabbet in the body will be the ending. We may observe before passing from this problem that if the stem be supposed to have no taper, $B\,D$ would be parallel to $a'\,b'$, for the same reason that $C\,D$ is parallel to $a\,e$, and there would be no necessity for getting in the tangent plane, as we could find the directions of $a\,f$ and $a'\,f'$ by means of the lines $a\,e$ and $a'\,b'$, and could then construct the triangle $a'\,f'\,F$, and proceed as before. This mode of solving the problem is similar to that adopted by Marmaduke Stalkartt, who makes the assumption that the stem is of parallel siding from the head to the heel; but, as the value of the problem is in any case mainly theoretical, we have striven to give it the greatest possible exactness. Draftsmen sometimes adopt the construction of Stalkartt, and end the lines in the way described, but the ordinary mode of ending level lines, water lines, and sheer lines, is to sweep a circle from i, fig. 15, or from a, fig. 16, with a radius equal to the thickness of the plank, and to let the line touch the back of this circle. Although this is incorrect, it has the advantage of leaving an excess of wood in the rabbet. If the fore edge of rabbet were vertical and the stem did not taper there would be no error, for the surface of the planking would be perpendicular to the horizontal plane; and any inclination in this surface arising either from the obliquity of the fore edge of rabbet or the taper of the stem, increases the thickness of the horizontal section of the planking, and makes it necessary that $e\,i$, Fig. 15, should be greater than the given thickness. In Fig. 15 there is a line marked *bearding line*. This is really the after edge of the rabbet of the stem, the upper edge of the rabbet of the keel, and the fore edge of the rabbet of the stern-post. It is obtained on the stem, as shown in this figure, by finding points k' and l' in the level lines in the sheer, vertically over those in which the same lines in the half-breadth are cut by straight lines representing the half-siding of the stem at the height of the respective lines. The bearding line on the stern-post and after deadwood are obtained in the same manner. To find the bearding line along the keel, measure the heights at which each transverse section in the body is cut by the half-siding of the stem, keel, or stern-post at its station, and set up such heights on the respective stations in the sheer. All the diagonals are ended at this line, as the harping, the forms of which they are intended to determine, do not go beyond it, but turn off at it and follow the side of stem or stern-post. The ending of one of these diagonal lines is obtained by measuring in the body the height at which it cuts the side of the stern or stern-post, setting it up on the bearding line in the sheer, and then dropping a perpendicular and finding the corresponding point in the side of the stem or stern-post in the half-breadth.

Parliamentary Proceedings.

CONDENSED FOR THE "MECHANICS' MAGAZINE."

THURSDAY, MARCH 10.

HOUSE OF COMMONS.

PIERS AND HARBOURS.

Mr. PINLAY asked whether it was the intention of Her Majesty's Ministers to introduce a Bill to facilitate the construction of piers and harbours; and, if so, when?

Sir J. PAKINGTON stated the introduction of the Bill was postponed till the report of the Harbour Commission should have been considered.

FRIDAY, MARCH 11.

HOUSE OF COMMONS.

RIFLED CANNON.

The order of the day for going into committee of supply having been read,

General PEEL, in reply to General Evans, said he did not think it would be quite prudent to state how many of Armstrong's guns were expected to be constructed during the present year. He had upon a previous occasion informed the House that the Government would have those guns made as quickly as possible, and that it was their intention to establish a manufactory for them at Woolwich.

DOCKYARD EXPENDITURE.

A lengthened discussion then ensued on Dookyard Expenditure, Lord Clarence Paget commencing it, and being followed by Sir John Pakington, Sir Charles Napier, Mr. Bernal Osborne, Mr. Bentinck, Sir F. Baring, Sir G. Pechell, Sir. J. Elphinstone, Mr. M. Gibson, Lord J. Hay, Mr. W. S. Lindsay, Sir C. Wood, Mr. Corry, Lord J. Russell, the Chancellor of the Exchequer, and Mr. Joseph Locke. The statements brought forward in the discussion appear in another column. The motion of Lord C. Paget was to the effect, "That, in conformity with the practise of the public departments of laying before the House detailed estimates for works costing above £1,000, it is desirable that a statement in the following form, showing the proposed expenditure in the construction and conversion of her Majesty's ships, be annually laid before this House with the navy estimates—viz., name of ship, tonnage, horse power, total estimated cost, amount already voted, gross sum already expended, amount proposed, 1859-60, further amount required to complete, remarks."

When the House divided the numbers were—

For the motion of Lord C. Paget	97
Against	117
Majority against the motion.	——20

MONDAY, MARCH 14.

HOUSE OF LORDS.

ELECTRIC TELEGRAPH GUARANTEES.

Lord STANLEY of ALDERLEY, in moving for copies of all contracts entered into by Her Majesty's Government with any Electric Telegraph Companies, expressed a hope that in all these contracts care might be taken to include a power to the Secretary of State, by warrant, to take possession of the telegraph, on any sudden emergency, for so long as he might think the public interest required, compensation being made to the company.

The Earl of DONOUGHMORE said there would be no objection to the return.

Lord REDESDALE objected altogether to the principle of guarantees. They were entirely unnecessary, and had the effect of deterring the construction of useful works, for when once the practice was established no work would be undertaken without a guarantee.

The return was then agreed to.

HOUSE OF COMMONS.

DOCKYARD EXPENDITURE.

Sir J. PAKINGTON said, in consequence of the statement made to the House on Friday evening by the noble lord the member for Sandwich (Lord C. Paget) that, in the course of the last 11 years, of the sums voted from time to time by the House of Commons for the expenditure of our dockyards, no less than 5,000,000*l.* have not been accounted for, or have been absorbed by what the noble lord called reckless extravagance, I wish to give notice that in the course of a day or two it is my intention to lay on the table, together with the reports of the committees I have already promised, a full statement of how the money voted by the House during these 11 years has been appropriated. And it is my intention that this statement shall be given as much in detail as it is in the power of the department of the Surveyor of the Navy to supply.

METROPOLITAN DRAINAGE.

Mr. WILLIAMS asked what steps had been taken by the Metropolitan Board with reference to the main drainage of the metropolis, particularly on the south side of the river.

Mr. TITE had obtained from the chairman a correct account of the present state of the works. On the south side of the river there were two systems of sewers—the high level and the low level. The high level sewer began at Clapham and ended at Deptford; it was 10 miles in length, and its estimated cost was £203,000. The contracts for this sewer had been concluded last week. The lower level sewer began at Putney and ended at the same point as the higher one—Deptford; it was 11 miles long, and the contracts for it would be advertised in June next. The two systems of drainage on the south side of the river would end at the same point at Deptford Creek, where the contents of the lower sewer would be pumped into the higher one and flow into the estuary of the Thames at Erith. On the north or city side of the river there were three systems of sewers; one began at Hampstead, and ran for seven miles and a quarter to a terminating point on the river Lea. The cost of this sewer was estimated at £252,000, and it would probably be finished in 12 months. The second sewer began at Kilburn, and ended at the same point on the river Lea as the first—a distance of 10 miles; it would be contracted for at the end of the year. The third system, being involved with the embankment of the Thames, would require a longer time in construction. All these systems meeting at one point on the Lea, the water would there be raised from the lower to the higher level, and run in a common conduit to the sea at Barking Creek. The works would be completed in four years; the whole of the money, £3,000,000, had been advanced by the Bank of England, at 3½ per cent. It was estimated it would all be paid off in 40 years by a 3d. rate on the metropolis.

THE NAVAL ESTIMATES.

On the question that the House may go into Committee of Supply upon the Naval Estimates,

Mr. WILLIAMS moved that they should be referred to a select committee. After remarks from Sir H. Verney, Sir H. Willoughby, Mr. Lindsay, Col. Sykes, Admiral Walcot, Sir F. Baring, Mr. Bentinck, Lord H. Vane, Lord C. Paget, Sir J. Pakington, Mr. B. Osborne, Sir C. Napier, Mr. Jackson, and Sir C. Wood, Mr. Williams' amendment was negatived without division.

DECIMAL COINS FOR CANADA.

THE coinage of decimal pieces for Canada still goes on at the Mint simultaneously with the ordinary coinage for home use. More than three millions of twenty, ten, and five cents, equal in weight and value to the franc, half, and quarter-franc of our belligerent friends "over the water," have already been despatched to that colony, and now one-cent coins of bronze are being produced. This latter may be considered, indeed, a model coinage. It is at once economical, artistic, and convenient. The bronze used is a mixture of copper, tin, and zinc—in the proportions of 95, 4, and 1—and thus gives a metal harder and more durable than copper alone. The pieces are, in comparison with our own copper currency, thinner and larger in diameter. For instance, farthings are 7-8ths of an inch in diameter, and there are 96 of them to the lb. avoirdupois; but the Canadian one cents are just an inch across and there are 100 of them to the lb. When it is considered, too, that they are current at the same value as the halfpenny, the economy of metal becomes at once apparent. The design of the obverse is chaste and pretty. Her Majesty's portrait, with the legend, VICTORIA, REGINA DEI GRATIA, CANADA, surrounded by an undulating wreath of maple leaves, comprises it. The reverse has a similar wreath, with the words, "One Cent," and the date, "1859," in the centre. Twenty tons' weight, or nearly 4½ millions, of these admirable coins are being, we are told, struck, and certainly the Canadians may be congratulated upon presently obtaining a perfect decimal currency, whilst the English people are but *thinking about* adopting the valuable improvement. Why should the population of these islands—to put the matter in a point of view as regards convenience only—be always carrying about 6,000 tons of metal in the shape of copper coins, when 3,000 tons or less, of bronze, well adapted for wear and tear, and for displaying the fine lines of the engraver, would answer the same purpose? When, indeed, may we expect a decimal coinage?

Mr. W. Phelps, of Red Lion-square, London, suggests "the employment in wet gas meters of an aqueous solution of deliquescent metallic and earthy salts, kept constantly neutral by the presence of a base or carbonate," instead of the ordinary water.

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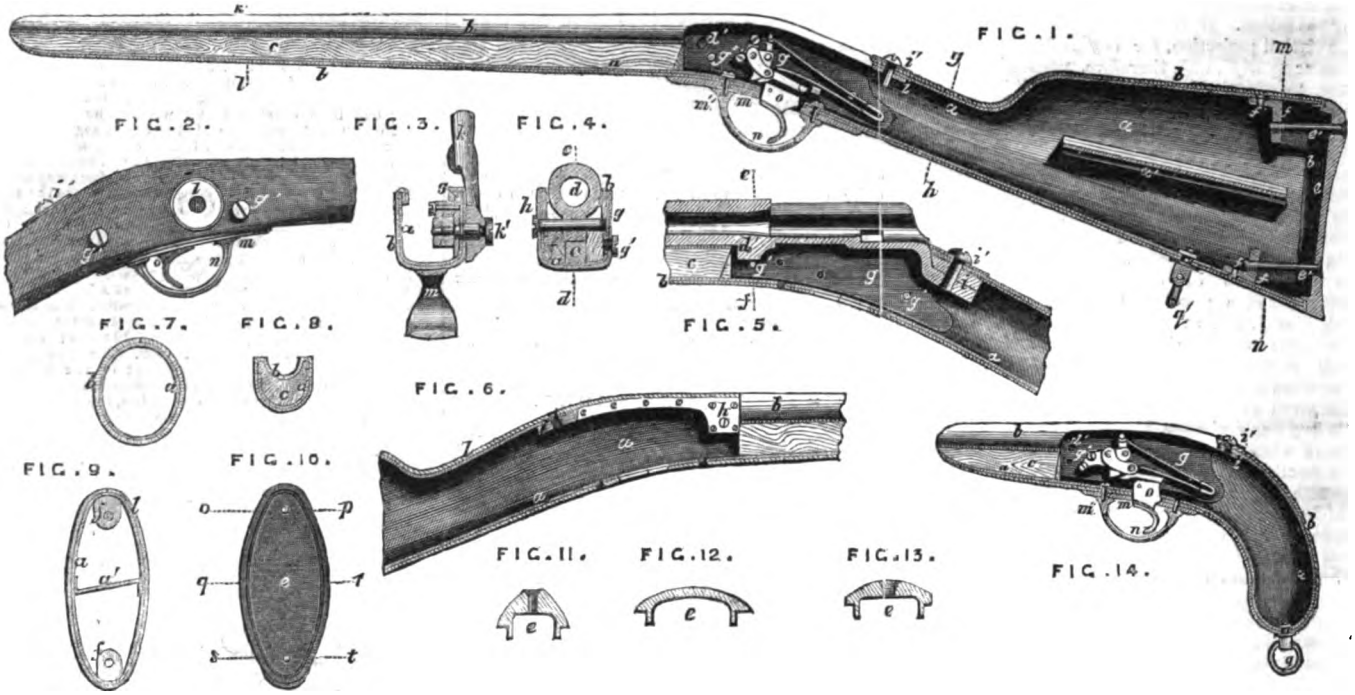
MANCEAUX'S METALLIC STOCKS FOR FIRE-ARMS.



MANCEAUX'S METALLIC STOCKS FOR FIRE-ARMS.

M. François Jules Manceaux, of Paris, one of the first gun-makers of France, has just completed a patent in this country for forming the stocks of muskets, pistols, and other fire-arms of a combination of wrought iron (or other metal), wood, and leather. He prefers to use thin wrought-iron plates as the most suitable metal. This he bends and fashions into the form of stock to suit the arm for which it is intended. All that part in front of the lock which supports the barrel is open and dished or curved to receive a block of wood hollowed out at top for the barrel to lie in. The butt-end of the stock is furnished on the inside with strengthening pieces to prevent the ends collapsing. A sheath of cow-hide or other suitable leather is stretched in a damp state over the metal and wood, and a barrel is forcibly pressed down on the leather over the fore part of the stock to cause it to assume the exact form of the stock. The open ends of the leather sheath are turned in and secured over the butt-end of the metal frame. The leather is then heated and plunged in a bath of melted wax, and after being thoroughly saturated the wax is drained off and the leather polished by brushes. A solid butt-piece of metal is screwed into the open butt-end off the metal frame. The lock is contained in the hollow of the stock, and is held by screws; a transverse screw bolt passing through a hole formed in a block on the bottom of the breech-end of the barrel keeps the barrel in place. A metal plate is screwed in outside the leather to receive the friction from the working of the hammer of the lock.

Fig. 1 is a longitudinal section of the stock of a fire-arm constructed according to this invention, and showing the lock. Fig. 2 is an external elevation of part of the stock, showing a plate on the side of which the hammer is to work. Fig. 3 is a cross section. Fig. 4, cross section through the line *e f* of Fig. 5, which is a longitudinal section through *c d* of Fig. 4; Fig. 6 is also a longitudinal section through *c d* of the opposite side of the arm; Fig. 7 is a cross section through *g h* of Fig. 1; Fig. 8, cross section through *k l* of Fig. 1; Fig. 9, cross section through *m n* of Fig. 1; Fig. 10 is an internal view of the butt-plate; Figs. 11, 12, and 13, are cross sections respectively through the lines *o p*, *q r*, and *s t* of Fig. 10; Fig. 14 is a sectional elevation of a pistol stock, showing the lock. The patentee first forms moulds and dies in metal, and then by successive heats, and under hydraulic or other pressure, fashions a sheet of plate-iron into the form required. He brazes the edges of the plate, and makes a perfect joint. This is the shell or carcass of the improved stock. He next furnishes the interior of the rear-end of the shell with a Z-shaped strengthening piece, *a'*, Figs. 1 and 9, to prevent the sides collapsing, and with two nuts, *f f'*, screwed to the shell to receive the ends of screws for holding the butt plate of the stock. The fore part of the metal shell is filled with a bed of wood, *c*, Figs. 1, 8, and 14, hollowed out at top, and riveted to the shell. He next takes a hide, *b*, of the shape shown, and sews it up at the sides to form a sheath. The leather is softened by steeping, and while wet, or damp, is drawn over the metal shell and wooden bed until the two open ends extend beyond the shell; a false barrel is then placed over the leather, and secured over the wooden bed by screw or other clamps, to cause the leather to assume and follow the shape thereof. A wooden block is introduced between the turned-over edges of the leather at the breech, see Figs. 1, 4, 7, 8, and 9. In drying, the leather follows the exact form of the shell, and in order to dry it thoroughly, he introduces and works about a hot iron inside of the hollow part of the stock. He next plunges the stock in melted wax, and rubs the wax into all the pores of the leather. He then allows the wax to drain off, and the stock to cool; when cold he polishes the waxed leather with a rubber and brush. One end of the sheath is turned in over the butt-end of the shell, and is covered and secured by a rim, *e*, in the inside of the butt plate, which is attached to the nuts *f f'* by the screws *e'*, *e'*. The opposite end of the sheath is turned in over the wooden bed. The lock is placed bodily in the hollow of the shell, and is there fixed by screws, see *g' g'*, Figs. 1 and 5; *k* is the hammer, secured on the spindle by the screw *k'*; *g* is the lock plate held inside the shell by the screws *g'*, *g'*; *l* is a metal collar screwed to the outside of the shell, against the face of which the side of the hammer works, and is thus kept from chafing the leather; *d* is the barrel placed in the bed in the fore part of the stock, and secured by means of a screw, *d'*, which traverses a hole made in a lump on the underside of the barrel, and if a screw, is screwed with a block, *i*, in the rear of the barrel; *h* is a strengthening block inserted into the shell of the stock on the side opposite the lock-plate, for the purpose of giving additional solidity of the stock at that part, and for maintaining the barrel in the centre of the stock; this block is traversed by the screw *d'*. At the further end of the stock there is a ring, *p*, which encircles the barrel, and is secured to the stock by a screw. If thought necessary, in order to protect the extreme end of the barrel, the wooden bed might be prolonged, and fastened by rings to the barrel, as in the ordinary military musket. The wooden bed should be covered over its whole length with leather, and then the leather sheath might be composed of two parts united at the breech, or other suitable part; *m* is the guard-plate screwed to the under part of the shell, and *n* the guard; *o* is the trigger which works in a slot made in the shell; *q q'* are buckles for attaching a sling.

STEAM FIRE-ENGINES.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

Fire Engine and Pump Manufactory,
245 Blackfriars Road, London, 16 March, 1859.

GENTLEMEN,—Referring to the number of the Magazine dated the 4th instant, we find several strictures by an anonymous correspondent upon our Steam Fire-Engine, but as we have two in hand nearly completed, with which we intend to have various public trials, we decline, at present, entering into a controversy upon the subject; at these trials your correspondent and the public will have ample opportunities of acquiring the fullest information. With regard to that part of his letter in which he states that the attempt to work the engine in St. Petersburg proved a failure, we beg leave to hand you the following letter:—

"Messrs. Shand and Mason. "March 15, 1859.

"GENTLEMEN,—In reply to your inquiries as to the performance of the Steam Fire-Engine sent by you to St. Petersburg last autumn, I beg to say that we were very fortunate in our various trials with the same. In the first, which was private, we worked it with two of the larger (¾) and to of the smaller (½) jets, and kept her at work for about three hours. The most severe trial was the third—the cold being 18° Reaumer, nevertheless she performed very satisfactorily. The Count Struvaloff, our Chef de Police, and the other authorities, were very well satisfied both with the quantity of water thrown and the force with which it issued from the pipe. Since my arrival in this country, I have received intelligence that it was used at the fire which took place at the Theatre Cirque, and although worked by the men of the brigade, did very well during the eight hours which the fire lasted. "Yours truly,

"(Signed) H. B. FROOM."

We are, gentlemen, yours very respectfully,

SHAND AND MASON.

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MACHINERY FOR TURNING.

FIG. 1.

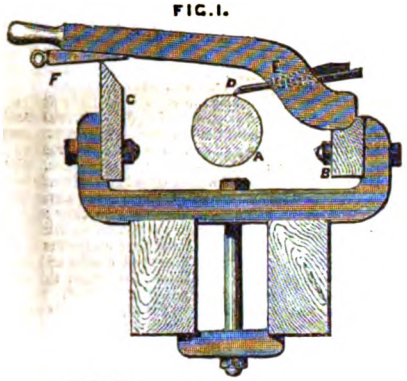


FIG. 2.

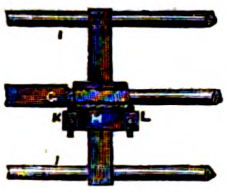
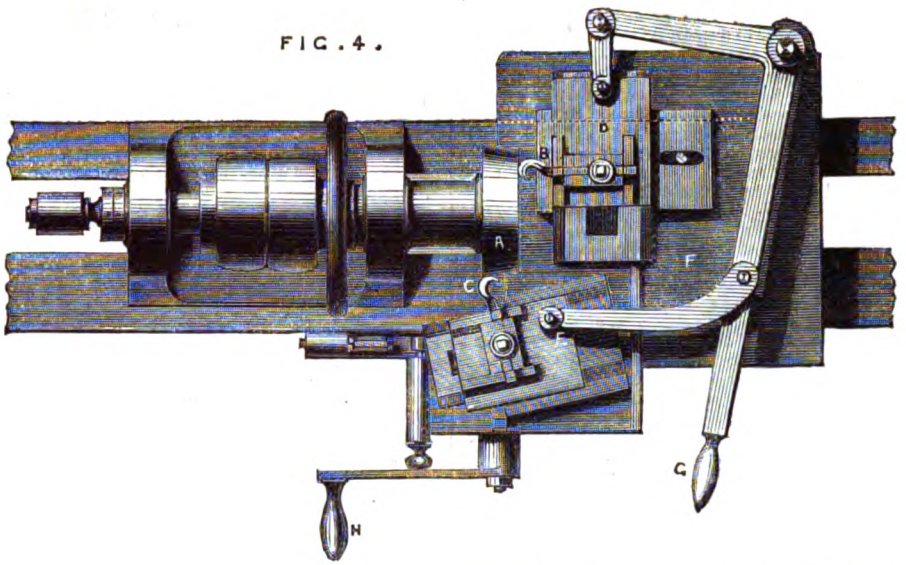


FIG. 3.

FIG. 4.



MACHINERY FOR TURNING.

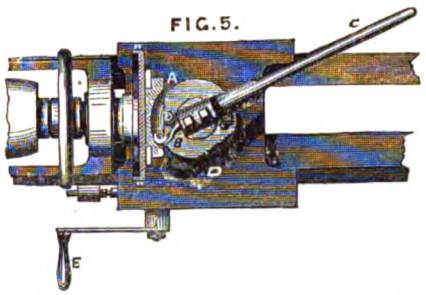
ON SOME APPLICATIONS OF THE COPYING OR TRANSFER PRINCIPLE IN THE PRODUCTION OF WOODEN ARTICLES.

By John Anderson, Esq., F.R.S.,
*Inspector of Machinery, Woolwich Arsenal.**

A distinguishing characteristic of the arts and manufactures of the present century as compared with those of the past consists in the application of the principle of machine copying, in contradistinction to dependence on the skill of the operative, in the production both of the ordinary articles of commerce and of the munitions of war. Engineers are so familiar with this principle in their every-day pursuits, that it frequently escapes their notice; yet a closer inspection will show that almost all machines that are intended to change the form of materials are constructed on some modification of this principle, of having the form in some way or other contained in the apparatus, with the specific object of imparting that form to the materials under operation; and it will generally be found that every process which is done well, and which at the same time is done cheaply, is performed by some skilfully-arranged development of this principle. The advantage of keeping first principles steadily in view in practical applications of science is generally conceded: the knowledge of facts is considered good; but to know the law of the facts is considered better, and much more likely to hasten onwards their more extended application. A complete exposition of the various applications of this copying principle in the several arts and manufactures of the world would form a highly interesting and valuable volume.

Within the last few years a remarkable change has taken place in this respect. With regard to the tools of the smithery, production by the hammer and hand of the smith is fast giving place to production by means of apparatus constructed upon the copying or transfer principle: such as dies under the American drop hammer, the steam hammer, and the forging machine; the employment of rolls containing on their surfaces the pattern of what is wanted; and the use of oscillating dies imparting the form to the red hot mass upon a moving table. In each case it is seen that the general tendency is to obtain the form and dimensions of the article produced by the transfer of both from an apparatus prepared with care; and to dispense with that care in the future actual production. The moulding operations of the foundry are pre-eminently copying; or, if it is attempted to analyse the recent improvements in the moulding of wheels, shells, railway chairs, and such articles, it will be found that all are designed with a view to have the accuracy and perfection of form provided in the apparatus, from which it is then transferred to the sand without so much skill being required on the part of the workman who performs the ramming of the mould. The other workshops of the engineer present that invaluable development of the copying principle termed the slide rest, assuming every variety and modification in the several machines used for turning, boring, drilling, planing, or shaping. The same principle in combination with circular cutters affords the machinery of the Small Arm Factory, the endless variety of which would alone form an interesting subject.

FIG. 5.



The object of the present paper is to give a description of a few applications of the copying principle in the production of certain articles mostly in connection with the simple operations of wood-turning, which have been more immediately brought under the notice of the writer; and although they are trifles in themselves, still it is only by each one making a small contribution from time to time that the improvements in the details of the several workshops can be made generally known to one another.

During a short professional tour in the United States in 1854, the writer was much struck with the many simple and ingenious contrivances there introduced, in order to apply the copying principle in connection with ordinary hand-lathe operations, where generally in this country more would be dependent upon the skill or attention of the turner or upon special machinery. For example, in the production of articles where there is repetition and which are to be turned in a common lathe, the application of certain very simple additions tends greatly to facilitate the operation, and to enable the operator to dispense with the usual measuring and gauging and the use of callipers, which generally occupies so much time.

A simple arrangement of a copying lathe is shown in Fig. 1. At the front of the lathe and parallel with the piece of wood *A* to be operated upon, there is fixed a strait edge, *B*, made of hard wood, with the upper or straight edge slightly hollowed. At the back of the lathe there is a similar fixture, *C*, only the upper edge is not straight but resembles the irregular form of the required article. The gouge or turning instrument, *D*, instead of being held in the hand of the turner over a rest, is fixed into a piece of wood, *E*, the arrangement slightly resembling that of a carpenter's plane, having one end adapted to slide firmly on the straight edge *B*, at the front of the lathe, while the other is adapted to trace the irregular line *C*, running along the back. In order that the workman may gradually reduce the wood to the proper diameter without the risk of digging into the mass and thereby breaking the cutting instrument, a small wedge of wood, *F*, is attached by a loop to the little finger of his right hand, and at the commencement of the operation is inserted between the toolholder *E* and the irregular pattern *C* at the back of the lathe, but is gradually withdrawn as the article approaches the required diameter; and at the last, a finishing tool is slowly and carefully drawn along the two guides *B* and *C*, thus producing the exact pattern without any effort, and in much less than half the time in which it could be done in the common way.

On a similar plan to the foregoing, but differently arranged, is the American system of turning long poles of small diameter, as shown in Fig. 2. The wood, *G*, to be turned is first cut by a circular saw into square rods of the required length; these are then placed between the centres of a turning lathe, with the corners still upon them. The toolholder or cutting apparatus, *H*, slides steadily upon two parallel straight edges, *I I*, placed respectively at the front and back of the lathe: this toolholder consists of a metal socket, *H*, having cutting gouges, *K* and *L*, at each end; the foremost gouge, *K*, is set to reduce the square rod to the internal diameter of the socket, *H*, in order to obtain perfect steadiness; while the second or finishing gouge, *L*, is set to reduce the pole to the required diameter. To relieve the workman from the trouble of pushing the socket, *H*, with its cutting tools along the lathe, the interior of the socket is made with a screwed surface; and the first gouge, *K*, being set to give a tight fit, the thread which is thus formed upon the wood draws the socket along; and as the second gouge, *L*, is close to the hinder end of the socket, the thread does not make its appearance, being cut off by the second gouge, which is set to give the proper finished diameter to the work. In turning long small poles of an irregular figure, the second tool, *L*, is not a fixture upon the socket, but is held in a toolholder having one end hinged upon the socket while the other traces the required pattern placed alongside, thus causing the tool to rise or fall as it slides along the pattern.

It may be mentioned that the American woodturners use a centre which is not common in this country; and having been introduced into the Royal Arsenal with great advantage, its general application can be recommended. This lathe centre, which is shown in Fig. 3, instead of having the ordinary sharp point, is formed at the extremity with a hollow cup, *M*, surrounded by a sharp circular edge; this when pressed into the revolving wood forms a hard centre within itself, by compression of the wood within the conical cup, which is better adapted both to retain the oil and also to continue uninjured during a long period.

The method of turning the sabots or blocks of wood which are attached to round shell, as performed in the arsenal at Woolwich, affords another illustration of the successful application of the copying principle. Hitherto these articles have been produced by the wood-turner with the gouge, chisel, and gauges, in the usual manner; it was a monotonous and very

* Paper read at the Institution of Mechanical Engineers.

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laborious process, and a skilled workman could produce only about fifty of them per day. By the new method, the wood is first cut out of the plank into circular pieces by means of an ordinary trepanning tool, costing for wages an average of 7*d.* per hundred. The wooden disc is then perforated by a drilling machine, in order to prepare it for being screwed upon the face plate of a turning lathe.

The first turning process is to form the exterior surfaces; and for that purpose the wood is screwed upon the centre screw of the face plate, as shown at *A*, Fig. 4. The tools or gouges, *B* and *C*, that are required to produce the form are contained on separate sliding rests, *D* and *E*, combined together upon one saddle, *F*, both being actuated by the movement of a single handle, *G*. The saddle, *F*, itself is made to slide upon the lathe bed in the ordinary manner, by means of a rack and pinion, and is moved by the left hand of the workman by means of the handle *H*. The dimensions of the sabot are determined by a stop upon the lathe bed against which the saddle, *F*, is pressed, and also by the adjustment of the gouges.

The next and last operation is to hollow the sabot for the reception of the shell. For this purpose a similar lathe is employed, shown in Fig. 5; the block, *A*, is held in a universal chuck adapted to the article. The required hollow being part of a true circle, the gouge, *B*, is fixed upon a holder which is capable of turning on its axis by means of a handle, *C*; the radius of the circle described by the gouge depending on the distance at which its cutting edge is set from its centre of motion. The toolholder is mounted upon the saddle, *D*, of a lathe, as in the former operation, the depth to which the hollow is cut being determined by a stop fixed upon the lathe bed and adjusted with reference to the face plate. In performing the operation the workman moves the saddle, *D*, with his left hand by a rack and pinion by means of the handle *E*, while with the other hand he gently moves the handle, *C*, of the toolholder, making the gouge describe an arc of a circle.

It will thus be seen that no skill is required during any of the producing operations, and that the form and dimensions of the article are in each case contained in the apparatus. To make sabots of other forms, the several slide-rests are readjusted upon the saddle. The saving in wages effected by these arrangements amounts to more than four-fifths of the original cost.

For another but smaller class of articles of similar shape, of which three or four hundred thousand are required daily, a different modification of the principle of copying is employed. The conical plug of the Minie bullet is made of boxwood by self-acting machinery. In this manufacture, the conical form of the plug is contained in a revolving cutter, which is fixed in a lathe spindle and driven at a high velocity. The wood having been first cut up into long square rods by means of circular saws, one of the wooden rods is fixed upon the lathe saddle, and pushed forward against the cutter; this gives a conical form to the end of the rod, which is then cut off by means of a circular saw, forming a plug of the required shape and dimensions.

(To be concluded in our next.)

THE NEW METAL ALUMINIUM.

A VERY interesting paper on aluminium was read at the Society of Arts, on Wednesday, the 2nd ult., by Mr. Foster, the able Secretary of that Society. First mentioning the extension which chemical knowledge has undergone in modern times, and the boundless supply of aluminous substances which has thus been opened up—in granites, slates, schist, and especially in clays—the author pointed out the fact that aluminium forms an essential portion of our most brilliant gems, including corrundum, the sapphire, and the Oriental ruby and emerald; and then proceeded to remark that, notwithstanding the universal diffusion of ores of aluminium, the existence of the metal itself was not known until the last half-century, and its extraction has been attended by great difficulty. He then detailed the means adopted for producing sodium by Davy, Gay-Lussac, Thénard, Mitscherlich, Brunner, Donny, Mareska, and, more recently, Deville; and traced the labours of Oersted, Wöhler, and Deville, in the production of aluminium. After quoting from the paper read by the Rev. J. Burlow, in 1856, on Deville's process, noticing the modifications which Paul Morin introduced, and sketching the labours of Dr. Percy, Mr. Dick, and Rose (of Berlin), the author stated that—

Mr. Gerhard, an Englishman, has for some little time past been engaged in experiments with a view to establish the manufacture of aluminium in this country, and to produce it at a cheaper rate than hitherto. He has adopted the cryolite process rather than the double chloride of aluminium and sodium, inasmuch as the cryolite is readily obtainable in large quantities and at a very low price. Mr. Gerhard has erected furnaces at Battersea, and there is no reason to doubt that with the modifications which he has introduced, added to the fact that the materials are cheaper in this country than in France, aluminium may be produced here at a still lower price than in France, whence the small quantity that has been used in this country has hitherto been imported. Mr. Gerhard's process he shortly describes as follows:—270 parts by weight of powered cryolite are mixed with 150 parts of common salt, and into this mixture are placed 72 parts of sodium, cut into small pieces. The whole is then thrown into a heated earthenware crucible, previously lined with a melted mixture of cryolite and salt, which mixture is also immediately poured over the contents of the crucible, covering them to some little depth, over which the lid is then placed. The crucible is then put in a furnace, and kept at a high red heat for about two hours. When the pot is uncovered the melted mixture is well stirred, and then poured out. The buttons of aluminium are found mingled with the slag, and may be easily melted together by heating them in a crucible with common salt. Theoretically, the amount of aluminium produced should be one-third of the weight of the sodium employed, but practically such a result is never obtained, and our manufacturers would be well satisfied with obtaining between one-third and one-fourth. This Mr. Gerhard has accomplished, though he is not always so successful. There is still some uncertainty in the process. "From what I have seen, and from what I have learnt from those better qualified to judge on matters of chemistry and metallurgical operations than myself, I am led to believe," said Mr. Foster, "that the cryolite process is the one that will ultimately be preferred to that of the chloride of aluminium." As yet, however, the process presents certain difficulties which Mr. Gerhard appears to have to some extent overcome by his method of performing the operation. Previous to Deville's labours, aluminium sold at the rate of £40 sterling for 35 oz. avoirdupois; and when Deville came to England, in 1856, the result of his labours had then already caused a reduction in the price to £3 per oz. Mr. Gerhard already manufactures sodium commercially, and owing to his labours, the price of sodium has been considerably reduced, being now sold at 16*s.* per pound avoirdupois, while two years ago the price of imported sodium was £6 sterling per pound. Aluminium, imported from France, fetches 7*s.* 6*d.* per oz., and there is no doubt that if large quantities of it were required the supply would be made at once at a considerable reduction on this, which may be termed a retail price. There can be no reason to doubt that at no distant period it will be produced at a cost which will secure its application to numerous important uses. "I may add," said the author, "that while engaged in the preparation of this paper, I have been informed, and I have no reason to doubt the truth of my information, that certain modifications are likely to be introduced into the manufacture of sodium, so as to enable it to be produced at a marvellously reduced price, which will affect in a proportionate degree the cost of aluminium." He next noticed the properties of this remarkable metal. One is its extreme lightness, its specific gravity being 2·6, nearly that of glass, whilst that of platinum is 21·5, gold 19·5, silver 10·5, copper 8·96, zinc 7·2, tin 7·3; and in comparing its price with these metals this quality must be taken into consideration. Thus, if one ounce of silver is required to make a spoon, the same weight of aluminium will make very nearly four. The metal is malleable, ductile, almost without limit; it can be reduced to very thin sheets, or drawn into very fine threads. Its tenacity, though superior to that of silver, is less than that of copper; but no very accurate experiments have been made in this respect. When pure it is about as hard as silver. Its elasticity is not great. It files readily, and is said not to injure the file. It conducts electricity with great facility, so that it may be considered as one of the best conductors known, almost equal in this respect to silver, and more than eight times a better conductor than iron. It melts at a temperature a little above that of zinc, between zinc and silver. In its chemical qualities it would seem to take an intermediate rank between what are termed the noble metals and the common metals, being, as Deville states, one of the most unalterable of metals. It might be imagined that it would as readily re-assume its oxygen as it parted with it with difficulty when in a state of oxide. This, however, is not the case; it appears to be as indifferent to oxygen as either platinum or gold. In air and in oxygen it undergoes no sensible alteration, and it even resists it at the highest temperature which Deville could produce in a cupelling furnace, a temperature higher than that employed in assaying gold. Water has no action, according to Deville, on aluminium, neither at its ordinary temperature nor when boiling, nor even upon the metal at a low red heat, near its melting point. (According to Professor Crace Calvert, this statement must be received with some degree of caution, as he considers that oxydation takes place slowly where the metal is immersed in water for any considerable length of time.) It is not affected by sulphur or sulphuretted hydrogen, like silver, nor is it acted upon to any considerable degree by any of the oxy-acids in the cold; nitric acid, whether strong or weak, at its ordinary temperature, in no way affects it, though when boiling it acts upon it slowly. Small grains of aluminium, plunged in sulphuric acid for three months, remained apparently unaltered. The vegetable acids, such as acetic, oxalic, and tartaric acids, have scarcely any effect on it at all. The true solvent of the metal is hydrochloric acid, which attacks it rapidly. It appears to resemble tin when brought into contact with hydrochloric acid and the chlorides. Its absolute harmlessness permits of its being employed in a vast number of cases where the use of tin would not be desirable on account of the extreme facility with which that metal is dissolved in the organic acids. But the effect of common agents on the metals in general use has been little studied. Aluminium, like iron, does not unite with mercury, and scarcely at all with lead. It, however, forms a variety of alloys with other metals. Looking at the various remarkable properties which this metal possesses, it is impossible not to see an immense variety of uses to which it may be applied. Already its lightness and colour has brought it into use for jewellery and ornaments of various kinds—bracelets, combs, pins, seals, penholders, tops of inkstands, portemonnaies, shirt studs, harness, statuettes, candelabra, candlesticks, &c. Its ductility and fusibility render it readily stamped and cast. It works easily under the graver, and being unaffected by the atmosphere it has an advantage over silver. Its lightness renders it peculiarly fitted for spectacle-frames, eye-glasses, telescopes, and opera-glasses, to which uses it has already been largely applied. It does not stain the skin as silver does. The alloys, too, or aluminium bronzes, as they may be termed, are peculiarly fitted, from the readiness with which they are worked, and their not changing under the action of the atmosphere, for the wheelworks of clocks and chronometers, as well as for the cases, too, for which the metal itself, also from its lightness, is peculiarly fitted. Spoons, forks, drinking vessels, and covers for glass vessels may be made of it, which, even at the present price of the metal, will be much cheaper than silver, while they even possess in a higher degree those qualities for which silver has hitherto been prized. Figuier suggests its use for theodolites, sextants, and surveying instruments which have to be carried by hand, and where, therefore, lightness is important. The adjusting screws of such instruments, which, when made of silver or brass, tarnish from the contact of the hand, might with advantage be made of aluminium. Professor Bleekrode informs me that the working of this metal has, at his suggestion, been taken up by Mr. Meyer, a jeweller at the Hague, who, amongst other things, has had a bell cast, the handle of which, as a casting, is equal to anything hitherto done in silver. Mr. Meyer's experience shows that the metal works well under the hammer, is well suited for chasing and engraving, as well as for casting. He alludes to the want of a proper solder for uniting several pieces, and has been obliged to adopt riveting, as in Paris. It has already been used by the dentist as a substitute for gold, in stopping, as well as for fixing artificial teeth, both on account of its cheapness and lightness, but the accounts differ as to its fitness. The special qualities of this metal render it well adapted for coin; and, as soon as it can be obtained at a sufficiently low rate, it would make an excellent substitute for our copper coinage. Thus assuming that it can be produced for 5*s.* the ounce, the price of silver, then looking at its bulk as compared with silver, any coin the size of silver coin would be worth one-fourth of it, and hence an aluminium coin of the size of a fourpenny-piece would be worth one penny. Its lightness, too, would always render any mistake between it and silver impossible. A piece the size of a shilling would be worth threepence. If the price should get still lower, this would not be of any importance, the coins being tokens only, and not passing at their intrinsic value. That the price will be reduced below five shillings per ounce is a matter which can scarcely be doubted, if we look to the enormous reduction which has been made in a very short time, and when we consider that the manufacture is as yet in its infancy. Let us not despair of its realising the price of copper, when the Master of the Mint would not look upon it with disfavour. Looking at what has already been accomplished in a few years in the production of this metal, both in quantity and price, from £60 sterling per pound down to £6, the present price, and seeing that each day brings with it a further simplification of the process and fresh reduction of price, there is every reason to expect that at no very distant period the metal will be produced in large quantities and at very diminished rates of cost, so as to render it available for an infinity of industrial purposes. Unfortunately, it appears subject to considerable abrasion under friction.

ON A QUICK-WORKING POWER ENGINE.

(*Concluded from page* 158.)

THE MOTIVE POWER.

It being not impossible that, after all that has been said, a reader might still ask the question, the explanation is here given that the motive power at first would be in several deposits of power, by the position of the pistons giving some advantage of gravity in the water, by the tension of the springs, by the pressure of air in a vessel towards a vacuum, and by the bearing off the contents of the perpendicular tapering pipe on the reservoir, and through it against the lower piston which was to be forced up and was to pump down the upper one resisted by general friction only, and that afterwards it would consist in the acquired superiority of the internal force, together with momentum over the resistance.

But this would be perpetual motion giving a surplus of power, to attempt which is universally and proverbially held to be absurd. The absurdity, however, as impossibility is an assumption which, by the laws of reason, cannot be opposed to a legitimate conclusion founded on admitted laws of nature and rules of art. Simple perpetuity of motion is indeed proved to be possible in a model at Woolwich. More was unattainable as long as the experiment was tried solely on the principle of the first law of motion, and the single force relied upon was momentum. But if

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some intrinsic and gratuitous power can be added to momentum, the two forces together may yield more than is required to perpetuate themselves. Then the power of the hydraulic press is intrisic to it, and is gratuitous in its own nature, though it is created from without, and not gratuitously; which engine, instead of returning less than it received, like all others, returns as much in degree and very far more in amount. And this is the power which would be added to momentum in the proposed quick-working variety.

It may be worth while to point out some analogies between Sir William Congreves' invention of a toy and this invention of a most effective engine. In that invention a polished ball rolls incessantly between opposite angles of a board resting at its middle on a pivot; and by its weight in that later half of its run, causes an inclined plane to be presented to itself, which it descends, and striking against a spring is driven up again, when the process is repeated to the opposite side, where also a spring is placed. The ball may be compared to the current in this engine, and the board to the double pump, though the things are very dissimilar. The running of the ball makes the board incline, and the inclination of the board helps the ball to run; and so the valve would work the double pump, and the pump raise and propel the water. Springs give continuity to the run of the ball, reversing its direction; and so springs would help to change the action of the pistons of the pump, but without reversing the direction of the current.

The difference is most essential, and must be decisive between attempting to produce perpetual motion solely by momentum, and attempting it on the basis of a new mode of creating and applying so vast an intrinsic force as that of the hydraulic press, added to momentum, so that the two powers, both being gratuitous, should together institute a perpetual power. Yet this plan is not primarily an attempt to solve the problem, but the problem of obtaining quick motion in a variety of the hydraulic press; and the solution of one is the consequence of that of the other, owing to the necessity that the engine should displace the water under the piston that was at its highest level, and because this would be very inconveniently done by the superfluous employment of an external force in working the double pump.

FRENCH NAVAL AFFAIRS.

A RELIABLE correspondent favours us with the following letter on French naval affairs, dated Havre, 4th March, 1859. He says:—

"The works for effecting a new and more direct entrance to the New South Docks are progressing rapidly. The north quay of the docks is now completed, and forms a noble platform. If war should unhappily occur, it is to be feared that it will be long ere it be covered with merchandise. The new dredging machine deserves particular notice. This fine vessel, built by M. Mastin, is constructed with a trough in the centre, or rather, she is formed of two vessels joined together, the dredge working between the two, a screw is fitted in the centre for propulsion, she can therefore shift her berth, or go from port to port without requiring the assistance of a steam-tug. It is said that she can be propelled at the rate of six knots. A brigade of barges has been constructed specially for her, with shifting or delivery bottoms, &c. Several of these barges have screw propellers, so that they are likewise independent of steam-tug assistance.

"Two gun-boats have just been completed by M. Norman for the Brazilian Government; the guns were sent from England. They are fine vessels, but rather deep, they are rigged as barques, and armed with three pivot guns (68 pd.) and four broadside howitzers.

"M. Norman has two vessels of war up in frame, the "*Carrara* and *Forfait*," the latter an Aviso 1st class; the construction of the bows of these vessels deserves notice. They are built in solid, that is, the timbers are placed close together, say to fifteen feet aft, forming a solid mass. This peculiar construction suggests the idea that the designer has in contemplation their running stern on into an opponent, on the same principle as the galley combats of olden times.

"The docks are not very full of shipping at present. It is remarkable how common M. Cunningham's system for reefing is becoming amongst the merchant navy of France. Almost every third ship now in the docks is rigged on that system. A few small vessels are fitted with M. Bronard's plan. By the bye, a very interesting trial came off here yesterday at the Tribunal of Commerce—M. Cunningham cited M. Bronard before the tribunal for infringing his patent. The principle of M. Cunningham's invention is, that he employs the gravitation of the yard and appendages as the motive power for producing the necessary rotation for rolling up the sail, which M. Bronard also has, and is, in fact, the vital point of M. Cunningham's plan. M. Blane, Advocate of Paris, appeared for M. Cunningham, and the pleading on both sides was maintained with much vivacity. The judgment will not be known until after the Carnival recess, but the general opinion is, that the sentence will be in favour of M. Cunningham.

"In conversation with a gentleman acquainted with the subject, we were surprised to find that the French ships of war are all using *six-bladed screws*. Now, our efforts have been altogether in a different direction—we have been trying to get the screw as compact as possible, so that when the ship is under sail, the screw shall be hauled up out of the water, which cannot be done with a six-bladed screw!

The old *Porteus* steam-boats with the paddles at the stern, for navigating the Seine up to Rouen, are at last giving place to handy screw steamers; a class of vessel which is also on the increase for the coasting trade."

NOTICES.

THE demand for Mr. E. J. REED's paper—
ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY, IN RESPECT OF DIMENSIONS, FORM, MEANS OF PROPULSION, AND POWER OF ATTACK AND DEFENCE,"
has been so great that the Journal of the Society of Arts, the MECHANICS' MAGAZINE, and all other Scientific Journals in which it appeared in December last, are now out of print. The demand still continuing, it has been deemed desirable to reprint it in a separate form. An 8vo. edition of it, in large type, and on fine paper, has, therefore, been prepared, and may now be had at the Office of this Magazine, price 1s.

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All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of nsertions less than 13; for 13 insertions, 4d. per line; and or 52 insertions, 3d. per line.

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CORRESPONDENT'S REPLY.

CHIEF ENGINEERS IN HER MAJESTY'S NAVY.—In reply to your correspondent (G. Hogben, at p. 143), I fear there is now no right Royal *route* to become at once a Chief Engineer in Her Majesty's Navy. In years bygone such exceptions occurred at the instance of favourite manufacturers, and engineers were inducted at once into the Royal Navy in charge of pet engines, then imagined to be so dissimilar from all others as to justify such exceptions—a rule, in my opinion, more honoured in the breach than in the observance. A prior period of servitude is required now as an assistant-engineer, averaging some ten years, and divided into three grades, for each of which stringent examinations are (or should be) insisted on, at some one of our naval dockyards; these passed, and the requisite time in each served, the candidate may then present himself at the Steam Department, in London, to pass his examination for his commission; and I believe I may state that a good text-book, to qualify from, would be Brown and Main's Examination Papers. I see no reason, however, that the whole of such period be insisted on, if by giving a better status to the naval engineer young men, who had gained honours at some one of the competitive examinations inaugurated by the Society of Arts, could be induced to join Her Majesty's service. Such could, however, in our opinion only be effected by pruning off some of the rough branches, an excision that must be resorted to ere the corps under consideration he recruited with none but young, well-educated officers.—*X. Y. Z.*

LONDON FIRES IN 1858.

TWENTY-EIGHTH ANNUAL REPORT.

By Mr. WM. BADDELEY, *C.E., Inventor of the Portable Canvas Cisterns, Farmers' Fire-engine, Improved Jet-spreaders, &c.*

"The statistics of London fires are by no means devoid of interest, and the time may come when they will form an index to the social advancement of the people; for, in proportion as houses are built more and more fire-proof, and habits of carefulness become more and more diffused, the number of destructive fires will assuredly lessen."—*Knight's London.*

(*Continued from page* 175.)

AMONG the more notable fires of the year the following deserve a passing notice:—

Sunday, January 3rd, 2 A.M.—A most extensive fire broke out in the premises of Mr. Thompson, boat-builder, Horse-ferry-stairs, Rotherhithe. The fire began, from some unknown cause, in the centre of this extensive range of premises, and for a time raged with a fury that defied opposition. The highly combustible nature of the stock, the distance of the fire-engine stations, the uncertainty as to which side of the river was the locale of the conflagration, and the deficient supply of water when the engines reached the spot, all contributed to aggravate the mischief. On the arrival of the two steam floating engines, however, a vigorous and successful attack was made upon the destroying element, seconded by the operations of a few land engines that were set to work from the sewers, and the spread of the fire was arrested, but not until the following damage had been done:—Two timber buildings, two storeys high and 160 feet deep, with their contents destroyed; the stock of timber and boats, finished and unfinished, very severely damaged; the windows of dwelling house burned out, and rest of building and furniture damaged. Large timber building of Mr. Thomas, shipwright, destroyed. Private residence of Captain Smith considerably damaged; and the old stores of Mr. Marshall, shipowner, partially destroyed. The reflection of this fire was visible at a considerable distance from the metropolis; it was plainly seen at Romford, on the one hand, and Windsor, on the other.

Tuesday, January 12th, 2½ A.M.—A most destructive fire broke out in the General Steam Navigation Company's works at Deptford-creek, which was not extinguished until a store warehouse of two floors, about 120 feet long by 36 feet wide, was destroyed; the sail makers' and turners' shops, loft, and roof, were considerably damaged.

Saturday, January 30th, 8½ P.M.—A fire took place on the premises of Mr. Athell, timber merchant, Elizabeth-street, Hackney-road. These premises were of considerable magnitude, comprising veneer rooms and sundry other buildings containing a valuable stock of mahogany, rosewood, &c., while the open yard was filled with piles of deal and other timber, all of which were nearly destroyed. Five houses in Elizabeth-street, and the parsonage house in St. Peter's-street, were more or less damaged.

Wednesday, March 10th, 8½ P.M.—A fire took place in the warehouse of Mr. Parker, wholesale mantle manufacturer, Monkwell-street, Cripplegate. The fire was soon extinguished, and appeared to have been wilfully occasioned, by pulling a gas bracket away from the stanchion to which it had been screwed, and bending it up so to cause the flame to act upon the under side of the shop flooring, which was soon burned through, and the flames were rapidly spreading when their progress was arrested. Mrs. Parker and the children left the house in the afternoon, and about 8 o'clock, or soon after, Mr. Parker sent the servant girl for some beer, but did not wait her return, she consequently could not get in, and the premises were found to be on fire. Mr. Parker had effected an insurance in the Westminster Fire Office for £1,000, and after the fire sent in what was considered an exaggerated claim; and the whole of the circumstances were so suspicious, that Mr. Parker was taken into custody on a charge of arson, and committed for trial, which took place at the April sittings of the Central Criminal Court, and lasted two days. After the evidence for the prosecution had been given, Mr. Parry for the defence, "admitted that the case was one of suspicion, but that the origin of the fire was involved in so much doubt, that a conviction could not safely follow, and if that conclusion was arrived at, then the exaggerated claim that was alleged to have been made did not effect the case;" the jury ultimately returned a verdict of "Not guilty."

Monday, April 5th, 9½ P.M.—A fire broke out in a very old house in the occupation of Mr. Soléme, shirt-maker, No. 28 High-street, Aldgate. Fire-escape conductor Cook immediately entered a front window and searched the house, but found it wholly destitute of inmates, and nearly so of furniture. Shortly after the arrival of the engines, the building fell down, and the fire was extinguished. Mr. Payne, the City Coroner, having received a numerously-signed requisition to that effect, held a court of inquiry into the origin of the fire. Mr. Hodsoll, the assessor, stated that the premises were insured in the Liverpool and London Fire Office for £600, the stock-in-trade, furniture, &c., for £700, making a total of £1,300. After carefully sifting the ruins he estimated the value of the stock and furniture to be worth at most but £39! Mr. Soléme had several times spoken of "making his fortune by fire or water," and of setting fire to his house, "when he would get £1,200 from the insurance office, and then he would go to St. Petersburg." A female witness, who had been standing opposite the house twenty minutes, saw two persons come out, whom she identified as Mr. Soléme and Mr. Goldberg, and immediately afterwards saw the shop was on fire. After an able summing up by the coroner, the unanimous verdict of the jury was, "that the premises were wilfully set on fire by the two persons who were seen

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to come out of the house, but who those persons were there was not sufficient evidence to prove."

Tuesday, April 27th, 7¼ P.M.—A fire broke out in the upper floor of the E warehouse, St. Katharine's Dock. These warehouses were six storeys high, and built on arches, every floor being filled with merchandise of great value. A powerful force of engines was soon brought to bear upon the seat of the fire, and by midnight its further spread was prevented. The sixth floor of the E warehouse, and atties, were burned out, the roof off, and serious damage to the contents on floors under by the immense volumes of water that were thrown upon the flames.

Saturday, June 19th, 9¼ P.M.—A very serious conflagration, which is supposed to have been occasioned by a cinder from a locomotive engine, broke out in the extensive premises of Messrs. Forrest, Norway Wharf, Commercial-road, Limehouse, which at the time contained a large number of ships, boats, and vessels of great value, as well as several life boats, recently finished for noblemen, and one for the Emperor of Russia. The fire raged with great fury for several hours, destroying three ranges of workshops, 200 feet long by 120 feet wide, the cottage, counting-house, boats, and immense stock of timber in open yard. The flames also entered the premises of Messrs. Dixon, timber merchants, and nearly consumed the whole of their stock. A similar loss occurred to Messrs. Dalton and Co., mast-makers, their stock of timber in open yard being all but destroyed. Six arches of the Blackwall Railway, and several adjacent buildings, were also severely damaged.

Monday, June 21st, 7¼ A.M.—A fire, involving a great destruction of property, broke out at Fresh wharf, Lower Thames-street. The premises formed a block of three warehouses about 130 feet wide, and six storeys (nearly 80 feet) high. The fire commenced in the middle floor of the centre warehouse, known as the silk floor. With as much promptitude as possible a strong force of engines, including the two steam floating engines, was brought to bear upon the fire, and by mid-day it was thought that any further extension of the flames had been averted. Unfortunately, however, the fire was found to have entered the eastern warehouse, and the conflict was renewed for several hours, when the flames eventually succumbed to the overwhelming force brought to bear upon them. On examination it was found that the three upper floors of the middle warehouse, with their valuable contents, were seriously damaged by fire; the three upper floors of the eastern warehouse were similarly damaged, the lower floors and contents being damaged by water. The third floor of the west side of the east end warehouse and contents was also damaged by fire, water, and hasty removal.

Tuesday, June 29th, 11¼ A.M.—A fire broke out in one of the South Quay warehouses of the London Docks, between the Hermitage and Wapping river entrances. Although termed one warehouse, it had numerous divisions, separated by thick party walls, communicating on each floor by strong iron doors. On the alarm of fire being given, the Dock Company's land and floating engines were brought to the spot, followed by that of the parish of St. John's, Wapping, one from Messrs. Hore's brewery, ten of the brigade and their two steam floating engines, as well as the West of England engine. This powerful force was brought to bear upon the seat of the fire, which, for a time, extended rapidly to the various floors until it reached the saltpetre, when a tremendous explosion took place, by which the centre division of the building was blown to atoms, the division walls forced in, and the floors of the adjoining warehouses fired. Happily, no person was injured by the explosion, and for hours the firemen worked with unflagging energy, and by six o'clock the fire was vanquished, when it was found that the centre warehouse was destroyed by fire and explosion, the upper floors of two warehouses adjoining destroyed by fire, and the lower floors seriously damaged by water.

Sunday, July 25th, 11½ A.M.—A fire broke out in the premises of Messrs. Rolt and Co., timber-merchants, Acorn-wharf, Rotherhithe, covering an area of ground nearly 400 ft. long by 30 ft. wide, filled with piles of timber from 70 to 80 ft. high. The cause of this disastrous fire was a chimney on fire at Mr. Goss's, in Trinity-street, some sparks from which fell among the timber in Messrs. Rolt's premises. Before any effectual assistance could reach the spot, the flames had made great progress. The floating engine from Deptford Dockyard, the two steam floating engines of the brigade, as well as six land engines, and that of the West of England office, were brought to the spot as quickly as possible, but for a time produced but little effect upon such a vast body of fire, which was not extinguished until the following damage had been done:—Messrs. Rolt's deal wharf, and three barges laden with timber alongside, all but destroyed; three brick and timber buildings in Trinity-street, the property of Government, burned down; and ten houses in Trinity-street damaged. This was not, however, the full extent of the fire, for the gale that was blowing at the time carried the shower of sparks across the river, and ignited the rope-works of Messrs. Fowler and Smith, Millwall, the engineers' shops of Messrs. Seaward and Co., Canal Ironworks, as well as the *Camperdown*, lying in the dry dock of that firm. At Messrs. Fowler and Smith's, about 300 ft. of sheds, including mill-house, machinery, and stock, were destroyed—and all through "a chimney on fire!"

Thursday, August 5th, 2½ A.M.—A most destructive fire occurred in the premises of Mr. Harrison, tanner, Willow-walk, Bermondsey, which rapidly extended to those of Messrs. Chisholm and Co., chemical and manure works; Messrs. Almond and Co., army contractors; and Mr. Hawes, fellmonger. The whole of this property, covering several acres of ground, became speedily ignited, and raged for a time with uncontrolled fury; for, although a strong force of firemen and engines soon arrived, upwards of half an hour elapsed before the Southwark Company's mains yielded any water. By seven o'clock, however, the apprehension of any further spread of the fire was at an end, and all that remained was to cool the smoking ruins.

Friday, August 13th.—At midnight a fire broke out in the premises of Mr. Emery, shipping and general cooper, in Brunswick-street, Blackwall. The property covered nearly half an acre of ground, on one side stood a number of lofty cooperages, and in the open yard were numerous stacks of prepared timber and immense piles of hoop sticks. Soon after the fire commenced it seized hold of seven of the cooperages, and then swept round the stacks of timber in the yard, all of which were destroyed; the roof of another cooperage adjoining and its contents, as well as seven adjacent buildings, were damaged.

Sunday, October 3rd, 3½ P.M.—A fire broke out in the extensive premises of Mr. Westhorp, ship rigger, near the West India Docks, Poplar. These premises consisted of the upper floor of a one-storey building, 200 feet long by 16 feet wide; the ground floor was occupied by Messrs. Bell and Wright (also ship riggers), as was also six arches of the Blackwall Railway, and there is no doubt that a cinder from a locomotive engine thrown into the premises was the cause of the fire. Each department was filled with ship's furniture, stores, and costly machinery, and from the combustible character of the premises and their contents the flames for a time defied opposition; they were, however, eventually extinguished, when a fearful amount of damage was found to have been done.

Just before 9 o'clock in the evening of Monday, December 20th, a fire broke out in a van belonging to the Great Western Railway Company as it was standing loaded with parcels, in New Oxford-street. The horses were at once detached, the van drawn up to a pump, and the fire put out by the firemen who arrived with their hand-pumps. The packages (for the most part Christmas presents) rapidly disappeared, and many of them were received where they were neither directed nor expected. The cause of the fire was supposed to be unextinguished tobacco falling between the packages From a similar cause, a pleasure van returning from Hampton Court in June last, took fire while crossing Clapham Common, and two of the female excursionists were very seriously injured.

About an hour before midnight on the 4th of December, a false alarm of fire, which caused a general turn-out of the fireman and engines, was occasioned by the sudden appearance of a brilliant red light in the sky in a northerly direction, which almost everybody supposed to be the reflection of a most extensive conflagration, but which was ultimately discovered to be a brilliant display of the Aurora Borealis.

(To be continued.)

ERRATA.—In Fire Report, page 154, third column, 22nd line from top, for "bleaching *rats*" read "bleaching *nuts*." Page 175, second column, 33rd line from bottom, for "The was" read "There was."

Our Weekly Gossip.

A singular excursion is said to have been organized at Antwerp—no less than a scientific and industrial voyage round the world. A vessel, it is said, is being fitted up for the accommodation of passengers, their instruments, scientific collections, and mercantile speculations. The programme is, to sail from Antwerp at the end of March, touch at Lisbon, thence sail to the Cape de Verde Islands, the Cape of Good Hope, Siam, Cochin-China, Java, Singapore, Hong-Kong, Canton, Jeddo in Japan, the Kurile Islands, and the Russian Settlements on the Amoor and in the Gulf of Ochotsk, returning by way of San Francisco, Lima, Valparaiso, Patagonia, the Straits of Magellan, Rio de Janeiro, and thence back to Antwerp. The price for the whole voyage, including provisions, is 4,000 francs (about £160) for each cabin passenger. The expedition is calculated to occupy fourteen months.

Messrs. Fox and Chesterman, the well-known steel-makers, of Sheffield, have this week terrified us with specimens of an improved make of steel, especially adapted for ladies' crinolines. This material is so light, so elastic, so easily fitted, and withal so strong, that we fear it will be likely to prolong a very bad fashion—a fashion which injures the health of one sex, destroys the comfort of the other, and corrupts the morals of both. The improved steel is hardened by a new process, and is corrugated transversely, whereby not only is its liability to breakage reduced, but great facilities are afforded for lengthening or shortening the hoops, as the fancy of the fair wearer may dictate—not, alas! as the peace or comfort of *man* may require. With all respect for the ingenuity of the Sheffield firm, we must say we regret to see them aiding a fashion which is doing society no good whatever.

The French papers state that five French frigates are about to be sheathed with thick iron, so as to make them shot-proof. The contract for one is said to be just concluded. What a pity it is that a little information respecting the mode in which this is to be done is not *vouchsafed to us* especially as we do not believe it to be at all practicable to operate upon ordinary frigates as proposed.

The official report of the Admiralty on the Falmouth Docks and Harbour Bill states that the following works are proposed:—A dock of 8 acres area; a tidal harbour of 12 acres; two patent slips, each 400 feet ong; and a channel leading from the sea to the tidal harbour, 2,780 feet in length, with a medium width of 400 feet at the bottom, and 18 feet depth at low water. The tidal space proposed to be occupied by the dock and basin is at present very shoal, having only a depth of about one fathom at low water, so that vessels of any size must ground. Under these circumstances the construction of a floating dock of eight acres with a depth of 21 feet, and a tidal basin of 12 acres, with a depth of 18 feet at low water, must, the report states, prove of great importance to the trade of the port, and especially to steamers; their lordships, therefore, consider that the scheme deserves the approval of Parliament. The amount to carry out the undertaking is fixed at £200,000, with power to borrow one-third more.

On Saturday last, Captain Norton attended at Brompton barracks, Chatham, for the purpose of making some further experiments with his liquid-fire rifle shells. In the experiments made on Saturday a liquid-fire rifle shell, adapted to a deep-grooved Enfield rifle, was fired from a pistol, rifled with the deep grooves, into canvas suspended at the end of the range. On the shell striking the canvas the glass containing the liquid fire was immediately broken, and the piece of canvas almost instantaneously became ignited. The result of the experiment proved that similar shells constructed by Captain Norton may be fired at long ranges from the ordinary Enfield rifle, for the purpose of blowing up the ammunition trains, or setting fire to the camp of an enemy. Captain Norton has presented specimens of these shells to the museum of the United Service Institution, where they can be seen.

Mr. Whitworth writes to the *Times* a letter which entirely confirms the remarks we made in our last number. "Would you allow me," he says, "an opportunity of correcting the impression which I find has got abroad, that cannon made by me have failed in practice? As this impression may, perhaps, be strengthened by the report of the observations made in the House of Commons last week, I feel myself called upon to state the facts that have given rise to reports which are really without foundation. My experiments have for some time past been mainly directed to the subject of rifled small arms; but, as the system which I have adopted is equally applicable to ordnance of all sizes, I bored and rifled several pieces of cannon, which were supplied to me in the solid by the Government. Some of these were brass guns, which have stood the test of continued firing, and three were of cast iron, which have burst. For the strength of these guns I was in no degree responsible; they were the ordinary pieces made for the smooth-bored cannon used in the service, and proved too weak to bear the strain of firing long rifled projectiles. I should most certainly not have undertaken to rifle them if I had foreseen, or could have supposed that their failure, which was caused by want of strength, would have been imputed to my system of rifling. Being desirous of immediately rendering all the aid I could to the service, I considered the experiment of rifling the pieces, as they are ordinarily supplied, worthy of being tried, and I think I may venture to state that their trial has furnished results of no inconsiderable importance. All the guns rifled by me belonged to and were at the time at the disposal of the War Department. I had not the means of firing cannon at long ranges, but I hoped to have been furnished with the results of experiments that would have enabled me to form correct conclusions. I hope soon, however, to be enabled to make trial of two guns which, on my own respon-

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sibility, I am constructing of the requisite strength, and which, I doubt not, will fully realize the expectations entertained by those who witnessed the first experiments in April, 1856, with the 24-pounder brass howitzer which I bored and rifled. At that time projectiles varying from two to six diameters in length, having quick rotary motion, were fired with great success."

Great preparations for the coming Handel commemoration festival at the Crystal Palace are in progress. From a programme issued by the Company we learn that the orchestra will be enlarged to the full width of the transept, viz., 216 feet, with a central depth from front to back of about 100 feet. Its extent will be more clearly appreciated when it is stated that its width is exactly double the diameter of the dome of St. Paul's cathedral, that it possesses a larger area than the combined orchestras of Westminster Abbey (as arranged for the commemoration of 1784), York Minster (as at the festival of 1823), the Birmingham Town Hall, the Leeds Town Hall, St. George's Hall, Bradford, the Philharmonic Hall, Liverpool, and some other smaller orchestras. But it is not from the mere augmentation of extent that the most favourable results are anticipated. The additions are mainly based upon a recent alteration of the orchestra at Exeter Hall, which has been attended with the happiest effect; and every confidence is felt that these modifications in the general plan, with certain acoustic improvements, will result in greatly increased concentration and unity of tone. At the same time the appearance of the orchestra will be materially improved by its more perfect proportions, and by the decorations which it is proposed to adopt.

Mr. Allan has explained in detail to a party of gentlemen assembled at the Town Hall, Manchester, his views with reference to the cable which he proposes should be laid in the Atlantic. Mr. Allan stated he was from the first convinced that a cable of the weight of that which had been laid down across the Atlantic could not be submerged in deep water without being strained, the result being the impairing of the insulation. In shallow water a light cable would be unsuitable, but on the other hand it was the only one suitable for deep water. In the construction of the light cables there was a saving of 40 per cent., and this saving he proposed to apply towards increasing the conductibility and insulation. His cable was composed of one solid wire of copper, covered with wire strands, over which were three layers of a material composed of gutta percha and another substance. Gutta percha alone might yield from the warmth of a ship's hold, but the mixture made it as tough as leather, and capable of resisting heat to the extent of 150 degrees. Little more than two hours would be occupied in sinking 2,000 fathoms of his cable, which he proposed to submerge in almost a horizontal position, so that the danger of straining would be escaped. The cable laid last autumn weighed 21 cwt. to the mile, but the weight of his was only 8 cwt., so that a vessel of 1,200 tons could take the whole length. The breaking strength in air of the new cable was not more than half that of the old one, but in water the difference was greatly reduced. The cost of his proposed new cable Mr. Allan estimated at £100 per mile.

Mr. Andrew Lamb, engineer, of Southampton, and W. J. White, of Cowes, have introduced several improvements into the construction of life-boats. They form the boat with longitudinal water-tight compartments on each side, and extending nearly from stem to stern, "the centres of gravity and displacement of which (should the life-boat be filled by a sea)," say they, "are so high as to make it almost impossible for the boat to be capsized." They introduce two or more delivery tubes, with valves so constructed as to prevent the admission of water from without, and to free the boat from the water within down to the level of the water outside; and "we so place and arrange the tubes," say they, "with reference to the calculated centres of gravity and displacement of the boat, as to make her available for carrying out the largest anchor from the ship, the anchor being slung under the bottom of the boat, and (being a life-boat) should she ship a sea, there will be sufficient buoyancy in the air-tight compartments to carry the anchor and crew with safety, whilst an ordinary boat would be buried by the waves, and consequently sink." These valves will also admit air, should such a contingency as the boat's capsizing occur, and the crew be confined underneath, where they would be safe, there being sufficient head room for them beneath the thwarts and the bottom. In addition to the water-plugs at the lower part of the air cases, they introduce screw-plugs at the top of the water-tight compartments, by which a free current of air may be passed through the cases to ensure their durability.

With reference to the obstructions in the Nene—in regard to which paragraphs have appeared for several weeks past—it appears that the Wisbeach Town Council have given the Nene Valley Commissioners formal notice to remove the dam at Guyhirn. The complete removal of the partially-destroyed dam at Waldersea has been entrusted to Mr. Marshall, who has undertaken to perform the work for £175. Mr. Page, C.E., has received instructions from the Wisbeach authorities to make a survey of the Nene from Peterborough to the sea, and to report what is best to be done with a view to secure the interests of all the parties concerned in the drainage, navigation, and water-supply.

A Mr. Prisley, of Walworth, has patented a method of advertising on ordinary street-lamps, which we hope will *not* come into general use. He first removes the top or upper part of any of the lamps or lanterns now in use for lighting streets and other public thoroughfares, and affixes to the lamp, in the place of its ordinary top, an addition or elongation, on which the name of somebody's hats, or pills, or coffee, or other necessaries or luxuries of life, is blazoned.

The *Critic* of Saturday last says:—"In a lecture recently delivered at Chelsea by Mr. Gilks, the following curious statistics were communicated concerning the illustrated press. Of ten illustrated papers published in London every week, viz., the *Illustrated London News*, *Illustrated Times*, *Punch*, *London Journal*, *Reynold's Miscellany*, *Cassell's Paper*, *Leisure Hour*, *Sunday at Home*, *Town Talk*, and *Mechanics' Magazine*, the aggregate circulation is 1,744,000 copies per week, and the weekly cost of engravings is £578; making a total annual circulation of 90,688,000 copies, and spending £30,056 per annum upon engraving."

Mr. W. Pursell, of Birmingham, is introducing an improvement in the manufacture of percussion caps. The caps having been charged with the detonating composition, the metallic or other powder is dropped in through perforated plates, similar to those which are used at present for charging. This powder is then subjected to sufficient pressure or friction to coat the surface of the detonating composition therewith, thus rendering the coating impervious to moisture, and protecting the detonating composition from injury by exposure to damp and wet.

Mr. H. C. Jennings, of Great Tower-street, London, proposes to manufacture an artificial parchment from fish, and then convert the parchment into leather. He exposes fish (the commonest or refuse sort), after the offal and skins are removed, to the action of dilute solutions of soda ashes, crystallised soda of commerce, or carbonate of potassa, and then to a solution of hydrochloric acid. The mass is then pulped, washed over sieves to remove the bones, &c., drained or pressed, and then saturated with a weak solution of bichloride of mercury. After this it is thoroughly washed to remove the salts employed, is formed into sheets by the ordinary means used by paper makers, and is then rolled or pressed to equalise the surface. To convert the parchment thus made into leather, he uses solutions of oak-bark, terra japonica, or any of the substances employed by tanners. But for particular purposes, and for a more perfect article, he employs solutions of ammoniated alumina, or aluminated potassa, muriate of soda, and nitric acid; and the sheets, after saturation, are immersed in a solution of dilute oxalic or hydrochloric acid, and then returned to the alumina solution, and so on alternately until the gelatine and fibre are rendered perfectly insoluble.

The *Manchester Guardian* of Wednesday week has the following:—Those who are interested in the extended growth of cotton may see, at the office of the Cotton Supply Association, or at the works of Mr. Dunlop, an adaptation of the M'Arthy roller-gin to cottage use. This gin undoubtedly frees cotton from seeds and dirt more effectually than any other, and gets through a larger quantity, in a given time, with the same power. That for the cottage is turned by two persons, at a speed of 680, and cleans fully 10lb. per hour. It preserves the fibre intact, instead of chopping it, and rendering it both shorter and of irregular length, which is the great fault of the saw-gin. It is less liable to injury than the saw-gin; and, as it is divisible into small parts, it may be easily carried, on men's shoulders or on the backs of animals, from the ports, and along bad roads or no roads, into the interior of India or of Africa. This adaptation—devised by Mr. Dunlop, the maker of the M'Arthy gin—is of great importance as regards those countries in which cotton is grown by small and poor cultivators of the soil.

CAPTAIN NORTON'S SPINSTER—"EYE OF NEWT."—"The question has often been asked of me, by what *charm* I insure the layers of match attached to the bottom of the spinsters to be ignited by the fire of the cartridges—I insure it by placing within the layers a small hollow glass ball containing sulphuric acid, and surrounded with the powder chlorate of potash, and sulphuret of antimony. A disc of hard pasteboard is placed on the heads of the cartridges, and this being pressed against the glass shell by the explosion of the cartridge, crushes it, and thus the layers of match are sure to take fire in passing through the air. This plan is best adapted to breech-loading rifles. —J. NORTON."

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated February 1, 1859.

290. G. A. Waller, of Dublin, Brewer. Improvements in the means of, and apparatus for, expressing liquid from semi-fluid substances and other substances containing liquid.

Dated February 10, 1859.

380. B. Burrows, of Leicester. Improvements in looms for weaving narrow fabrics.

Dated February 16, 1859.

438. J. S. Benson, of Birmingham, Merchant. A new or improved method of silvering glass. A communication.

Dated February 19, 1859.

466. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in machinery for doubling threads. A communication from A. Bonez, of Paris.

Dated February 21, 1859.

476. A. Taperell, of Moorgate-st. Improvements in compositions or compounds used when cleaning glass.

478. J. Schloss, of Cannon-st., Manufacturer. An improvement in locks or clasps for porte-monnaies, pocket-books, bags, and other like purposes. A communication.

Dated February 22, 1859.

488. W. Gossage, of Widnes. Improvements in the utilization of alkali-waste.

Dated February 23, 1859.

490. S. Ridge, of Hyde, Millwright. Improvements in coupling or making the joints of pipes and other articles.

492. G. Davies, of Serle-st., Lincoln's-inn. Improved apparatus applicable to the evaporation of saccharine liquids, and for the concentration of heat for other purposes. A communication.

494. W. Sharp, of Bingley, York, Worsted Spinner. Certain improvements in machinery for spinning and twisting worsted, cotton, silk, and other fibrous materials.

496. S. Russell, of Sheffield, Metal Manufacturer. An improvement in the manufacture of handles for tea and coffee pots, jugs, kettles, knives, daggers, and forks, or any other description of article to which handles are applied.

Dated February 24, 1859.

499. J. Robinson, of Lower House, near Burnley, Manager. Improvements in machinery and apparatus applicable to machines for spinning and doubling.

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500. R. Mushet, of Coleford, Metallurgist. A new metallic compound or alloy.

501. R. Mushet, of Coleford, Metallurgist. An improvement in the manufacture of cast steel.

503. J. Crosland, of Huddersfield, Manufacturer. Improvements in looms for weaving textile fabrics.

504. A. Lançon, jun., of Basançon, France, Watch Maker. A new system of watches.

505. J. H. G. D. Wagner, of Paris, Manufacturer. Apparatus for cleaning water, and removing all matters in suspension and dissolution contained in it, water intended to feed generators of all sorts (applicable also to other purposes), which besides previous to its getting into the generators, is heated to the highest degree without almost any expense.

506. J. Dale, of Cornbrook, Manchester, Manufacturing Chemist. Improvements in concentrating caustic alkalis, and in applying a product therefrom to the purpose of obtaining motive power, and to other purposes.

507. E. Price, of Doncaster, Railway Contractor, and E. Hawkins, of the same place, Builder. Improvements in the mode of forming fish plates, and in the method of fixing or attaching them to the joints of rails on railways.

508. A. C. Keily, of Silchester-road, Notting-hill, Gentleman. Improvements in apparatus for drawing-off fluids.

Dated February 25, 1859.

509. A. Reid, of Manchester, Merchant, and R. Tonge, of the same place, Manufacturer. Certain improvements in weaving, and in the machinery employed therein.

510. A. Reid, of Manchester, Merchant, and R. Tonge, of the same place, Manufacturer. Certain improvements in, or applicable to, looms for weaving.

511. T. C. Hinde, of Dudley, Iron Merchant, and G. J. Hinde, of Wolverhampton, Merchant. Improvements in coating iron with copper, or alloys of copper.

513. W. McNaught, of Manchester, Engineer. Certain improvements in steam engines, particularly applicable to compound steam-engines.

514. R. Fielden, jun., and T. Fielden, of Walsden, Lancaster, Paper Manufacturers. An improvement or improvements in the manufacture of pickers to be used in looms for weaving, and also in the machinery or apparatus to be employed in the manufacture of the same.

615. J. Reddie, of Fulham, Gentleman. An improved mode of propelling and steering vessels.

517. W. Clark, of Chancery-lane. Improved apparatus for spinning, twisting, doubling, and drawing fibrous materials. A communication.

Dated February 26, 1859.

518. F. Weekes, of Bolney, Sussex. The treatment of certain alcoholic products.

519. G Earnshaw, of Horbury, near Wakefield, Millwright. The treatment of woollen and other rags and waste of fibrous substances, so as to obtain useful products therefrom.

520. J. Lee, of Saint Helen's, Grocer. Certain improvements in ploughs.

521. J. Hine, of Clerkenwell, Cabinet Maker. An improved joint for cabinet making, carpentry, and other constructive purposes.

522. W. Burgess, of Newgate-st., Agricultural Implement Maker. An improvement in reaping and mowing machines.

Dated February 28, 1859.

523. E. Gatwood, of Great George-st., Westminster, Carriage Builder. Improvements in buffing traction and bearing springs, applicable to railway carriages and locomotive engines.

525. A. Martin, Merchant, and A. Crichton, Mechanic, of Pollokshaws, Renfrew. Improvements in weaving and woven goods.

526. J. Howden, of Glasgow, Engineer. Improvements in machinery or apparatus for cutting, shaping, punching, and compressing metals.

527. J. Leigh, of Manchester, Surgeon. Improvements in the purification of coal gas.

528. G. Horner, of Belfast, Machinist. Improvements in hackling flax and other fibrous materials, and in machinery for the same.

529. J. H. Johnson, of Lincoln's-inn-fields. Improvements in apparatus for stopping horses. A communication.

530. J. H. Johnson, of Lincoln's-inn-fields. Improvements in apparatus for taking soundings, applicable also to the throwing of life-lines. A communication.

531. C. Hall and C. Hall, jun., of Navestock, Essex, Agriculturists. Improvements in steam agricultural machinery.

532. A. Turner, of Leicester, Elastic Web Maker. Improvements in the manufacture of elastic fabrics.

533. A. V. Newton, of Chancery-lane. Improvements in constructing and working condensing engines. A communication.

534. W. Hodson, of Hull. Improvements in rotatory engines.

535. R. Brown, of Earith, near Saint Ives, and W. Milne, of Bushey, Herts. Improvements in fire-arms.

Dated March 1, 1859.

537. T. Cloake, of Walworth, Watch Maker. Stopping of the bodies and wheels of railway and other carriages.

538. J. Holroyd, of Leeds, Cloth Finisher. An improvement in finishing woollen cloths and cloths made from a combination of wool and other materials.

539. Rev. H. Moule, M.A., of Fordington, Dorset. Improvements in apparatus applicable to the evaporation of sewage or other waters, and for affording heat for other uses.

540. J. Wetherilt, of Mayfair. Certain improvements in locks.

541. J. Edwards, of Fenton, Stafford, Manufacturer. Improvements in stacking or holding biscuit, earthen, china, and glossed ware for firing.

542. G. P. Rivers, Baron Rivers, of Rushmore Lodge, Wilts. An improved implement for breaking up and preparing land.

543. J. Templeman, of Glasgow, Artificial Fuel Maker. Improvements in the manufacture or production of artificial fuel.

544. J. Pile, of West Hartlepool, Ship Builder. Improvements in the construction of floating docks.

545. D. Lichtenstadt, of Peckham, Chemist. Converting certain vegetable substances into fibrous materials for the manufacture of paper, textile, and other fabrics.

Dated March 2, 1859.

547. P. Currie, Brass Founder, of Birmingham. Certain improvements in spindles for locks, latches, and other door-fastenings.

549. J. M. Adams, Gentleman, and D. Law and J. Inglis, Iron Founders, all of Glasgow. Improvements in fireplaces, grates, ranges, and stoves.

551. W. F. Dearlove, of Dartmouth-st., Westminster. An improved chopping machine.

553. J. W. Harker, of Upper Barnsbury-st., Islington, and J. K. Field, of Upper Marsh, Lambeth. Improvements in coating the bottoms of iron and other ships and vessels. A communication.

555. C. Hill, of Cheddar, Somerset, Stay Maker. An improved construction of stay fastening.

557. J. H. Johnson, of Lincoln's-inn-fields. Improvements in the construction of grease boxes and bearings generally. A communication.

559. J. Newcomb, of Bristol, Engineer, and J. G. Lovell, of Bristol, Merchant. Improvements in obtaining and applying motive power, especially adapted, amongst other purposes, to the propelling of ships and vessels.

561. W. Brown, of Edgar-place, Mile-end, Pipe Maker. Improvements in the manufacture of pipe mounts or stems, cigar tubes, and similar articles.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

569. H. Leonard, of Massachusetts. An improvement in the manufacture of paraffine candles. Dated March 3, 1859.

570. W. Tucker, of Massachusetts. An improvement in bit stocks or auger handles. Dated March 3, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, March* 15, 1859.)

2453. V. Blumberg. Billiard tables.
2461. J. Oxley. Carriages.
2467. R. A. Brooman. Motive power. A communication.
2468. I. Baggs. Telegraphing
2474. E. Rowland and J. Dewhurst. Steam engines and valves.
2481. H. N. Penrice. Tunnelling.
2485. J. Cliff. Kilns.
2495. J. Wardill. Purchases.
2496. T. MacSweney. Steering apparatus.
2497. W. Hale. Rockets.
2503. J. S. Dawes. Machine for cultivating land.
2504. J. F. Dickson. Permanent way.
2507. A. Henderson. Vessels.
2515. R. A. Brooman. Telegraphing. A communication.
2516. R. M. Ordish. Permanent way.
2520. W. G. Taylor. Preparing skins.
2522. E. Humphreys. Steam engines and boilers.
2527. C. T. Judkins. Gas regulators.
2529. J. and W. Lees. Oil cans.
2531. F. H. Maberly. Ships and other vessels.
2535. J. Rae. Cisterns.
2541. D. Turner. Wood soles for clogs.
2543 M. N. Mills and N. Sidebotham. Looms.
2544. J. Benyon and J. W. B. Bowden. Looms.
2560. T. R. Butcher, F. Stevens, W. T. Johnson, and T. Jarvis. Pianofortes.
2562. G. Davies. Pile fabrics. A communication.
2597. W. Clark. Bridle. A communication.
2600. E. Briollet. Obtaining caloric. A communication.
2738. E. Jones. Coke.
2964. R. Hornsby, jun. Ploughing and tilling land.
159, W. A. F. Powell. Stopping jars.
175. T. Greenwood and J. Batley. Gassing fabrics. A communication.
290. G. A. Waller. Expressing liquid.
291. M. Loam. Raising sewage, &c.
328. J. Honeyman. Ships; propellers.
329. A. Barclay. Telegraph ropes; paying out the same.
368. G. Bower. Gas.
380. B. Burrows. Looms.
391. J. Grimes. Beer-engines.
405. R. Bell. Separating wool.
468. G. Paul. Spindles and flyers.
469. O. Blake. Glass.
477. R. W. Johnson and W. Stableford. Axle boxes.
478. J. Schloss. Locks or clasps. A communication.
481. J. Grimond. Treating jute.
485. E. Lund. Umbrellas and parasols.
503. J. Crosland. Looms.
522. W. Burgess. Reaping and mowing machines.
527. J. Leigh. Coal gas.
530. J. H. Johnson. Taking soundings. A communication.
538. J. Holroyd. Finishing cloths.
569. H. Leonard. Paraffine candles.
570. W. Tucker. Auger handles.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed March 11, 1859.

2004. J. M. Courtauld.
2065. H. Page.
2069. L. Kaberry and T. Mitchell.
2074. C. W. Siemens.
2075. S. Hanbury.
2081. L. Vidie.
2090. F. Fowke
2382. A. V. Newton.
2424. J. Drummond.
2456. P. A. Mawdsley.
2457. P. A. Mawdsley.
2667. R. H. Hess.
2862. J. Wade.
2878. T. Moss.
21. G. T. Bousfield.
94. J. Hands.

Sealed March 15, 1859.

2091. E. Smyth.
2093. W. G. Taylor.
2099. C. F. Vasserot.
2102. C. Hadley.
2105. J. Luis.
2115. E. Riepe.
2121. J. Bethell.
2127. J. Hope.
2139. T. C. Hinde.
2147. R. Bodmer.
2151. G. L. Turney.
2157. W. Clark.
2241. W. A. Munn.
2479. R. E. Pinhey and J. Wood.
2613. G. Howe and J. Norton.
2791. G. Snell.
53. E. Heywood.
93. J. Thompson.
207. C. Sharps.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

586. J. Davy and J. Milnes.
592. J. Fowler, jun.
598. E. A. Pontifex.
612. T. Porter.
618. P. Marcus.
619. W. Yates.
622. C. Coates.
625. E. T. Wright.
632. J. Pegg.
635. C. B. Normand.
762. C. B. Normand.
846. W. H. Gauntlett.
897. W. Smith.

LIST OF SPECIFICATIONS, &c.

Published during the week ending March 11, 1859.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s d		s d		s d		s d		s d		s d
1766	0 10	1777	0 3	1788	0 6	1799	0 6	1810	0 10	1823	0 3
1767	0 3	1778	0 4	1789	0 3	1800	0 5	1812	0 5	1834	0 6
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1770	0 3	1781	0 9	1792	0 3	1803	0 8	1815	0 7	1885	0 7
1771	0 3	1782	0 9	1793	0 3	1804	0 7	1816	0 3	1895	0 3
1772	0 3	1783	0 3	1794	0 10	1805	0 10	1817	0 3	1919	0 7
1773	0 3	1784	0 3	1795	0 3	1806	0 3	1818	0 3	1928	1 4
1774	0 9	1785	0 8	1796	0 3	1807	0 3	1819	0 3	...	...
1775	0 10	1786	0 3	1797	0 6	1808	0 3	1820	0 3	...	...
1776	0 6	1787	0 3	1798	0 3	1809	1 4	1822	0 10	...	...

Note.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 3s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

ABRIDGED SPECIFICATIONS OF PATENTS.

The abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

Steam Engines, &c., 1649, 1660, 1669, 1698, 1699, 1737.
Boilers and their Furnaces, 1645, 1656, 1665, 1667, 1671, 1689
Roads and Vehicles, including railway plant and carriages, saddlery and harness, &c., 1629, 1631.
Ships and Boats, including their fittings, 1646, 1651, 1674, 1690.
Cultivation of the Soil, including agricultural and horticultural implements and machines, 1626.
Food and Beverages, including apparatus for preparing food for men and animals, 1641, 1661, 1673, 1695.
Fibrous Fabrics, including machinery for treating fibres, pulp, paper, &c., 1628, 1632, 1642, 1643, 1658, 1662, 1677, 1679, 1681, 1696.
Buildings and Building Materials, including sewers, drain-pipes, brick and tile machines, &c. *None.*
Lighting, Heating, and Ventilating, 1650, 1675.
Furniture and Apparel, including household utensils, time-keepers, jewellery, musical instruments, &c., 1630, 1636, 1666, 1672, 1676, 1686, 1691, 1693.
Metals, including apparatus for their manufacture, 1635, 1637.
Chemistry and Photography, 1657.
Electrical Apparatus, 1663, 1687.
Warfare, 1634, 1655.
Letter Press Printing &c. *None.*
Miscellaneous, 1627, 1633, 1638, 1639, 1640, 1644, 1647, 1648, 1652, 1653, 1654, 1659, 1664, 1665, 1668, 1669, 1670, 1674, 1678, 1680, 1682, 1683, 1684, 1685, 1688, 1690, 1692, 1694.

1626. W. Tasker, Jun. *Improvements in combined thrashing machines.* Dated July 19, 1858.

This relates to the cleaning of the grain, and consists in fixing a riddle near the top of the caving board for facilitating the separation of the grain from the husks. The grain, after passing through this riddle and through the caving board, enters a set of riddles, fixed immediately

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under, and attached to the caving board, beneath which riddles a blower is fixed, and so constructed as to direct a blast of air through the grain as it falls. *Patent completed.*

1627. T. F. CHORLEY. *Improvements in the form of bankers' cheques and other similar documents, with the view of preventing fraudulent dealings therewith.* Dated July 19, 1858.

This consists in engraving banker's cheques, &c., with certain appropriate words, which, upon the words being allowed to stand, or upon their being cancelled or torn off, the cheque will either be paid to bearer or through a bank as the case may be. *Patent abandoned.*

1628. W. HERAPATH. *An improvement in the manufacture and treatment of paper with the view to the prevention of forgery.* Dated July 19, 1858.

This consists in treating paper with a solution of Ferrocyanide, a Ferridcyanide, or a sulphocyanide of potassium, sodium, or ammonium; these salts with the alum used with size produce a tint which may be varied by the addition of small quantities of such metallic salts as will produce the required tint. The colour of common ink written upon paper prepared as above will, upon being exposed to the action of acids of an electro-negative character, be changed from black to blue or red; and with alkalies or electro-positives to a brown red, and render the attempt to extract the ink visible. *Patent completed.*

1629. C. LAMBERT. *Improvements in collars for horses and other draught animals.* Dated July 19, 1858.

This invention was described and illustrated at page 92, No. 6, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

1630. S. MAW. *An improved feeder for administering food.* Dated July 19, 1858.

This feeder is so constructed that air cannot be drawn into the mouth while feeding. *Patent completed.*

1631. J. SCHMITT. *Cementing, hardening, and tempering rails for railways, and also axles for railway carriage wheels.* Dated July 20, 1858.

This consists in subjecting the rails and axles to the action of the following composition—viz., charcoal, grease, hoof-parings, tartar, coarse sugar, rosin, saltpetre, and sand. *Patent abandoned.*

1632. J. CHADWICK. *Improvements in the application of certain woven fabrics to printing purposes.* Dated July 20, 1858.

The patentee takes woollen bunting, and, by dissolved caoutchouc, &c., attaches two or more folds together, and makes a waterproof fabric termed "back-cloths," suitable for printing purposes. *Patent completed.*

1633. J. SHAND. *Improvements in fire-engines and pumps.* Dated July 20, 1858.

This invention was described and illustrated at page 124, No. 8, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

1634. T. BAILEY. *Improvements in repeating fire-arms.* Dated July 20, 1858.

This consists, 1, in constructing the arms so that all the working and actuating movements are contained inside the body thereof. 2. In constructing the revolving chamber solid, or without a hole through it for a spindle. 3. In connecting the barrel to the body of the arm by a circular hook joint. 4. In certain arrangement of the parts of the lock, by which the hammer may be cocked either by the hand or by the trigger. 5. In cocking and discharging in the manner of an ordinary fowling piece. 6. In stopping the revolving chamber by a spring stop acting on the ratchet at right angles thereto, and being moved into its required positions by a cam or projection on the tumbler. 7. In cutting a notch or cavity in the cap guard or "cock nose," so that it may rest on the solid part of the chamber and retain the latter in a safe position. 8. In forming a toothed rack on the loader and the toothed segment, or small toothed wheel connected to the end of the lever, for loading the chamber. Our space will not admit of a detailed description. *Patent completed.*

1635. J. C. HILL. *Improvements in making joints for connecting pipes and other articles by means of lead or other soft metal.* Dated July 20, 1858.

This consists in inserting the two ends of pipe to be joined in a leaden collar, and compressing the same by a suitable tool. *Patent completed.*

1636. R. CLARKE. *Improvements in windows, window blinds, and shutters.* Dated July 20, 1858.

This consists in the application of springs of steel for supporting window blinds or shutters in various positions. *Patent completed.*

1637. C. DOLEY, E. BIGLAND, and T. H. WORRALL. *Improvements in ornamenting metallic and non-metallic surfaces.* Dated July 20, 1858.

This consists in ornamenting the said surfaces by designs etched upon glass plates, or by transfers obtained by printing from the said etched glass plates. *Patent completed.*

1638. G. WHEATLEY. *An improvement in the ornamenting of sticks.* Dated July 20, 1858.

This consists in ornamenting sticks by applying to them white varnish holding bronze powder. *Patent abandoned.*

1639. R. A. BROOMAN. *Improvements in movable apparatuses for receiving fecal and sewage matters.* (A communication.) Dated July 20, 1858.

This consists in providing vessels for the reception of sewage, &c., from which the liquid is allowed to flow away while the solid portions remain. *Patent abandoned.*

1640. W. N. NICHOLSON. *Improvements in crushing mills.* Dated July 20, 1858.

This consists, 1, in driving the moveable roller of crushing mills by a pinion working in cogs on the internal edge of an annular wheel mounted on the axle of the roller. 2, in supporting the bush of the moveable roller in a slot of such form that the roller as it moves may describe an arc of a circle about the centre of the driving pinion. For varying the distance between the rollers, the patentee uses an iron slide on which the bush of the moveable roller is fixed, with a circular hole to receive a flanged eccentric, and in holding the eccentric in the required position he uses a notched disc, into the notches of which a catch drops. *Patent completed.*

1641. J. V. N. S. PETRZIWALSKY. *Improvements in the manufacture of bread, and in apparatus to be employed therein.* Dated July 20, 1858.

A complete specification of this invention was filed with the application, and an abridgement of it was published at page 621, No. 1846, of the MECHANICS' MAGAZINE. *Patent completed.*

1642. W. and J. ASQUITH. *Ornamenting the surfaces of raised piled fabrics, and the apparatus employed therein.* Dated July 20, 1858.

This consists in placing at the back of the fabric one or more plain surface rollers, so that by the action of rollers set with figures or devices, which revolve upon the surface of the cloth, and to which a lateral reciprocating movement is given by a cam action, the design may be produced by changing the direction of the pile in those parts of the fabric acted upon as aforesaid, a horizontal motion being communicated to the cloth until the entire length has been operated upon, so that the pile being presented to the light in different positions may cause a difference of shade to appear, the said rollers at the back of the fabric either revolving in fixed bearings or working with a rising and lowering motion to suit the requisite pattern, which is subsequently fixed on the fabric by steaming or boiling, drying, cutting, and pressing. *Patent abandoned.*

1643. E. HARDON. *An improved manufacture of woven fabrics for covering umbrellas and parasols.* Dated July 21, 1858.

This consists in covering umbrellas, &c., with a fabric composed of cotton and spun silk. *Patent completed.*

1644. J. W. WILSON. *Certain improvements in machinery or apparatus for turning and cutting wood and other substances.* Dated July 21, 1858.

This relates particularly to the turning of wood "bobbins." The apparatus consists in arranging a series of turning lathes in a circular framing, each one consisting in a driving and following headstock, the power being communicated to the series from a main driving shaft to the driving spindles by an endless strap encircling the peripheries of their driving pulleys, and the tools for turning each article are also mounted in rests in a similarly-shaped framing, the whole system being mounted upon one rotating shaft, so as to impart to each lathe two motions, one round its own axis, and the series round the central shaft. *Patent completed.*

1645. M. MATLEY. *Improvements applicable to steam boilers for consuming smoke and economizing fuel in the generation of steam.* Dated July 21, 1858.

This consists in placing a partition at the firing end of the furnace above the dead plate, so as to form a space between the partition and the bottom of the boiler or top of the internal fire-place, this partition having in it a number of perforations so that air admitted to the cavity from the ash-place will become heated on entering the cavity, and will then pass through perforations and mix with the combustible gases. The openings at the ash-place through which the air is admitted have valves or dampers by which the passage of the air may be regulated or shut off. The arrangement above described is used in combination with a hollow "fire-bridge" supplied with air from the ash-place, which is allowed to pass from the fire-bridge through perforations made in the back of it. *Patent completed.*

1646. T. PIATTI. *An improved propeller.* Dated July 21, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1647. L. CUNQ. *Improvement in calculating machines.* Dated July 21, 1858.

This relates to the well-known caculating rule, and has more particularly in view the application of the instrument to the rapid calculation of the quantity of liquid running in a certain length of time through an orifice of given diameter under a given pressure. The instrument is based on the same construction as the straight logarithmic calculating rule, but with its divisions instead of straight lines on four concentric circles, one of which is fixed and the three others moveable round the first one, the fixed circle and two of the other ones being divided so as to have the same intervals corresponding with the same central angles, and to have these divisions in logarithmic proportions with the length of the periphery, the scales of the two just mentioned moveable circles being further divided in opposite directions to the scale of the fixed circle. The periphery of the third moveable circle is provided with two scales following each other, the unit being the half of the periphery. *Patent abandoned.*

1648. H. ALLNUTT. *A vehicle for lamplighters.* Dated July 21, 1858.

This consists of a stage, mounted at such a height on a carriage travelling-frame or support that a person placed on it may easily reach the lamps. The frame is carried on wheels, and provided with draught arrangements for horse traction. *Patent abandoned.*

1649. J. W. GILES. *Improvements in locomotive or traction engines.* Dated July 21, 1858.

This relates to engines propelled by jointed levers, attached at one end to the engine, and furnished at the other end with feet which descend on to the land, and the propelling action obtained by straightening out the lever by the power of the engine. This invention consists in attaching the jointed levers to the engine at a point near its centre of gravity, so that the whole or nearly the whole weight of the engine is applied to resist the upward pressure of the propellers. *Patent completed.*

1650. J. MEACOCK. *Improvements in wet gas meters.* Dated July 21, 1858.

This consists in fitting a tube to the valve-box in wet meters which leads directly into the spout from whence the gas enters the drum and wheel of the meter; in fitting the float at the back of the drum, and in attaching a double valve or stop to the spindle of the float, or to a spindle connected by a lever or levers to the float. Upon attempt being made to tamper with the meter, by tilting it upwards or downwards, the float would either rise or fall, and stop the outlet pipe by bringing one or other of the valves or stops into action. *Patent abandoned.*

1651. D. W. WARDER. *Improvements in the manufacture of beams, girders, ships' ribs or frames, and other structures of wrought iron.* Dated July 22, 1858.

The patentee constructs or builds up his beam or girder, &c., in two or more pieces, each part being rolled of the form required. He then temporarily binds the several parts together, and unites them one to the other by welding them in the direction of their length, forming a beam the same as if produced from the rolls. *Patent completed.*

1652. B. BLAKE. *An improved kiln for burning earthenware, and other similar articles.* Dated July 22, 1858.

Here the fire-places are arranged at certain intervals all along the outside walls of the kiln; the fire-places are each to be provided with a narrow passage or "goit." Each "goit" communicates with "bugs" or flues, with holes or openings for distributing the heat regularly throughout the kiln and flue within the kiln, to prevent the flame "flashing" upon the ware. It also consists in the use of a series of arched shelves, made of fire-clay bars, quarries, or tiles, and fitted up throughout the entire length of the kiln one above another, and placed against the two opposite "bugs" or flues. These shelves are to receive the earthenware to be burnt. *Patent completed.*

1653. H. GREEN. *A new or improved hinge for hanging and closing doors, grates, or windows.* Dated July 22, 1858.

This consists of a hinge in which the mechanism for hanging and closing the door, gate, or window is acted upon by a weight. Its details are not described apart from the drawings. *Patent completed.*

1654. C. GAMMON. *Improvements in the fastening of envelopes and letters.* Dated July 22, 1858.

Here a small metal catch is attached to the envelope. *Patent completed.*

1655. W. L. THOMAS. *Improvements in ordnance, fire-arms, and apparatus generally in which gunpowder is employed.* Dated July 22, 1858.

This consists in constructing ordnance, fire-arms, &c., according to the impulsive force or action of impact which the gunpowder exerts on the shot, &c., and also according to the fact that the initial force of relative quantities of powder exerted on the shot, the charges being of the same form, increases in a much greater ratio than the quantity. The metal material of the gun has to be distributed accordingly; the precise forms and dimensions to be adopted of course varying, but the gun or piece is made thick about the breech. *Patent completed.*

1656. J. P. B. A. THIERRY, Jun. *Improvements in furnaces.* Dated July 22, 1858.

This relates to a previous patent of the patentee, and consists, 1, in mixing atmospheric air with the superheated steam before it passes into the furnace; 2, in superheating the steam before introducing it into the furnace by passing it through hollow fire-bars. *Patent completed.*

1657. A. B. TRIPLER. *Improvements in obtaining products from a species of asphaltum at present found in the Island of Cuba, and called chapafote.* Dated July 22, 1858.

The matter above mentioned is heated in a still, and the vapours which rise from it are condensed. The products consist of oily, fatty, bituminous, and other substances, which may afterwards be separated. *Patent completed.*

1658. H. HIGGINS, and T. S. WHITWORTH. *Improvements in machinery for spinning and doubling or twining cotton and other fibrous materials.* Dated July 22, 1858.

The patentees claim, 1, the use of jointed rods or levers for putting up the carriage or creel, and working in concert with a quadrant or other part of the mule. Also, the use of the scroll or spiral pinion, (as described,) for giving motion to a quadrant wheel or rack. 2, the use of eccentric or equivalent apparatus in place of the usual scroll, the essential feature of this part of the invention being the use of a band which continues to act at the same angle to the shaft. 3, driving the change or cam-shaft by a friction surface mounted on the boss of the backing-off-wheel. 4, the adaptation to the small pulley or disc for acting upon the fallers of a part acting as a stop, but capable of allowing more than one revolution if required. 5, the method of attaching or coupling parts of the mules. *Patent completed.*

1659. L. J. MARKS. *Improvements in compasses.* Dated July 23, 1858.

The patentee applies to the card, in addition to the ordinary needle, several magnets, by preference radiating from the axis of the card, and at equal distances from each other. *Patent completed.*

1660. W. A. GILBEE. *An improved rotary engine.* (A communication.) Dated July 23, 1858.

This engine is composed of two cylinders united end to end, and attached together by a common plate which serves as a separation, and having one shaft passing through them, provided in each cylinder with a cast iron piece or washer, which latter also supports two wings or pistons. These pistons move in a circular direction in an annular space divided into two equal parts by moveable partition plates. The steam enters at both ends of the cylinder through ingress pipes, and passing through the valve chest and orifices, presses simultaneously against the two pistons, and causes them to travel over a half circumference. At this moment the partition plates, which slide in grooves, rise, and allow the pistons to continue their course. To facilitate the passage of this dead point the pistons of the second cylinder are disposed perpendicularly, in such wise as to be at their highest point of power. A perfect vacuum is kept up in front of the pistons by the part of the cylinders through which they have to pass being in constant communication with the condenser. *Patent abandoned.*

1661. R. P. WALKER. *Improvements in machinery for hulling and finishing rice and similar grains.* Dated July 23, 1858.

Here the patentee passes a thin flat stream of rice into a cylinder covered with emery, and causes the same to pass beneath elastic rollers whose surfaces travel at a slightly different speed to the main cylinder, to cause a rolling and rubbing motion between the cylinder and its rollers, and to

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the said rollers he imparts simultaneously an endways motion, which slips the hull endways off the rice, thereby ensuing a proper hulling, and with very little waste from broken berries. *Patent completed.*

1662. H. BARBER. *Improved machinery for producing knitted fabrics.* Dated July 23, 1858.

The object here is, 1, to simplify the mode of selecting moveable presser bits which are used to press down the beards of the needles employed in the ordinary stocking frame or loom. It next relates to the use of a bar or bars for holding in position the presser bits after they have been selected. Next to the use of a peg cylinder for acting on the levers, whereby the position of the presser bits may be changed, so as to produce the pattern or knitted fabrics. The needle is made with a sliding or moveable presser for closing the beard when required. The invention is not described apart from the drawings. *Patent completed.*

1663. G. BROKELBANK. *Improvements in laying submarine cables for telegraphic purposes.* Dated July 23, 1858.

The telegrabhic cable, as it is payed out from the ship, is passed down a sustaining cable which is attached to the stern of this ship, and is itself supported at one or several points in its length by ropes. *Patent abandoned.*

1664. W. PARSONS. *Improvements in separating the solid matter from sewage waters.* Dated July 23, 1858.

Here the sewage is raised by pumps to such a height as to obtain a considerable head, and from this elevation is conducted by pipes into bags of woven fabric, which are protected by cases of perforated metal to enable them to sustain the pressure. The fluid parts of the sewage pass through the bags, and the solid parts are retained by them. *Patent abandoned.*

1665. H. J. GIFFARD. *Improvements in feed apparatus for steam and other boilers, which improvements are also applicable to the raising and forcing of fluids.* Dated July 23, 1858.

Here the impulsive force of a steam jet or blast is made to raise and force the fluid required. This apparatus consists, according to one arrangement as applied to a steam boiler of a steam jet or injection pipe, which receives the steam from the boiler, and directs it in a continuous jet into a small passage the lower end or mouth of which is expanded sufficiently to admit of the entrance of a stream of water, which, by surrounding the steam jet pipe, forms an annular jet of water with the steam jet in the centre. The water is drawn from a well or tank in any convenient situation. *Patent completed.*

1666. C. ATKINSON. *A certain improvement in Venetian blinds.* Dated July 24, 1858.

This consists in the use of thin strips of steel, for mounting the laths in the construction of venetian blinds, the vertical strips being hinged to admit of their folding up. The blind may be used also as a shutter. *Patent abandoned.*

1667. M. SHANTY. *A mercurial level, to show the height of liquids in enclosed and opaque vessels, vases, and principally for steam boilers.* (A communication.) Dated July 24, 1858.

A complete specification of this invention was filed with the application, and it is not described apart from the drawings. *Patent abandoned.*

1668. W. MERRY. *Improvements in apparatus for preventing the escape of foul air from area, kitchen, and scullery drains of dwelling-houses, also from street, stable, and slaughter-house drains.* Dated July 24, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

1669. M. SHANTY. *A metallic trimming for intercepting water, air, gas, or steam round piston rods, of whatsoever they may be; the same may be applied to the joints of steam machines.* (A communication.) Dated July 24, 1858.

A complete specification of this invention was filed with the application, and an abridgement of it was published at page 621, No. 1846, of the MECHANICS' MAGAZINE. *Patent abandoned.*

1670. S. TOWNEND. *Improvements in cranes.* Dated July 24, 1858.

The object here is the application of a self-adjusting counterweight capable of adapting itself to, and thereby balancing different weights to be lifted. *Patent abandoned.*

1671. J. F. BELLEVILLE. *An improved smoke-consuming apparatus or furnace.* Dated July 24, 1858

This consists of two sets of fire-bars, one large set composed of louvre-like bars arranged so that their edges all lie in a plane inclined at an angle of about 45 deg., with a space for the admission of air between every two bars; the other and smaller set is placed horizontally at the bottom of the inclined louvre bars. The large set of bars consists of metal laths arranged stepwise over each other so as to form a plane sufficiently inclined to allow of the fuel employed falling by gravitation. A feed hopper is fixed over the inclined grating. Flues are made in the brickwork of the apparatus for the admission through regulating valves of air, which becomes heated in its passage, and is admitted through the openings between the louvre bars and into the upper part of the apparatus. Between the bottom of the louvre bars or grating and the horizontal bars, there is a door through which clinkers may be removed. *Patent completed.*

1672. H. C. TRAPHAGEN. *Improvements in ladies' skirts.* Dated July 24, 1858.

This consists in attaching to a skirt a series of air-tight tubes, placed horizontally on the skirt to be inflated with air. *Patent abandoned.*

1673. H. WIKOFF. *An improved aperient medicine, to be used in the shape of a biscuit, cake, or sweetmeat.* (A communication.) Dated July 24, 1858.

This consists in mixing "Arabian scammony" with cakes, biscuits, &c. *Patent abandoned.*

1674. D. ADAMSON. *Improvements in hydraulic apparatus for raising and lowering heavy articles, and in the application of hydraulic power for riveting metallic structures, as iron ships' boilers, tanks, and similar articles.* Dated July 26, 1858.

This consists, 1, in improvements in the construction of hydraulic lifting jacks. 2, in the application of a separate valve, called a pass valve, for the passage of the fluid from cylinder into the ram cistern when it is requisite to lower the head of the ram or the weight. 3. in the mode of acting on the pass valve when the ram has to be lowered. 4, in the application of hydraulic power for riveting metallic structures, such as ships' boilers, tanks, and similar articles. 5, in certain improved modes of constructing hydraulic apparatus for riveting. These several improvements are not described apart from the drawings. *Patent completed.*

1675. C. F. VASSEROT. *Improvements in glass roofs, skylights, and other glass structures.* (A communication.) Dated July 26, 1858.

This consists in joining together the panes or sheets of glass by a flexible band, the joint being either air-tight, or made to receive and convey outside the condensed moisture from the insides. *Patent completed.*

1676. A. SAX. *Improvements in wind musical instruments.* Dated July 26, 1858.

The patentee claims constructing brass and musical instruments in which pistons are made use of in such manner as to allow of giving, with musical exactness, all the notes of their chromatic scale, by providing the said class of musical instruments, besides the descending pistons, with descending ones, for giving the ascending chromatic notes. *Patent completed.*

1677. J. COOKE. *Improvements in singeing, treating, or finishing textile fabrics.* Dated July 26, 1858.

Under one form of the machinery used the fabric to be singed or heated is passed from a horizontal beam round guide rollers, and thence over or in contact with a fixed bush or scrubber, which raises the loose fibres and renders the surface better suited for being singed; and from this point it passes over a row of gas flames, by which the piece is singed upon its upper surface, a stream of heated air being passed upon the row of gas flame at the point of contact with the fabric. After quitting this point the fabric passes inside angle iron, and thence over a trough containing cold water, which, together with the row of gas flame, is covered by an exhausting chamber connected with an exhausting fan. The piece then passes beneath a bush roller or scrubber, and over or through a second singeing arrangement of a kind similar to that just described, and it then traverses between a pair of nipping rollers which act as dampers in putting out any sparks left on the surface. The fabric finally passes round a guide roller and is then beamed upon a roller in a finished condition. *Patent completed.*

1678. J. HARDIE. *Improvements in apparatus for regulating the flow or passage of fluids.* Dated July 26, 1858.

This relates to valvular apparatus for use in different situations where the flow or passing of fluids is to be regulated, and particularly in water-closets where a predetermined supply of cleansing water is to be periodically let on. There are several modifications included, which we cannot give in detail. *Patent completed.*

1679. J. TAYLOR and J. NIMMO. *Improvements in healds, and in machinery or apparatus for making healds.* Dated July 26, 1858.

This relates to Bernie and Anderson's patent, dated 25th March, 1835. In the improved healds the counts or sets are marked by the introduction into each leaf of a determined number of legs, loops, or stitches, of coloured threads. These threads are worked in by the marker, who, according to one modification, on arriving at the part of the leaf where the marking is to be made, detaches the usual pirn and attaches the pirn of coloured yarn, working it into the upper half of the heald until the proper number of marking legs or eyes are worked in, when the ordinary yarn is resumed. *Patent completed.*

1680. B. T. HARRIS. *Improvements in registers for indicating the presence or absence, and the time of arrival and departure, of workmen or employés.* Dated July 26, 1858.

The inventor makes use of a registering surface of paper, moved by clockwork, and in connection to this he uses a row of pins standing at right angles to the line of motion of the registering surface. Each workman has one of these pins assigned him, and each time he comes to work he operates the said pin to make a mark on the registering surface, and he also makes a similar mark on leaving work; hence the space between each alternate pair of marks indicates the time the workmen has been employed. He also makes use of a perforated plate or its eqivalent, behind which black and white or dissimilar surfaces or devices are alternately exposed to view, to indicate the presence or absence of the workmen by inspection. *Patent abandoned.*

1681. C. DE JONGH. *An improved system of, and machinery for heckling or combing flax, silk, or other fibrous substances.* Dated July 26, 1858.

This relates to heckling and combing machinery whereby stricks of flax, silk, &c., may be submitted to the action of different gradations of pins in succession, each gradation commencing to operate at the end of the strick, and working up to the holder without the aid of a moveable head trough for carrying the holders. *Patent completed.*

1682. T. HALL. *Improved apparatus for indicating a rise of temperature in confined spaces.* Dated July 26, 1858.

The inventor employs an air-tube, or a system of air-tubes, closed at one end and connected at their open end to a tube in direct communication with a mercurial or fluid indicator. *Patent abandoned.*

1683. E. JONES. *Effecting a better system of drainage, and the machinery or apparatus necessary for the same, whereby the sewage manure is collected and conveniently exported for use, and the noxious effluvia prevented from contaminating the air of populous cities and towns, and whereby the drains may be more strongly and securely built, by the manufacture of a more suitable and better material.* Dated July 26, 1858.

This invention is not described apart from the drawings. The patentee claims, 1, portable tanks for collecting the sewage and débris of the streets, together with filtering gratings and flood-gates (as described), with the mode of effecting their removal; 2, gully traps and tanks as described; 3, the closet pan and traps with the flexible joint and apparatus as described; 4, the sink and area trap and tank; 5, the mode of manufacturing bricks (as described) by the combination of pistons, levers, and perforators connected with the cutting apparatus for preparing the blocks. *Patent completed.*

1684. H. JACKSON. *Improvements in preparing lubricating matters.* Dated July 26, 1858.

Here the tallow is broken into small pieces and placed in a vessel, which is then closed, and the air is exhausted. Afterwards connection is made between the vessel and a retort in which oxygen is generated; when the oxygen in the vessel has arrived at a considerable pressure, it is allowed to escape by a weighted valve. The tallow when it has been kept in contact with oxygen under pressure for some time, is removed from the vessel, and ground with an amalgam of mercury and tin. *Patent completed.*

1685. J. HOPE. *A new and useful mechanism or apparatus for supporting and adjusting a graver of a machine, for engraving the surface of a calico printer's roller, preparatory to the same being etched.* Dated July 26, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1686. J. DAVIES. *Improvements in cloaks for military and other purposes.* Dated July 26, 1858.

This consists in constructing them so that each cloak may also serve as a tent. *Patent abandoned.*

1687. P. A. GODEFROY. *Improvements in the cleansing of gutta percha, and in the more perfect insulation of electric telegraph wires.*

This invention is not described apart from the drawings. *Patent completed.*

1688. H. GLOVER. *Improvements in instruments for measuring angles and taking altitudes.* Dated July 26, 1858.

The object here is to measure the angular distance of two or more objects from each other. The inventor can measure not only the angular distance of two distant objects, but their altitude also. He can also obtain the zenith distance of an object without a sea or artificial horizon. The instrument consists of two graduated arches, combined so that the plane of one arch shall be at a right angle to that of the other. Each arch has a limb attached with a nonius, as usual in sextants, and has also reflectors placed on the end, through which the axis pin is placed. One of these arches measures the altitude, and the other the angular distance between two contiguous objects that are at the same altitude. The arch measuring the distance apart lies horizontally, and that which measures altitude is vertical when held in position for conducting observations. The invention is not fully described apart from the drawings. *Patent abandoned.*

1689. H. ASHTON. *Improvements in the furnaces of steam boilers.* Dated July 26, 1858.

In applying this invention to the fire-box of a locomotive steam engine, the inventor makes the door in two halves, hinged together, and to the door frame attaches a slanting plate by which the air is guided on to the fire. An adjustable plate may be applied to this slanting plate to guide the air closer to or further from the fire. He makes the door frame capable of being easily removed from the fire-box, so that the tubes may be got at with facility. *Patent abandoned.*

1690. J. SCOTT. *Improvements in pumps, which improvements are also applicable for the propulsion of ships, vessels and boats.* Dated July 27, 1858.

This relates to the pumping or forcing of liquids by a rotary helical coil of piping or tubes. *Patent completed.*

1691. J. EMES. *A portable folding bedstead.* Dated July 27, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1692. T. LINE. *Improvements in engines for raising beer and other liquids.* Dated July 27, 1858.

This relates to a former patent granted to H. James, 16th May, 1857. The inventor mounts a plate or disc carrying an arm or hand lever, arranged on the top of the pump cylinder, and that cylinder is at its lower end attached to a shop counter or other suitable support. Thus, in this arrangement, it is the pump cylinder alone which carries the plate or disc and the arm or hand lever. *Patent completed.*

1693. A. TAYLOR. *Improvements in pianofortes.* Dated July 27, 1858.

The patentee introduces glass into certain parts of the piano. *Patent completed.*

1694. C. N. KOTTULA. *Improvements in the manufacture of soap.* Dated July 27, 1858.

This consists in combining "fitted" soaps with "neutral hydrated" soaps, or the elements of such neutral soaps, that is to say, with soaps made of cocoa-nut oil, or tallow, or certain other descriptions of fatty matters and soda leys, without separation of water or leys. *Patent completed.*

1695. J. LONG. *Improvements in cooling brewers' and distillers' worts and other liquids.* Dated July 27, 1858.

This consists in placing within the vessel in which the worts, &c., are to be cooled two longitudinal battens covered by canvas, cloth, &c., the said battens stopping short of the ends of the vessel, and in blowing air in upon the worts or other liquids below the cover, so that the worts, &c., shall be caused by the blast to flow between the battens towards the end of the containing vessel, and passing round the ends of the battens return outside of them, again entering between them to undergo the cooling action of the blast. *Patent abandoned.*

1696. G. HURN. *Improvements in the manufacture of certain articles made from fibrous materials.* Dated July 28, 1858.

A complete specification of this invention was filed with the application, and an abridgment of it was published at page 621, No. 1846, of the MECHANICS' MAGAZINE. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, MARCH 25, 1859.

THE NEW PATENT OFFICE BUILDING.

ABOUT £9,000 a-year is what Her Majesty's two law officers, the Solicitor-General and Attorney-General, divide between them from the fees on patents. £4,500 per annum, easily earned, ought to be sufficient, one would think, to keep each of these gentlemen a little true to the interests of patentees; and yet we have to charge them with lending themselves to a movement which ought to be discountenanced by them to the utmost.

It is tolerably well known by this time that a splendid library lies awaiting exhumation in the "dark arches" of the present Great Seal Patent Office, and also that covetous hands are endeavouring to drag library, museum, and offices all westward. "To South Kensington with them!" was the first cry; and now that this has become hopeless of success, "To Burlington-house!" is the new note of certain gentlemen who have already more to do with the Patent Office than is desirable. Now, it is to the Commissioners of Patents, and especially to Sir Fitzroy Kelly and Sir Hugh Cairns, that we have looked for an official resistance to these cries. That the removal of the office and library to Piccadilly would be a highly improper thing, must be very evident to all who think for a moment on the subject. The persons who visit them daily and hourly are inventors, patentees, patent agents, and lawyers. The first three classes have, as a matter of course, perpetually recurring occasions of attending both the office and the library; and as to barristers and solicitors, there are now no less than 3,000 registered deeds in the office, in which these gentlemen almost exclusively are concerned. Now, do inventors, patentees, patent agents, barristers, and solicitors, congregate at Chancery-lane, where the Patent Office and Library now are, or at Piccadilly? Further, it is well known that a concentration of all the law courts and offices, with which the Patent Office is most intimately concerned, is extremely likely to take place on ground adjoining Chancery-lane. Sir Richard Bethell, for one, has set his heart upon the accomplishment of this, and with the Suitor's Fund of unclaimed millions to draw upon, he will doubtless attain his end. With what reason, then, can the permanent removal of the Patent Office and Library to Piccadilly be contemplated?

That the Commissioners of Patents thoroughly understand the matter is very evident, for only a very few weeks since they represented the facts of the case to the Lords of the Treasury in a memorial which is now before us. From it we extract the following sentences:—

"The 4th section of the said Act enacts, that 'it 'shall be lawful for the Commissioners of Her 'Majesty's Treasury to provide and appoint from time 'to time proper places or buildings for an office or 'offices for the purposes of the said Act.' In pursuance of the requisition of the Lords Commissioners of Her Majesty's Treasury, dated in 1853, the Commissioners of Her Majesty's Board of Works provided certain offices for the Commissioners of Patents, being the ground-floor rooms of the Masters' offices in Southampton Buildings, Chancery Lane, theretofore occupied by Masters in Chancery, abolished under the Act 15 and 16 Vict. c. 80.; and an annual rent of £490 is now paid out of the Fee Fund of the Patent Office to the Suitors' Fund of the Court of Chancery for the hire of the same. This arrangement was not considered to be permanent; no lease has been granted, and as these offices are now required for the occupation of the registrars and other officers of the Court of Chancery, the notice has been given to the Commissioners of Patents, requiring them to give up possession so soon as other suitable offices can be procured. These offices were, in 1853, sufficient in number and accommodation for the ordinary business of the office. In the year 1855, the Commissioners of Patents established a free public library within their office, containing works of science in all languages, the publications of the Commissioners, and the works upon patented and other inventions published in the British Colonies and in Foreign countries. This library has greatly increased and continues to increase, partly by purchases, but in a great measure by gifts and loans of valuable and useful books. It was resorted to at the first opening by inventors, engineers, and mechanics, as well as by barristers, solicitors, and agents engaged in Patent business; it has become a collection of great interest and importance, and the number of readers has gradually so much increased that at this time convenient standing room cannot be found in the two small rooms within the office which can be appropriated to the library. It is the only library within the United Kingdom in which the public have access, not only to the Records of the Patents and Inventions of this country, but also to official and other documents relating to Inventions in Foreign countries, and this without payment of any fee. A largely-increased accommodation is urgently required. No suitable building can be found in the immediate neighbourhood of Southampton Buildings, either to be rented or for purchase. The new offices to be provided must be fire-proof, for the preservation of the original Specifications and other Records of the office; the offices now occupied are fire-proof throughout. The Commissioners of Patents are in possession of a collection of very valuable and interesting models of patented machines and implements, as also of portraits of inventors, many of them gifts, and others lent by the owners for exhibition. They are now exhibited daily, and gratuitously, in a portion of the Museum at Kensington assigned to the Commissioners of Patents for that purpose by the Lords of the Committee of Privy Council for Trade. A museum of this nature necessarily increases, and the number of models now exhibited may be considered as forming only the foundation of a great national museum..... They are of opinion that the surplus income, calculated as before stated, to amount to £30,000 at the end of the current year, 1859, and to increase in each succeeding year at the rate of £20,000 per annum, may be beneficially applied in the purchase of ground in a central situation, and in the erection thereon of a sufficiently spacious fireproof building for the Patent Offices and public free library attached thereto; and that the surplus fund may also be beneficially applied in the purchase of ground and the erection thereon of a permanent and spacious building for the Patent Office Museum, sufficient ground being taken for the extension of the building, from time to time, as may be required. This is the more necessary inasmuch as models of the most interesting and valuable description lie scattered over the kingdom, in many instances constructed at a great expense, for legal and other purposes, for which the owners have no present use, and many of which occupy a space inconvenient to them. These models, or many of them, would, as the Commissioners confidently expect and believe, be presented or intrusted to them for exhibition in such museum, provided the public are allowed free access to it at all reasonable times. *The Patent Office is the place of constant, daily, and hourly resort of patentees, agents, and all others concerned in obtaining patents, and in ascertaining what discoveries and improvements have already been made. It should be conveniently placed with reference to the courts of law, the government offices, and the offices of the attorney and solicitor-general.* With respect, however, to the proposed new museum, the Commissioners of Patents are of opinion that the same reasons for a central position do not exist, and that it might be placed upon any spot easily accessible to the inhabitants of the metropolis, and that the place in which the models are now exhibited would be an eligible position, sufficient ground being there purchased or assigned for the purpose. A large space will be required for the building in the first instance, and a larger extent must be provided for its future extension, and sufficient ground cannot be found in the centre of the town for a building of the extent required, unless at an enormous cost."

Here we have the case stated clearly and fairly enough. But, unhappily, some bad influence has very lately been brought to bear upon the learned gentlemen who signed the memorial (Lord Chelmsford, Sir John Romilly, Sir F. Kelly, and Sir H. Cairns), and they have lately, as we are informed, consented to build "the place of constant, daily, and hourly resort of patentees, agents, and all others concerned in obtaining patents"—at Piccadilly! We appeal to these gentlemen against so monstrous a repudiation of their own good sense, to say nothing of the feelings and desires of others.

We entirely deny that any insuperable obstacle prevents the acquisition of a suitable central site for a Patent Office. It is, of course, not to be expected that large plots of building ground are to be obtained in abundance in the very centre of the metropolis. We must be prepared to buy and pull down a few old buildings, before we can put up new and spacious edifices. With this understood, there need be no difficulty in securing even a choice of sites for the new Patent Office. We will point out two. In the first place, there is a large plot of ground between the new Record Office and Chancery-lane which would answer the purpose most admirably, and which might be built upon without delay. Secondly, why should not the building at present occupied by the Commissioners of Patents be purchased, and with it the block of buildings between it and Chancery-lane? These may, we confidently state, be purchased on fair and reasonable terms, and with these for their own, the Commissioners may rear a Great Seal Patent Office worthy of themselves and of this nation of inventors. Were there but the will, there would be no want of the way.

And now a word or two as to financial matters. The reader will observe that in the extract which we have quoted, the Commissioners put down the probable surplus income at the end of 1859 as £30,000. This is a most false estimate. We will explain how it has been made. In the Patent Law Amendment Act of 1852 provision was made for the payment of certain sums, part in fees and part in stamp duties. The stamp duties were £5 payable on the Law Officer's Warrant for Letters Patent; £10 out of the third year's fee of £50; and £20 out of the seventh year's fee of £100. Now, some official gentlemen or other—we know not who exactly—*chose* to put down these sums as so much "Revenue," and paid them into the Treasury as such. In 1853, however, another Act was passed converting the whole of the payments (including fees) into stamp duties, and therefore abolishing his pretended distinction between the two kinds of payments. But, strange to say, no corresponding change has been made in the manner of keeping the accounts. Every year, away goes a large sum from the surplus Patent Fund as "revenue" still. The amount thus abstracted since 1852 is nearly £90,000. The Commissioners estimate the "Revenue Stamp Duties" for the current year at £16,000 more. So that the actual surplus fund raised from patentees since 1852 is at least £100,000 more than the Commissioners represent. This sum ought—every farthing of it—to be available for the new building if required, and with it we have no need to go begging a bit of Burlington-gardens from Lord Derby.

We earnestly hope the Commissioners will consider the facts we have here stated. Who is to care for inventors if they who draw from them handsome emoluments are untrue to hem?

PATENTS FOR INSTRUMENTS AND MUNITIONS OF WAR.

PIQUED, probably, at the sarcasm which their official trifling with Sir W. Armstrong's invention has called down upon them, the Government have again determined to seek the powers necessary for the suppression of patents for instruments and munitions of war. A bill has accordingly been prepared by Mr. Attorney-

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General, Mr. Solicitor-General, and General Peel, and was read a first time in the House of Commons a few evenings since. It is published in full on another page of this Magazine.

It will not be possible for the reader to comprehend the sinister and dangerous nature of this measure, without recurring to the circumstances which have led to its production. On the 18th of October, 1855, a paper, of which the following is a copy, was issued from the War Department :—

"(Copy.)

"*Patent Law Amendment Act*, 1852.

"I, Charles George Bannister, of Pall Mall, Middlesex, Solicitor for the War Department, and for and on behalf of Her Majesty's Principal Secretary of State for the War Department, hereby give notice that I object to the sealing of Letters Patent to John Macintosh, of Great Ormond Street, Middlesex, for the Invention of 'Improvements in the application of Incendiary Materials to be used in Warfare,' as set forth in the warrant of the Solicitor-General for the sealing of such Letters Patent, received and recorded in the Office of the Commissioners of Patents for Inventions, on the 18th day of December, 1855. And my objections to the sealing of such Letters Patent are as follows:—That such an invention can only be useful in time of war, and that the publication of it may be prejudicial to Her Majesty's service.

"Dated this 18th day of December, 1855.

"(Signed,) CHAS. G. BANNISTER,
"Solicitor, War Department."

Now, we have nothing whatever to say against the formal legality of this document, taken by itself, because the Act of Parliament (15 and 16 Vict. Cap. 83, cl. 12) expressly authorises "any persons having an interest in opposing the grant of letters patent" to state their objections in this manner. But what should be most carefully observed is, that by stopping the sealing of the patent in this way until the war was ended, the Government arbitrarily deprived the inventor of all right to a patent for his invention, because the Lord Chancellor had no legal power to extend the time allowed for sealing the patent beyond one month. By consulting the 6th clause of the 16th and 17th Vic. cap. 115, the reader will find it expressly stated that "it shall not be lawful for the Lord Chancellor to extend the time for the sealing of any letters patent, or for the filing of any specification, beyond the period of one month." With this fact before them, however, the month was allowed to elapse—as were other months afterwards—with the patent unsealed, and therefore destroyed. Hence sprung Mr. Macintosh's just claim for compensation. That claim was, however, cavilled over until the war ended, and the invention became for the time useless, when, in order to avoid it we presume, the Solicitor of the War Department withdrew his opposition, and the Lord Chancellor—in flat contradiction to the law laid down in the clause just quoted—affixed the Great Seal to the patent. From that time to this Mr. Macintosh has received no compensation from the Government, either for the invention itself, or by way of compensation for these arbitrary infringements of his legal rights. Next has come the case of Sir W. Armstrong's gun. Here the authorities have thought a semblance of secresy desirable, although secresy itself has been proved impossible. Very recently Sir William has applied for two further patents, and the Act now under consideration is intended to provide, doubtless, for the sealing up of the facts concerning these.

As to the Act itself, we are really unable to speak of it with any respect whatever. The first clause "enacts" that an inventor of any improvement in instruments or munitions of war *may*, "for valuable consideration or without," assign the benefit of his patent to the Secretary of State for War. That appears to us to be a very curious thing to enact. Who ever doubted that an inventor "*may*," if he please, assign his patent to General Peel or any one else? We all know very well that inventors not only *may* but *have* so assigned them. The War Department cannot possibly be ignorant of this fact, because Lord Panmure only three or four years since purchased a patent for a gun from an American gentleman, who, on his part, felt no difficulty, so far as we know, in receiving a cheque for the £10,000 paid him. Surely the mere fact of the patent being worthless could not have been the only reason why he was allowed to sell it and the Secretary of State to buy it. Perhaps, as the second clause of the new Bill is retrospective, the object of the measure is to justify this particular transaction!

The Bill does not—as we feared it might—propose to give the Government any new power of suppressing an invention without the consent of the inventor. The assignment of the invention or of the patent to the Secretary of State is to be, it appears to us, indispensable to the Government control—a circumstance which indirectly shows how unjust were the proceedings of Lord Panmure and his solicitor in respect to Mr. Macintosh's patent. But this feature of the measure by no means renders it innoxious. Let us briefly examine how it is likely to work in practice.

The inventor of an improved gun, for example, may do one of two things: he may either communicate directly with the War Department before applying for Provisional Protection under the Patent Law; or he may first apply for this Protection, and then address himself to that Department. Now, in the first case, if his invention be pronounced valuable, he will very naturally demand a high compensation for it, and will be disposed to urge this under the threat of making it public. Here, then, at the very outset, is a direct encouragement to extortion, which we are quite sure will be found to work with very bad results. On the other hand, if the War Department is disposed to be niggardly—and that is by no means an improbable case—the inventor will feel no encouragement to proceed with his plans here, but will at once carry them to some foreign Government which is known to be more liberal. The case will not be very different when the inventor obtains his protection before he applies to the Government; the difficulties described will still be experienced.

It may be thought by some that inventors will be disposed to assign their rights to the Secretary of State, leaving the amount of remuneration to be subsequently fixed. But clause 11 of the new Bill will, we think—and we know inventors pretty intimately—forbid this. That clause gives the Secretary of State, it will be observed, legal power to repeat what was done illegally with Mr. Macintosh's invention, viz., to fling the invention overboard, and with it the claims of the inventor, whenever it may suit the purpose of the Government to do so.

We have discussed this bill on its own grounds as a measure of Patent Law Amendment. Upon the more general considerations which might be adduced against it, as a matter of policy we shall not here enter. Some may think we display too little confidence in Secretaries of State and Public Departments. To simple-minded men it may seem incredible that anything but fairness and liberality is to be expected from the holders of high offices in this country. But too many of us know well the fallacy of such thoughts. Office, and especially high office, works miracles on men, and all its miracles are mischievous. It makes men of clear vision blind; men of quick hearing deaf; men of sound judgment senseless; men of pure virtue immoral. So seldom is justice done to individuals by Governments, that we pity the man, be he who he may, who has to put his trust in them. He *may* get justice done him; but if he does it will come by chance, and bring with it neither sanctity nor sweetness.

THE PRESENT STATE OF NAVAL ARCHITECTURE.

REFORMERS as we are, the Government of Lord Derby has a very considerable amount of sympathy from us, and we heartily wish them well through their trouble. Some of the prominent members of that Government are personally entitled to the respect of men of science, and we have observed, in the course of our experience, that Conservative Cabinets are more heedful of the claims of science upon their support than our late Liberal Cabinets have been. In no case is this more clearly displayed than in the relation between the Government and the science of naval architecture, and we had hoped much in this regard from our liberal-minded chief at the Admiralty.

We believe we have reached a period in our naval history of greater importance than any through which we have passed, and nothing can be more detrimental to our naval interests than perpetual changes in the administration of its affairs. Let us mark the position in which we find ourselves at the close of the first decennary of the present half-century—a period of almost unprecedented activity in naval matters. In the year 1850, the number of *screw* ships of war which received Her Majesty's commission was 4; in 1852, 17; in 1854, 34; and in 1856, 105. Last year, out of 39 ships commissioned, 33 were steam-ships, and 25 were propelled by the screw; and so completely has the screw superseded every other mode of propulsion, that there is not, at this moment, a single *paddle*-steamer or sailing-ship on the stocks of any of our royal dockyards. The San Fiorenzo, the last of her race, is no more.

This great change has taken place mainly, as will be seen, within the last ten years. What opportunities might not have been gained during this transition period for perfecting the construction of ships of war, if, in the midst of their anxiety for the present, our Administrators had thought also of the future, and had made every step with the intention of arriving at some definite conclusion as to form, engine-power, and immersion of screw! But we fear they have thought of little beside meeting vessels of a particular class in a foreign service on equal terms, or securing such a draught of water as should make the Sea of Azov navigable, or allow of carrying guns within the forts at Cronstadt. The consequence has been that, whilst our screw ships have embodied all the *recognised* principles of naval architecture, they have failed to render new ones available; and what, rightly directed, might have been a magnificent series of experiments, is now little better than an incongruous mass of badly-observed and worse-recorded facts. We need no other proof of the defectiveness of many of our ships with regard to form, power, &c., than the inequality of their relative performances. We know it would have been as difficult to point out why and in what respects a particular design would fail, as it now is to account for its failure, and for the remarkable character of the results obtained. But this is the ground of our complaint—that, seeing the uncertainty attending the subject, so little pains should have been taken to obtain knowledge. And now we are about to enter upon what promises to be a larger and more costly re-construction than that through which we have passed, and we enter upon it as com-

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pletely ignorant of the best dimensions and form of ship for securing speed and steadiness as we were ten years ago.

What we desire is, that the Admiralty should not only continue to value symmetry of form and perfection of internal arrangement, but also esteem it their duty to make every experiment performed with the public money subserve the advancement of the science of naval architecture. We will not offer a single suggestion as to how this may be done, for there are no men in the world so capable of doing it as the present staff of the Surveyor of the Navy. Had he not been so fortunate as to secure such aid, we should not now have to congratulate ourselves that Russians, Austrians, Portuguese, Turks, Brazilians, and all the smaller maritime powers, build their vessels after English models, and thus proclaim their excellence. It must not be supposed that vessels of war, constructed by private builders for foreign Governments are designs of their own. They are, in nine cases out of ten, engaged to build them like a certain class of ship in the royal navy, permission being given to increase the length or the breadth enough to gratify the self-respect of the builder, but *not* sufficient to make it necessary to enter into any calculations or re-arrangements, or to make it possible for any great blunder to be committed. We do not misrepresent our private shipbuilders when we say that although some of them know perfectly well how to make a ship that will carry a good cargo, or how to secure high speed where that is the desideratum, it would be vain to look to them for help of any importance in securing the combination of qualities which would constitute the perfect man-of-war. Perhaps we could not give a better illustration of the darkness which prevails in these high places on the subject of Naval Architecture than by reproducing a statement made by Vice-Admiral Moorsom in a memorandum drawn up for the British Association in 1857, "on the want of facts respecting the performance of vessels at sea." He says, "a correspondence and negociation was carried on above twelve months between the Government and the London and North Western, and Chester and Holyhead Railway, &c., for vessels to run between Holyhead and Kingstown at the highest attainable speed without undue risk. The negociators differed in their views, from a speed made good of somewhat under 17 statute miles an hour, up to 21 miles; that difference involving sizes of vessel somewhere about as 2 to 3; of cost in outlay nearly in the same proportion, and in working expenses about as 3 to 5.... The most striking features, however, in the case is the great difference in the size and proportion of the vessels, and in the power proposed by the several authorities who were applied to, the request being that they would state their views as to the power and size of the vessel best adapted to perform 65 statute miles in 3¼ hours. The vessels differed in displacement from about 1,550 tons to 3,000; in proportion of breadth to length, from 9·37 to 11·6 per cent; in draught of water to breadth, from 30 to 40 per cent; and in nominal horse-power, from 550 to 1,600."

So wide a range as this is, as Admiral Moorsom very properly says, hardly consistent with a scientific knowledge of the size and form of ships.

We have already informed our readers of the steps which the Admiralty have taken to secure the assistance of the best private shipbuilders and others in designing a Frigate. We saw two or three of the designs which were made for this purpose, and discovered to our astonishment that although the weights to be carried were given, with the number of guns on each side, the minimum distance between them, and other important limitations, yet one of these designs was not more than 4,900 tons burthen, while another was 7,500; and while one proposed to secure the desired speed with 1,000 horses' power, another asked for 1,800.

This, then, is the position of Naval Architecture in the Royal and Merchant Services. We have said what we think the Government ought to do towards improving this gloomy state of things, and we should like to offer a word of counsel to private shipbuilders and shipwrights. They have gone on for years in ignorance of the commonest principles on which their art is based, content to copy continually vessels which would stow a good cargo and could manage to keep their legs, and never dreaming of improvement. Such men may rely upon it they will find before long that the carrying trade is slipping through their fingers and passing into other hands. They complain already of scarcity of freights and of the large number of foreign vessels engaged in our colonial trade, attributing these evils to defective navigation laws; but they have only to build faster and better ships than their rivals, and they will soon find employment as active as they can desire. But if they set their faces against all improvement, and refuse to take means to secure for the English merchant marine the position it ought to occupy, they will fail in the competition with cheaper vessels, and there will be none to pity them in their ruin.

Parliamentary Proceedings.

CONDENSED FOR THE "MECHANICS' MAGAZINE."

THURSDAY, MARCH 17.

HOUSE OF COMMONS.

HARBOURS OF REFUGE.

In reply to Mr. Baxter, Sir S. Northcote said the report of the commissioners had been presented only a few days before, and its importance was such that the Government could not possibly give any answer at present as to the course which they might adopt with respect to it. It was intended to take the usual vote this year for the works at Dover and Alderney.

THE BUILDING DEPARTMENT OF THE ADMIRALTY.

Sir J. Pakington gave notice with reference to the statement on the subject of the allegations made against the building department of the Admiralty by Lord C. Paget, that he would, on an early day, move that it should be referred to the consideration of a select committee. He would give due notice of the terms in which he should make that motion.

FIRE INSURANCES.

Mr. Sheridan moved for leave to introduce a bill to reduce the duty upon fire insurances.

The house divided, when the numbers were—

For the motion	102
Against it	112
Majority	—10

STATE OF THE NAVY.

Sir C. Napier moved for a copy of letters from Sir Baldwin Walker on the state of the navy, to the Admiralty or the First Lord of the Admiralty, from March, 1858, to the end of the year.

Sir J. Pakington said the documents in question were confidential papers presented to the Admiralty, and it would be neither in accordance with precedent nor beneficial to the public service to produce them.

After some discussion the House divided, when the majority against the motion was 151. The motion was therefore lost.

MERCHANT SHIPPING.

On the motion of Mr. Lindsay the select committee on this subject was nominated, as follows:—Sir G. Lewis, Lord Lovaine, Mr. Cardwell, Mr. T. Baring, Mr. Crawford, Mr. Horsfall, Lord C. Paget, Sir J. Elphinstone, Mr Fenwick, Mr. Bentinck, Mr. Wilcox, Mr. Liddell, Mr. Dalglish, Mr. F. Russell, and Mr. Lindsay; power to send for persons, papers, and records; five to be the quorum.

FRIDAY, MARCH 18.

HOUSE OF COMMONS.

DECIMAL CURRENCY.

Mr. Beamish asked the Chancellor of the Exchequer when the report of the Royal Commissioners on Decimal Currency, who were appointed in 1855, might be expected to be laid on the table?

The Chancellor of the Exchequer regretted that the report of the Royal Commissioners on this subject had not been made. The Commissioners were Mr. Hubbard, Lord Monteagle, and Lord Overstone; he knew that Lord Overstone's report was quite ready to be produced; he hoped the inquiry of the hon. member would lead to an early production of the report.

SUPERANNUATION BILL.

The House, after some discussion, passed this Bill through Committee.

BRITISH MUSEUM.

Mr. Gregory moved that a select committee be appointed to inquire how far, and in what way, it may be desirable to find increased space for the extension and arrangement of the various collections of the British Museum, and the best means of rendering them available for the promotion of science and art.

The House divided, and the numbers were:—

For the motion	21
Against it	2
Majority	—19

MONDAY, MARCH 21.

HOUSE OF COMMONS.

PATENTS FOR INVENTIONS (MUNITIONS OF WAR.)

The Attorney-General, in moving for leave to bring in a Bill "to amend the law concerning patents, with respect to inventions for improvements in instruments and munitions of war," said the measure was intended to accomplish a very important object. According to the present law, an invention when patented very soon became public, not only in this country, but, from the very liberal course adopted at the patent-office, abroad, for communications took place with foreign Governments and foreign societies, and the specifications thus became known throughout the world. Now, it was thought that inventions respecting munitions of war, or others of a character which it was for the public interest to conceal, should be vested in the Crown, or some of the officers of the Crown, say the Secretary for War. This, however, could only be effected by means of an Act of Parliament. The Bill would vest such inventions accordingly, and upon a declaration being made to the officers of the Patent-office power would be given to seal up all the papers connected with the invention, which would thus be kept secret as long as was thought advisable. To such a proposal there could, he thought, be no constitutional objection, because in ancient times it was the prerogative of the Crown to secure to itself an exclusive right to all inventions of a military character. The Bill was, therefore, only in furtherance of the ancient common law.

Leave was given to bring in the Bill, which was afterwards read a first time.

PATENT LAW AMENDMENT BILL.

A BILL TO AMEND THE LAW CONCERNING PATENTS FOR INVENTIONS WITH RESPECT TO INVENTIONS FOR IMPROVEMENTS IN INSTRUMENTS AND MUNITIONS OF WAR.

Whereas in some Cases of Inventions for Improvements in Instruments or Munitions of War it may be important to the Public Service that the Nature of the Invention should not be published, and it is therefore expedient to amend the Law concerning Letters Patent for Inventions: Be it enacted by the Queen's most Excellent Majesty, by and with the Advice and Consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the Authority of the same, as follows:

1. Any Inventor of any Improvement in Instruments or Munitions of War, or the Executors, Administrators, or Assigns of such, may, for valuable Consideration or without, assign to Her Majesty's Principal Secretary of State for the War Department, on behalf of Her Majesty, all the Benefit of the Invention, and of all Letters Patent obtained or to be obtained for the same, and such Secretary of State may be a Party to the Assignment, and such Assignment shall be effectual to vest the Benefit of such Invention and of such Letters Patent in the said Secretary of State for the Time being, on behalf of Her Majesty, at Law and in Equity; and the Benefit of such Invention and of such Letters Patent shall be deemed Property acquired by the said Secretary of State on behalf of Her Majesty; and all Covenants and Agreements contained in such Assignment for giving full Effect thereto, and for keeping the Invention secret, and otherwise in relation thereto, shall be valid and effectual (notwithstanding any Want of valuable Consideration), and may be enforced and proceeded upon by the said Secretary of State for the Time being accordingly, and all Actions, Suits, and Proceedings in relation thereto may be instituted and conducted by such Secretary of State for the Time being, who shall have all such Rights, Privileges, and Prerogatives in relation thereto as by Law provided in the Case of Actions, Suits, and Proceedings concerning Property under his Care, Control, and Disposition.

2. The foregoing Enactment shall extend to render valid and effectual, and be otherwise applicable to and in respect of any such Assignment as aforesaid made before the *passing of this Act*, and the Covenants and Agreements contained in such Assignment, as well as any such Assignment to be made thereafter, and the Covenants and Agreements therein contained.

3. Where any such Assignment as aforesaid has been made to the said Secretary of State he may, at any Time before the filing of the Petition for the

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Grant of Letters Patent for the Invention, or after the filing of such Petition and before Publication of the Provisional Specification (if any), if he think it for the Benefit of the Public Service that the Particulars of the Invention, and of the Manner in which the same is performed, should be kept secret, certify the Fact of such Assignment having been so made, and his Opinion to the Effect aforesaid, in Writing under his Hand to the Commissioners of Patents for Inventions.

4. Where the said Secretary of State certifies as aforesaid the Petition for Letters Patent for the Invention, the Declaration accompanying such Petition and the Provisional Specification or Complete Specification (as the case may be) filed or left therewith, and any Specification to be filed in pursuance of the Condition of any Letters Patent for such Invention, and all Disclaimers and Memoranda of Alterations to be filed in relation to such Letters Patent, and any Drawings accompanying any of the Documents aforesaid, and any Copies of any such Documents or Drawings, or, where the said Secretary of State so certifies after the said Petition has been filed, such of the said Documents and Drawings as may be filed after his so certifying, and the Copies thereof shall, in lieu of being filed or left in the ordinary Manner in the Office of the Commissioners, or in the Office appointed for that Purpose under "The Patent Law Amendment Act, 1852," be delivered to the Clerk of the Patents in a Packet sealed with the Seal of the said Secretary of State.

5. Such Packet shall at all Times after the Delivery thereof to the Clerk of the Patents, until the Expiration of the Term or any extended Term for which Letters Patent for the Invention may be granted, be kept by him sealed up as aforesaid, or under the Seal of the Commissioners, save when it may be necessary to have Access to the Documents therein contained, or any of them, for the Purpose of recording and endorsing the Day of the filing thereof, or for the Purpose of any Reference to One of the Law Officers, either in relation to the same or any other Invention; but in any such Case as aforesaid the Clerk of the Patents shall not part with the Care or Custody of the said Packet, or any of the said Documents, save as may be required by One of the Law Officers for the Purposes of any such Reference, and shall use such Precautions as may be necessary to prevent the Contents or Particulars of any such Documents being improperly disclosed.

6. Such sealed Packet shall be delivered at any Time during the Continuance of any such Letters Patent to the said Secretary of State, or to any Person having Authority to receive the same on his Behalf, on Demand in Writing under the Hand of the said Secretary of State, or to such Person as the Lord Chancellor may order, and shall, if and when the same is returned to the Commissioners, be again sealed up and kept under Seal as aforesaid.

7. Such sealed Packet as aforesaid shall, at the End of the Term or extended Term for which any Letters Patent for the Invention to which the Documents in such Packet relate, be delivered up to the said Secretary of State or to any Person having Authority to receive the same on his Behalf.

8. Where the said Secretary of State certifies as aforesaid after the filing of the Petition, and before the Publication of the Provisional Specification (if any), such Petition, and the Declaration accompanying such Petition, and the Provisional Specification and Drawings relating to the Invention which may have been filed or left in any such Office as aforesaid, and all Copies thereof in any such Office, shall be forthwith placed in a Packet sealed with the Seal of the Commissioners; and every such Packet shall be subject to all the Provisions of this Act concerning any sealed Packet delivered to the Clerk of the Patents.

9. No Copy of any Specification, or other Document or Drawing by this Act required to be kept under Seal, shall be transmitted to Scotland or Ireland, or be printed, published, or sold, or be open to the Inspection of the Public; but, save as in this Act otherwise directed the Provisions of the Patent Law Amendment Act, 1852, and any Act amending the same, shall extend and be applicable to and in respect of every such Specification and other Document and Drawing as aforesaid, and the Letters Patent and Invention to which the same relates, and this Act and the Patent Law Amendment Act, 1852, shall be construed together as One Act.

10. It shall not be lawful for any Person to take Proceedings by Scire facias or otherwise to repeal any Letters Patent for any Invention in relation to which the said Secretary of State has certified as aforesaid.

11. The Secretary of State may, at any Time by Writing under his Hand, waive the Benefit of this Act with respect to any particular Invention, and the Documents and Matters relating thereto shall be thenceforth kept and dealt with in the ordinary Way.

12. The Communication of any Invention for any Improvement in Instruments or Munitions of War to the said Secretary of State, or to any Person or Persons authorised by him to investigate the same or the Merits thereof, shall not, nor shall anything done for the Purposes of the Investigation, be deemed Use or Publication of such Invention so as to prejudice the Grant or Validity of any Letters Patent for the same.

13. In the Construction of this Act, "Her Majesty's Principal Secretary of State for the War Department" shall mean Her Majesty's Principal Secretary of State for the Time being to whom Her Majesty shall think fit to intrust the Seals of the War Department.

WROUGHT IRON AND PUDDLED STEEL.

The whole of the evening meeting of the Institution of Civil Engineers, on March 8th, 1859, Joseph Locke, Esq., M.P., President, in the chair, was occupied by the discussion of Mr. Mallet's paper, published in our number for March 11. It was explained that Tredgold and other experimenters only gave the absolute forces which would tear a bar asunder. In Mr. Mallet's investigation an endeavour had been made to ascertain the amount of permanent elasticity possessed by the metal, as well as the point at which it would become actually ruptured. It was contended by one speaker that the drawings exhibited gave a very imperfect representation of the piling of the iron for large forgings, and that hence the author had been led to draw erroneous conclusions. With regard to the manufacture of the monster mortars, 36 inches in diameter, and capable of throwing a ball weighing about 30 cwt., it was remarked that their merits, as forgings, were extraordinary. At first, owing to large rents in the centre of the core, the forgings were failures, but after a little experience had been gained, the second forgings were quite successful. In the manufacture of these monster guns, they were built up in seven distinct layers, the forging occupying seven weeks. So far from any deterioration, or crystallization, taking place, the metal was improved by its long-continued heating and working; and the metal in the heart of the gun was found to be of greater strength than the bar iron of which it was composed, being perfectly homogeneous, strong, and tough. A series of experiments for testing the correctness of the process, showed that the ordinary manufacture of bar iron, by working and re-working several times, had its limits. As a proof that the deductions in the paper were incorrect, it was asserted by another speaker that engineers had one universal rule for the manufacture of forgings, whether large or small, and it was not found that the shafts of 1,000 H.P. engines were more liable to fracture than those of 100 H.P. This was practical evidence that the metal was not more deteriorated in large forgings than in small, from the length of time it was exposed to the action of the fire; indeed, no one portion was so exposed for any great length of time. It was urged that scrap iron, or any other highly refined iron, was the worst material for the construction of large forgings. It was considered that a strong, fibrous, fresh-puddled iron was superior in every respect, as the ordinary workings required in the process of forging would be sufficient to improve it to the average maximum of strength; whereas a highly-refined iron had already reached the highest point as regarded strength, so that it was more likely to be injured by additional working. There was another reason why scrap iron should not be used for the manufacture of forgings. Scrap iron was composed of many different qualities of iron, all having their own special welding points. When worked together, one portion, which was less refined, was too much heated, and consequently deteriorated, before the more highly-refined portions were at a welding heat; so that there was the difficulty either of burning the one or of being unable to weld the other. Again, the specimens selected by the author for trial, and which he said were weaker than the original iron composing the forging, were not taken off in the direction in which the fibre was laid for strength—in which it was intended that the strain should be borne. Now, forge-masters always laid the grain of the metal in the direction in which the strain would ultimately be applied; whereas, the samples experimented upon had been cut transversely to that direction.

With regard to the new material, "puddled steel," it was believed that it was destined to work a complete revolution in almost all matters in which iron had hitherto been used. It had been proved to possess at least double the tensile strength of the best wrought iron, and the elastic limit of the material was also greater in proportion to the breaking strain. A piece of this material had been subjected to a strain of 32 tons per square inch for seventeen consecutive hours, without exhibiting the slightest appearance of elongation. Subsequently, a bar, 4 feet in length and 1 inch by $\frac{1}{4}$ths inch in section, had been exposed to a strain of 45 tons per square inch, when it was found that an elongation of $\frac{1}{12}$ths of an inch had taken place. Upon the weight been removed, $\frac{1}{13}$ths of this elongation were recovered, showing that the elasticity of the material had not been destroyed. On another occasion the elongation amounted to $\frac{1}{75}$ths of an inch, and returned to $\frac{1}{100}$ths of an inch. Upon a second application of a strain of 56 tons per square inch, the bar was broken, the elongation having been $\frac{1}{27}$ths of an inch. In other experiments the bars broke at 55, 56, and 60 tons, and one bore the enormous strain of 87 tons per square inch. To attain this favourable result, which it was believed might eventually be accomplished as a rule, it was essential that great care should be taken in the selection of the materials, and great pains in the manufacture. It was entirely a question of good workmanship and good machinery; and a new manufacture of this sort would, for years to come, require the utmost attention and solicitude. In Germany, where this great improvement in metallurgy had been first introduced, a large number of manufacturers commenced making puddled steel; the consequence had been, that an amount of bad material had been thrown upon the market, which had brought puddled steel into disrepute for a time, and from which it had scarcely yet recovered. This was to be feared in this country, when the German patent had expired.

It was further contended that if the calculations in the paper had been based upon forgings, faggoted in the manner delineated in the drawings, they were of little practical utility. It was stated that large forgings, weighing 20 tons, and measuring 24 inches in diameter, for engines of 1,000 H.P., were now made at several places in England, without flaw or defect, except, perhaps, a small sand speck upon the surface, which was not of any consequence. When Nasmyth's hammer was first introduced, the plan was suggested of having the lower forge block made of a V shape, and the bottom part of the hammer so small as to strike only upon the upper centre of the periphery of the forged piece. The mass was thus struck in three places, and the tendency was to force the material to the centre, so as, in fact, to render the heart as solid and homogeneous as the other portions.

In reply to an inquiry, as to whether the rents in large iron forgings, spoken of in the paper, would not also be liable to occur equally in the puddled steel, it was said that in forgings of iron, large crystals or grains were developed, which would not be the case in similar masses of puddled steel; and that in the latter, the aggregation of grains or crystals was not increased by the agglomeration of the mass. These rents might be accounted for by the differential contraction of the metal. In the principal case referred to, the outside of the collar, which was four feet in diameter, cooled more quickly than the remainder of the forging, and these internal rents took place after it had left the hammerman's hand. It was stated that plates of puddled steel had already been supplied, from the Mersey works, for twenty-one vessels, some of them of 250 tons burthen and 38 feet beam. The thickness of the plates for the vessels for Indian river navigation was one-eighth of an inch, and none had yet been made, or called for, as a mercantile commodity of greater thickness.

CAST-IRON ARCHES.

At the Institution of Civil Engineers, March 15, the paper read was an "Account of Experiments upon Elliptical Cast-iron Arches," by Mr. T. F. Chappe, M. Inst, C.E. Joseph Locke, Esq., M.P., president, in the chair.

These experiments were undertaken at the request of Mr. W. H. Barlow, M. Inst. C.E., for the purpose of ascertaining, practically, the safe load to which elliptical cast-iron arches might be subjected, as well as the most economical distribution of the metal. The intrados of the arches was, in all cases, a segment of an ellipse, in order to obtain the greatest headway at the haunches. The experiments were in each case conducted upon two ribs, placed two feet apart from centre to centre, and resting on cast-iron abutment pieces, keyed up tight against the springings. Diagonal stays and longitudinal struts were also introduced to prevent lateral motion.

The first experiment was made upon a model, one-fourth the real size, of one arch of a bridge intended to be erected over the River Trent, near Newark.

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The (model) arch had a clear span of 14 feet 6 inches, and a rise of 16 inches; a camber of ¼ of an inch being given in fixing the halves together. The sectional area of the arch at the crown was 2.43 inches—that of the curved rib near the springing two inches—about midway between the springing and the crown, 1.75 inch, and of the spandril, 1.34 inch. The weight of each arch was 1 cwt. 2 qrs. 22 lbs.

The other experiments were made upon a model, one-sixth the real size, of an arch erected over the Gloucester and Stonehouse and Great Western Railways, at Standish, six miles from Gloucester. The dimensions of the model were, span, 13 feet 10^3 in., and rise 1 foot 10 in. The sectional area, at the crown, was 1.25 inch, of the curved rib near the springing, 1.055 inch, about midway between the springing and the crown, 0.993 inch, about the middle of the upper rib, 0.883 inch, and of the spandril, 0.57 inch. The weight of each arch was 3 qrs. 26 lbs.

The following pressures were given as those to which the arches were subjected in these experiments:—

Experiment.	Ultimate Load.	How distributed.	Pressure per sq. inch of Sectional Area.	
			At Crown.	At Smallest Section.
	Tons. Cwt.		Tons.	Tons.
No. 1	30 10	Uniformly.	8·52	11·83
,, 2	18 0	Ditto.	6·89	8·58
,, 3	12 0	Partially removed from the haunches.	4·54	5·72
,, 4	5 0	On one haunch.	2·36	2·98
	3 12	At centre.	2·93	3·70
,, 5	3 14	Ditto.	3·00	3·85

In the first experiment, the ultimate pressure was not reached. In the second and third experiments, one-half arch was out of line laterally, beyond what would be permitted in practice, and was wanting in that assistance which would have been afforded, in the number of ribs required for the width of a bridge, so that the ultimate pressures indicated were below what such arches might be estimated to bear. This was also the case in the two last experiments, in which the castings were faulty, and the tests were such as were not likely to occur in practice. It was thought that cast-iron arches, of the form experimented upon, might safely be considered capable of bearing a pressure of between eight and ten tons per square inch of section. From the position of the fractures, it was believed that the spandrils were too weak, in proportion to the size of the arches.

The communication was accompanied by several tables, showing the deflections on the application of the different loads.

ON MILITARY AND OTHER TENTS.

By Major Godfrey Rhodes.*

THE subject of "tent-architecture" is one of very early origin; and although the necessity of supplying efficient shelter for troops in the field is at the present time fully acknowledged, yet little or nothing has been done towards accomplishing that requirement. It is a crying fact that enormous sums of money, and great encouragement are awarded for the perfection of destructive missiles; yet little or no encouragement, and but scanty supplies are granted towards (what ought to be the first step) supplying efficient shelter for the preservation of the health of our own troops when encamped in the field. The earliest mention we have of tents is in the 4th chapter of Genesis and the 20th verse, where we are told that "Jabel was the father of such as dwell in tents and of such as have cattle;"† evidently meaning that he was the inventor of tents, and of pitching those moveable habitations required for a nomadic life. We find after the flood, that Noah,‡ Lot,‖ Abram, and the two sons of Isaac (Esau and Jacob§), lived in tents; and although it is natural to suppose that, as "Esau was a cunning hunter and a man of the field," he required those portable dwellings, yet we find (Genesis, chap. 25,) that "Jacob was a plain man dwelling in tents," giving us sufficient evidence that tents were the earliest constructed habitations of man. It is impossible to ascertain with precision what was the peculiar form and construction of the Patriarchal tents; but, as the Arabs are so averse to adopting or deviating from the customs of their forefathers, we shall not be far from the truth, if we consider the present Arab tent the nearest existing approximation to the ancient model. To illustrate the subject, I will briefly describe the present Arab family-tent. Their most usual sized tent is from 25 to 30 feet long, by about 10 to 12 feet in breadth; it has nine poles. To pitch the tent, the three longest poles (viz. from 7 to 10 feet in length) are placed in the middle, at equal distances apart, and three of the others (about 5 or 6 feet long) are placed in like manner on each side; to the top of these, the black goat's-hair cloth, with which the Arabs cover their tents, is secured; and owing to the skill of the women, who manufacture all the tent coverings, even the heaviest rains do not penetrate this closely woven fabric. The side-coverings, or walls, are often of a coarse woollen cloth. The tent-coverings are kept stretched out in the usual manner, viz., by cords, which latter are fastened at one end to the top of the poles and at the other to pegs driven into the ground at the distance of three or four paces from the tent. The front of the tent is usually kept open, except during the winter, and the back and side hangings are so managed that the air can be admitted in any direction or excluded at pleasure. The weight of a tent of the above dimensions is about 1,500 lbs., or the load of two strong camels. I may mention that tents of much larger, and even smaller dimensions are used, according to the rank and wealth of the owner. It is not my intention to here enter into the minute details of the tents and coverings as used by the Israelites during their wanderings in the wilderness, as such would take up too much time, and perhaps afford but little interest to many of my hearers; but, as there is a diversity of opinion with reference to the various translations of the Hebrew words, "or, thakhash," which have been generally rendered badger-skin (such being supposed to have been used as the outer covering of "The Tabernacle"), I may mention that there is no certainty that the outer covering of the tabernacle must necessarily have been made of badger-skins: on the contrary, the commentators, as Jarchi, &c., raise the question whether any part of an unclean beast (and such is a badger) should or could have been used for the outer covering of that sacred building. The celebrated and generally correct historian Josephus, in his description of the offerings made by the Israelites when encamped at the foot of Mount Sinai, only states, "that the upper curtain was of a stuff that was proof against rain;" again, "that the outer covering was of skins, for a shelter against heats and rains, and for a fence against the injuries of the seasons." Niebuhr says that there is a fish in the Red Sea which the English call porpoise or sea-hog, and which is called by the Arabian merchants "dahash:" the skin is used for bucklers, and is said to be musket-proof. Other authors say the skins are used for covering huts, &c. It is well known that badgers do not now inhabit (if they ever did) the neighbourhood of Mount Sinai; and, as the porpoise is still to be found in the Red Sea under the name dahash, it may fairly be assumed that the "thakhash" of the Hebrew is the "dahash" or porpoise of the present day. The circumstance of the want of water in the wilderness, and the close approximation of the Red Sea to the sacred mount, may be of sufficient circumstantial evidence that the holy tabernacle was covered on the outside with the skin of the propoise and not with that of the badger. There is nothing very remarkable in the employment of fish-skins as an outer covering for tents, for the present day, the "Fishing or Alien Tuski," (a nomadic people who inhabit the extreme northern and eastern point of Asia, bordering on Behring's Straits) cover their tents with the prepared skin of the walrus, which is so beautifully cured as to retain its elasticity, and owing to its semi-lucent properties, sufficient light is admitted by the roof, to render windows quite unnecessary. Lieutenant Hooper, of the Royal Navy, who wintered amongst that tribe in 1848, when in the Plover, states, "that he saw a walrus skin of the enormous size of 70 to 80 square feet, and that the whole was as transparent as parchment." I may here mention that the Alien Tuski can raise the temperature of their tent to 90 and 100 degrees of Fahrenheit; they obtain this great heat by burning lamps filled with train oil, using the fibres of "weet-weet" or moss as a wick. Lieutenant Hooper says that there is neither smoke nor smell, when these lamps are well trimmed. There is another tribe called the Tungoozes, who cover their tents with fish-skins; these fishing-Tungoozes inhabit the south-eastern Siberian coasts, from the banks of the river Aldan (63° N. latitude, and 130° E. longitude), and a large river called by the Tungoozes, Okat, signifying, in a somewhat exclusive sense, "The River," which, flowing in a S.S.E. direction from the town of Yudomsk, and passing by Arki, emerges into the Okhotsk Sea, at the seaport town of Okhotsk (55° N. latitude and 143° E. longitude). With respect to the general form, and mode of constructing the tents of the numerous nomadic tribes which inhabit the earth, it is sufficient to say that their form is generally conical, sometimes with a centre-pole, but more often formed of straight poles having their upper extremities converging to one centre, and so arranged that a fire can be lighted within the tent, permitting of the smoke escaping through an aperture at the top. The various coverings or textures which are used for tents consist in camel's-hair cloths, rude felt, and goat-skin tissues, reindeer and buffalo skins, the birch-bark, chuco-leaf thatch, palm-mats, reeds, and sword grass, and the membranous and silky leaves of the vijao-plant; also a species of cloth made from the fibres of a root called lift-adum; the sailcloth of the modern Laplanders; and the sheltering ice-blocks of the Esquimaux; to say nothing of the brilliantly-coloured cloths, embroided velvets, and gold-starred satins which have decked the tents of kings, and chiefs, and conquerors in Europe and Asia, from the period of the middle ages down to the insignificant and shelterless canvas tents of the present day.

I will not enter into details of the tentology of the ancient Jews and Scythians, the Babylonians and the Egyptians, the Greeks and the Romans, neither the Kurds, the Tatars and Calmucs, the Turks and Esquimaux, Australs and Patagonians, nor the more modern systems of the great European States, such as France, Austria, Prussia, Russia, Sweden, Hanover, and Belgium, but will at once proceed to illustrate the British army tents of the present day. I will endeavour to explain their peculiarities of construction in detail, point out their general defects, call your attention to some very valuable remarks already recorded by professional men, having the object of directing public attention to the necessity of providing efficient coverings for our own troops when encamped in the field, and finally, will bring to your notice a proposed remedy, in the shape of a new system for constructing curvilinear and other tents of my own invention. The object I have in view is to endeavour to supply a practical remedy for an acknowledged and still existing deficiency.

The tents at present adopted in the British army consist of three, viz.:—First. "The Hospital marquee." Secondly. "The field-officer's marquee." Thirdly. "The circular single-poled tent." The hempen canvas of the hospital tent is supported by two vertical poles of nearly 14 feet each in length, secured together at their top ends by a ridge pole of 13 feet and 10 inches long. When the canvas has been stretched out, and secured to the ground by 184 pegs (which number includes the 4 large pins to secure the storm ropes), the canvas walls (5 feet and 4 inches in height) are hooked on to the bottom edge of the sloping canvas roof, and then pegged to the ground at that part which touches it. The roof and walls of this tent are of double hempen canvas, having a space between each of about one foot. The inside ground measurement of this tent is 29

* A lecture delivered on Monday last at the United Service Institution.

† About 4000 years B.C. ‡ About 3156 years B.C.
‖ B.C. 2080. § B.C. 1915 years.

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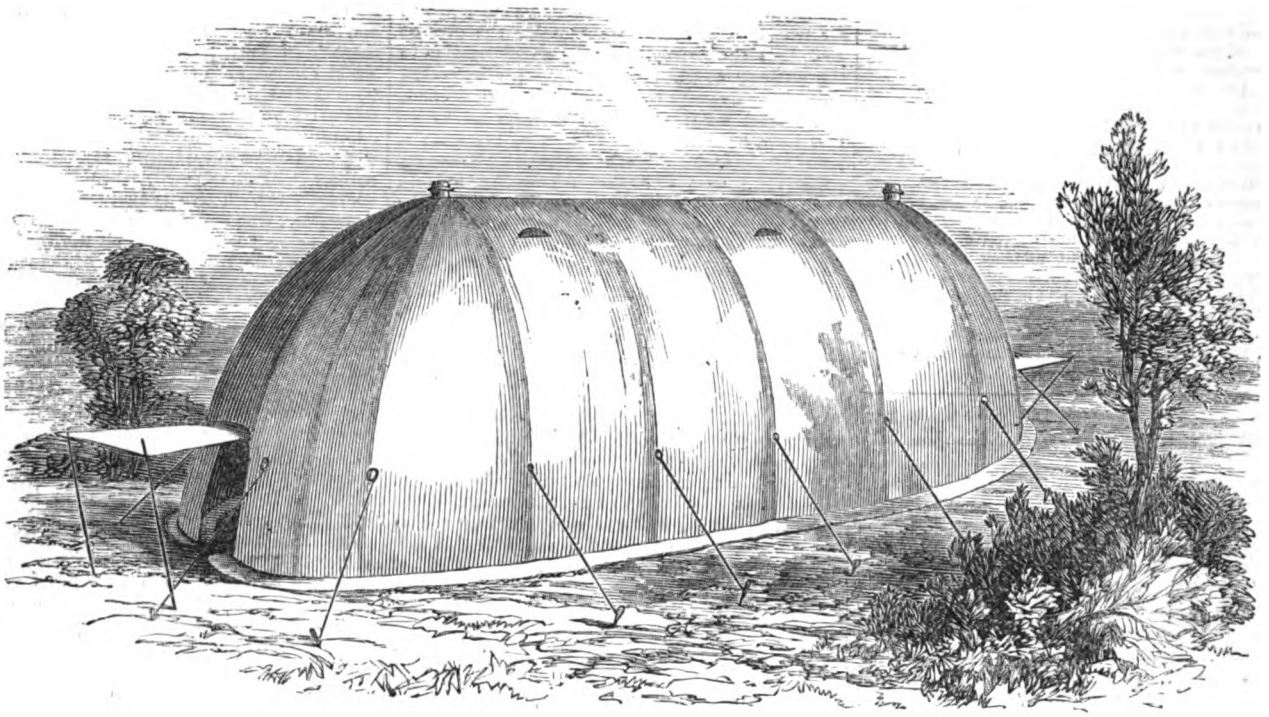


MAJOR RHODES' HOSPITAL TENT.

[The description of this tent will appear in the concluding portion of Major Rhodes' Lecture.]

feet long by 14½ feet wide, and as it is understood to afford accommodation for not less than 18 or more than 24 men, it would, in the latter case, permit of 2 feet 5 inches by 6 feet 6 inches for each soldier, allowing 18 inches for a passage down the centre of the tent. This tent, when pitched, covers a space of ground 20 paces by 17, or about 340 square yards. The weight of these tents, when dry, varies from 428 to 507 pounds, and when wet, from 644 to 676 pounds. Or in other words, the weight increases about one-third, viz., in the former, the increase is 216 pounds against 169 pounds of the latter. It is thus evident that if the canvas was effectually rendered waterproof, greater efficiency and a large saving of transport would be the result. (See the table of sizes and weights of tents in the "Aide Mémoire to the Military Sciences," published in 1845-6.) A tent of the above dimensions contains 3,310 cubic feet of air, which would allow of about 275 cubic feet each to 12 men, about 183 cubic feet each to 18 men, and about 137 cubic feet each for 24 men. The hospital marquees are not provided with suitable means of ventilation.

(To be continued.)

AVERILL'S MILLS FOR GRINDING.

Mr. Thos. Averill, of Birmingham, has introduced an improved mill for grinding, constructed as shown in the accompanying engravings. Fig. 1 is a vertical longitudinal section, and Fig. 2 a plan, partly in section.

The grinding surfaces consist of a series of plates *a*, *b*, *c*, *d*, and *e*; *a*, *c*, and *e* being fixed, and the plates *b d* alternating with them moveable. Motion is given to the moveable plates by a crank *f* upon the axis *g*, which axis is driven by the pulley *h*. The moveable plates *b* and *d* are supported near the middle of their upper edges by means of a pin *i*, passing through a slot *k* in the said plates. By the rotation of the axis *g* and crank *f* the plates *b*, *d* are drawn backwards and forwards upon the pin *i*, and have besides an oscillating motion about the said pin *i* consequent upon the alternate elevation and depression of those ends of the said plates which are jointed to to the crank *f*. Both the fixed and moveable plates are corrugated, grooved, or otherwise roughened upon their surfaces, and the grinding is effected by the matter to be ground being operated upon by the corrugated, grooved, or roughened surfaces of the said plates. Each of the moveable plates *b*, *d* works between a pair of fixed plates. The size of the corrugations may be varied to suit different articles to be ground. The fixed plates *a*, *c*, and *e* are supported by the pins *i* and *i'*, and on the tops of the legs *l* of the machine. *m* is the hopper in which the substance to be ground is supplied. The said substance descends through the passage *n*, and passing through the slots *o* in the plates, falls between the said plates. The lower edges of the slots *o* in the plates are notched,

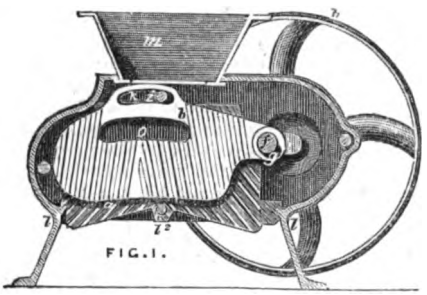


FIG. 1.

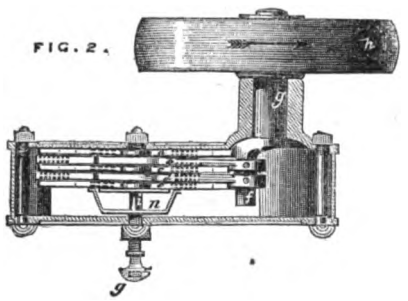


FIG. 2.

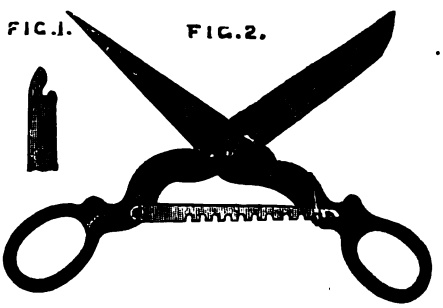
in order that the breaking of the coarser particles of the substance to be ground, and the introduction of their fragments between the plates, may be effectually secured. The upper edges of the plates, that is, the edges immediately below the slots *o*, are the thinnest parts of the plates, and the plates gradually thicken downwards, while the parts of the plates which constitute the ribs or projections are of uniform thickness. The grooves or depressions between the ribs are thus deepest at top, and become gradually shallower towards the bottom. The fineness or quality of the powder produced by the mill is determined by the set screw *q*, by driving home which said set screw *q* the distance to which the plates *a*, *c*, and *e* can separate is determined. The plates *a*, *b*, *c*, *d*, and *e* are made of cast iron or other metal or alloy sufficiently hard, and the frame or box in which the said plates work of cast iron. Although in the accompanying engraving we have represented a mill having but three fixed and two moveable plates, yet the number of the plates may be varied to any desired extent. The mill may either be worked as a hand-mill or be driven by steam or other power; and although it is particularly adapted for the grinding of grain, yet it may be employed for grinding coffee, pepper, spices, and for grinding generally.

Mr. Averill has patented his improved mills.

FISHING REQUISITES.

Mr. Rolfe, of Clement's-lane, City, the well-known piscatorial artist, has just given to the brethren of the "gentle craft" two very excellent inventions, the results of his own fertile brain. The one is a knife, the peculiarity and usefulness of which will be estimated by the drawing we give; and the other is a pair of scissors, both adapted to well-known emergencies in disgorging the hooks from a captured pike. The knife is likewise a dis-

FIG. 1. FIG. 2.



gorger, and permits of the actions of cutting and thrusting at the same time without a withdrawal of the instrument. The scissors serve all the purposes of the ordinary scissors, but having a racket and catch attached to the handle, when inserted in the fixed jaws of the pike, gradually extend its mouth, and the extension of the scissors being secured by the racket, keep it open for the necessary operations of detaching the line, &c. The knife, with a little alteration, would, we think, be

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valuable to the butcher, and others, for flaying animals where the cutting and thrusting succeed each other so constantly. Both of these articles are procurable at Mr. Hills, the cutlers, in the Haymarket.

THE CONSERVATION OF FORCE.

(Continued from p. 107.)

GENTLEMEN,—The questions discussed by Mr. Grove are related to the very foundations of natural science. They relate, that is, to the knowledge of the material world attained by, and attainable to, the human mind. These questions have therefore a double character—psychological and physical. They cannot be completely investigated, nor satisfactorily solved, without examination of their connection with the nature and powers of the human mind as well as with the matter and forces of the external world. I have not the presumption to put myself forward as capable to prosecute so subtle and so arduous a task; and, had I the facility, I have not the leisure for the self-introspection, still less for the experimental and literary research which such a work would require, and my present want of leisure induces me to bring this series of letters to a somewhat abrupt conclusion. I propose, therefore, to make one or two concluding observations, first on Mr Grove's theory of electricity and light, and then, finally, on M. Seguin's views respecting impact, without attempting at present a thorough discussion of these subjects.

In endeavouring to show that heat, light, electricity, magnetism, &c., are all correlative forces, or affections of ordinary matter, Mr. Grove naturally addresses himself to solve the question, Has light, heat, or electricity any existence apart from and independent of ordinary ponderable matter? Of electricity, it has been the custom to speak as if it were a fluid substance, something resembling air or water, having an existence of its own, but unlike those substances, inasmuch as it neither increases nor diminishes the weight of the body to which it may be added, or from which it may be withdrawn. This hypothesis of a fluid has been suggested by that property of electricity by which it manifests itself in a line of motion like the swift flowing of a stream. There is another resemblance which electricity may be imagined to bear to the fluid substances of nature, viz., the equilibrium which it seeks to establish when two bodies in different electrical states are placed in communication. This feature resembles the equilibrium established when two vessels containing water at different levels are connected by a tube, or when two bladders of air at different pressures are connected in a similar manner. This, I think, is the simplest, though, perhaps, the most meagre of the various modifications of the electric-fluid hypothesis, and this to me is as much a figure of speech as a scientific theory. Mr. Grove, of course, favours an opinion adverse to this view, and certainly succeeds so far as to prove that no manifestation of electricity ever takes place except through the medium of ordinary ponderable matter. And he argues that since there is no experimental evidence of its separate existence, it may be regarded as one of the forces, affections, or qualities of matter, like gravitation or chemical affinity. This reasoning may be not altogether valueless, and, indeed, may have its use in showing the limits of our knowledge: but I do not see that it is of importance, whether we employ the phrase electric fluid or electric force. Electricity has relations to and distinction from both force and fluid as these terms are ordinarily understood. It is well known that electricity is nearly related to heat, light, magnetism, and chemical affinity. Everybody has seen the electric light with its intensely heaten charcoal points, the electro-magnet, and the electro-chemical experiments of the popular lecture-room. Mr. Grove endeavours to show that light may similarly be made to transform itself into heat, electricity, magnetism, and chemical action. This attempt, however, he himself seems to regard as rather unsuccessful. Photography is adduced to show that light produces chemical action, but it does not appear to me satisfactory to conclude that it is the light or luminous portion of the sun's rays which produces the photographic effect, when we know that those rays are composite. The sun's rays, according to some, are made up of a mixture of light, heat, and a principle called actinism, producing chemical action. The philosophers who hold this view regard the photographic agency as a principle of the sun's rays, independent of both the light and heat which accompany it. The following experiment, used as evidence of the truth of the same proposition, for a similar reason is equally weak:—

"Light would seem directly to produce heat in the phenomena of what is termed absorption of light: in these we find that heat is developed in some proportion to the disappearance of light. To take the old experiment of placing of different coloured pieces of cloth upon snow exposed to sunshine, the black cloth absorbing the most light, and developing the most heat, sinks more deeply in the snow than any others; the other colours, or shades of colour, sink the more deeply in proportion as they absorb, or cause to disappear, the more light, until we come to the white cloth, which remains upon the surface."

This may be partially, or even wholly, a correct explanation of the experiment cited. But its truth or its falsehood is by no means apparent; and it cannot, therefore, be made a ground of argument. Why may not the pieces of cloth which reflect or absorb most light coincidently reflect or absorb most heat? And why, therefore, may not the whole effect of the sinking of the black cloth be due to the heat which it receives from the sun's rays, and have nothing to do with the light at all? I am hardly competent to offer an opinion on this subject; but I may say that the argument is inconclusive—as, indeed, Mr. Grove himself admits.

The following extract will exhibit Mr. Grove's theory of light in another aspect:—

"Light was regarded, by what was termed the corpuscular theory, as being in itself matter or a specific fluid emanating from luminous bodies, and producing the effects of sention by impinging on the retina. This theory gave way to the undulatory one, which is generally adopted in the present day, and which regards light as resulting from the undulations of a specific fluid to which the name of ether has been given, which hypothetic fluid is supposed to pervade the universe, and to permeate the pores of all bodies.

"In a lecture delivered in January, 1842, when I first publicly advanced the views advocated in this essay, I stated that it appeared to me more consistent with known facts to regard light as resulting from a vibration or motion of the molecules of matter itself, rather than from a specific ether pervading it; just as sound is propagated by the vibrations of wood, or as waves are by water. I am not here speaking of the character of the vibrations of light, sound, or water, which are doubtless very different from each other, but am only comparing them so far as they illustrate the propagation of force by motion in the matter itself.

"I was not aware, at the time that I first adopted the above view, and brought it forward in my lectures, that the celebrated Leonard Euler had published a somewhat similar theory; and though I suggested it without knowing that it had been previously advanced, I should have hesitated in reproducing it had I not found that it was sanctioned by so eminent a mathematician as Euler, who cannot be supposed to have overlooked any irresistible argument against it,—the more so in a matter so much controverted and discussed as the undulatory theory of light was in his time.

"Although this theory has been considered defective by a philosopher of high repute, I cannot see the force of the arguments by which it has been assailed; and therefore, for the present, though with diffidence, I still adhere to it. The fact itself of the correlation of the different modes of force is to my mind a very cogent argument in favour of their being affections of the same matter; and though electricity, magnetism, and heat might be viewed as produced by undulations of the same ether as that by means of which light is supposed to be produced, yet this hypothesis offers greater difficulties with regard to the other affections than with regard to light; many of these difficulties I have already alluded to when treating of electricity; thus conduction and non-conduction are not explained by it; the transmission of electricity through long wires in preference to the air which surrounds them, and which must be at least equally pervaded by the other, is irreconciliable with such an hypothesis. The phenomena exhibited by these forces afford, as I think, equally strong evidence with those of light, of ordinary matter acting from particle to particle and having no action at a distance. . . . ."

"The analogies in the progression of sound and light are very numerous: each proceeding in straight lines until interrupted; each is reflected in the same manner, the angles of incidence and reflection being equal; each is alternately nullified and doubled in intensity by interference; each is capable of refraction when passing from media of different density. This last effect of sound, long ago theoretically determined, has been experimentally proved by Mr. Sondhauss, who constructed a lens of films of collodion, which, when filled with carbonic acid, enabled him to hear the ticking of a watch placed in one focus of the lens, the ear of the experimenter being in the opposite focus. The ticking was not heard when the watch was moved aside from the focal point, though it remained at an equal distance from the ear."

Both Mr. Grove's and the etherial hypotheses appear to me incomplete. To complete them, it is necessary to show how, by means of different modes of vibration of ordinary matter, the characteristic effects of light, heat, magnetism, electricity, &c., may be produced. Each is rather a hint at an hypothesis than a definite supposition. A mere fragment of an hypothesis seems to me of very little use, and it is hardly worth while to dispute about the relative merits of these two. I see but little to choose between them. If the phenomena of conduction and non-conduction introduce difficulties in the etherial theory, they make equal difficulties in Mr. Grove's own hypothesis. If it be hard to understand how the electric ether will propagate its motions better through copper wire than through glass or atmospheric air, it is equally hard to conceive why copper should communicate its electric vibrations more readily to water than to wax.

The analogies between the phenomena of light and sound, given by Mr. Grove, are striking enough, especially the last which he cites. But to say that they are both propagated in straight lines is hardly correct, for sound, even in a uniform medium, makes no difficulty in turning the sharpest corner, whereas light, if left to itself, will scarcely turn a corner at all. This is, indeed, the grand distinction between light and sound. And this has always been a difficulty with me in forming a notion of the undulatory hypothesis, for I have never been able to conceive the kind of vibration which would confine the propagation of itself through a uniform medium to the right-lined method in which light proceeds. There is one objection to the theory of light advanced by Mr. Grove, which I must not pass over unnoticed, and which Mr. Grove himself acknowledges to be of considerable weight. I cannot do better than quote partially his own statement of it, he says:

"An objection to which the view I have been advocating is open, and a formidable one, is, the necessity involved in it of a universal plenum; for if light, heat, electricity, &c., be affections of ordinary matter, then matter must be supposed to be everywhere where these phenomena are apparent, and consequently there can be no vacuum.

"These forces are transmitted through what are called vacua, or through the interplanetary spaces, where matter, if it exist, must be in a highly attenuated state.

"It may be safely stated that hitherto all attempts at procuring a perfect vacuum have failed. The ordinary air-pump gives us only rarefied air; and by the principle of construction, even of the best, the operation depends upon the indefinite expansion of the volume of air in the receiver; even in the vacuum which is formed in them, so great is the tendency of matter to fill up space, that I have observed distilled water contained in a vessel within the exhausted receiver of a good air-pump has a taste of tallow, derived from the grease, or an essential oil contained in it, which is used to form an air-tight junction between the edges of the receiver and the pump-plate." . . . .

"Sir W. Herschel's experiments go to prove that the sun and Jupiter have dense atmospheres, while Wollaston's were believed to prove that they have no appreciable atmospheres.

"If it be admitted, or considered proved, that the sun and planets have atmospheres—and little doubt now exists on this point—then the grounds upon which Wollaston founded his arguments are untenable, and there appears no reason why the atmosphere of the different planets should not be, with reference to each other, in a state of equilibrium. Ether, or the highly attenuated matter existing in the interplanetary spaces, being an expansion of some or all of these atmospheres, or of the more volatile portions of them, would thus furnish matter for the transmission of the modes of motion which we call light, heat, &c.; and possibly minute portions of these atmospheres may, by gradual changes, pass from planet to planet, forming a link of material communication between the distant monads of the universe." . .

". . Of the existence of matter in the interplanetary spaces we have some evidence in the diminished periods of comets. . ."

To all this I can merely say that I have a sort of antipathy to the idea of the existence of ponderable matter in the interplanetary spaces. Certainly the diminution of the periods of comets is no evidence of such existence, for this diminution may perhaps be accounted for by the disturbances produced by the presence of the planets themselves upon those mysterious strangers.

Yours, &c., A MECHANIC.

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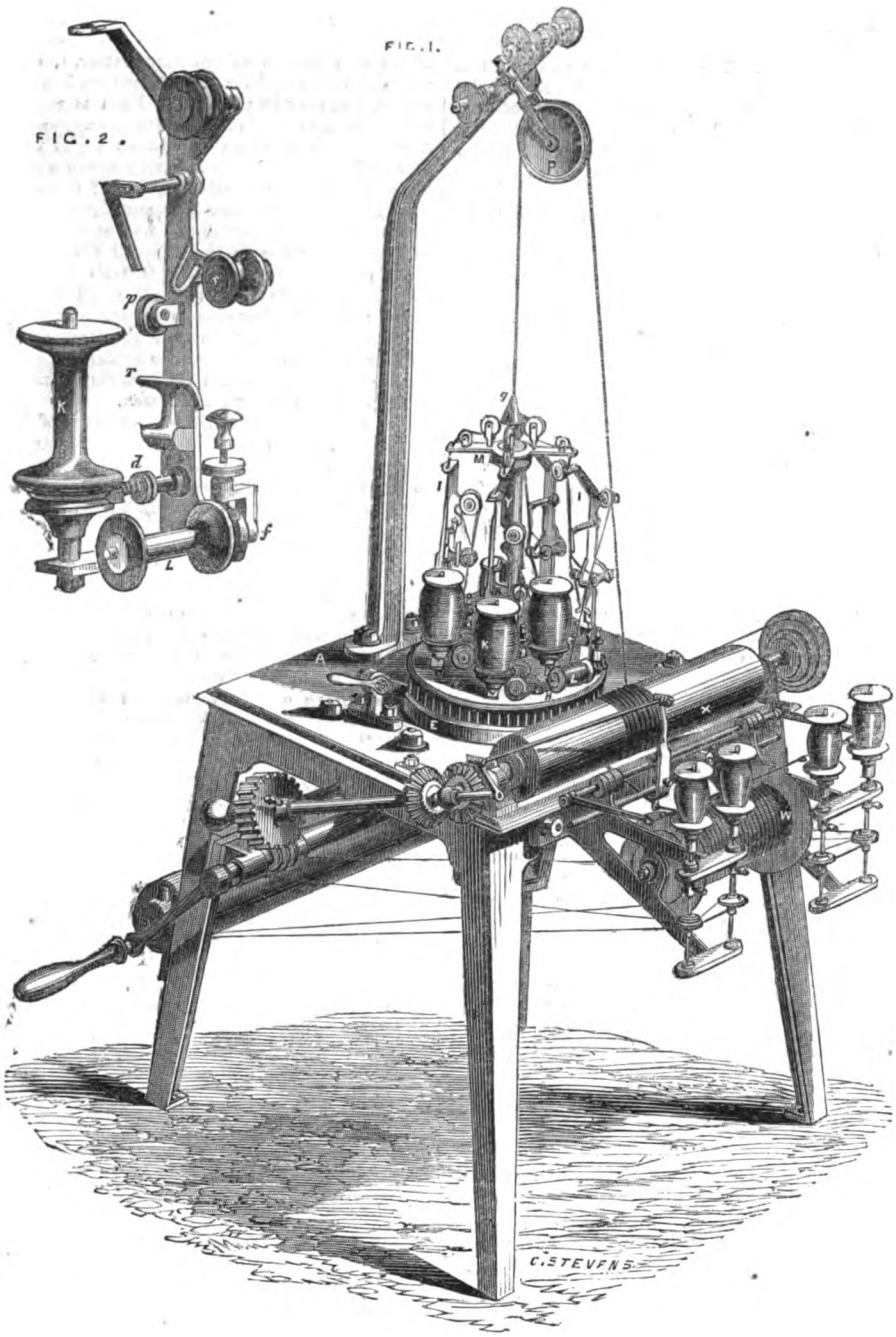
ZAHN'S MACHINE FOR MAKING COVERED OR PLATED TWIST OR CORD.



ZAHN'S MACHINE FOR MAKING COVERED OR PLATED TWIST OR CORD.

MR. JOSEPH LEWIS, engineer and machine-maker, of High-street, Bloomsbury, is manufacturing a highly-ingenious machine for making the material known as covered or plated twist or cord. The machine is extremely compact, and is capable of being worked with great rapidity, so as to produce the finished twist or cord in large quantities and with a small expenditure of power.

By this machine cotton, hemp, &c., may be covered, or, as it is technically termed, "plated," with silk or worsted, or any suitable fibrous or textile material may be twisted and covered or plated with the same or a different material, and, if desired, afterwards laid to make cord at one and the same operation. Fig. 1 of the annexed engravings is an elevation of the machine. *A, A* is a table or stand for supporting the upper framework of the machine; *C* is a shaft with two journals and bevel wheels, which, conjointly with a double clutch movement, gives motion to and controls the centre spindle or cylinder *Y*, and engages or disengages the plates *E* and *H*. For the fabrication of the plated twist, the upper plate *H* is stationary, and the lower one *E* only revolves. *I, I* are the flyers, of which there are supposed to be four, but may be a greater or less number. An enlarged view of one of these flyers is shown detached in Fig. 2. Each of the flyer spindles carries a spur or cog wheel placed between the two plates *H* and *E*, which gears with a circular rack composed of a series of upright studs secured in the bottom of the lower plate *E*. Each flyer carries two bobbins, a large one, *K*, carrying material to form the interior or core of the twist or cord, having its axle supported by the bottom of the flyer; and a smaller one, *L*, carrying the material for the plating or covering, having its axle secured at one end in an arm *f* attached to one side of the flyer. The bobbin *K* has on the side of it a spring of any suitable material with a metal washer intervening. This spring is operated upon by the set screw *d* for the purpose of regulating the supply of the warp, and the bobbin *L* has a similar set screw attached to a spring for regulating the supply of silk to the warp. The flyer is furnished with pulleys and guide pieces as shown in the detached view Fig. 2, for spreading the silk covering upon the cotton core. Attached to the flyer, and nearly central with the bobbin *K*, is a double hook *r*, which, receiving the cotton from the bobbin *K*, serves as a guide to keep the cotton off the bobbin, and leads it to the pulley *p*, as well as to prevent the cotton warp from twisting before it passes the hook. This pulley *p* is for the purpose of improving and rounding the cotton twist preparatory to its receiving the silk, and at the same time keeping the twist in one position. On the centre of the plate *M* is fixed a conical guide *g* for the better laying of the cord. This guide can be elevated or depressed according to the angle the twist is to assume to form the cord. On the side of the guide are grooves along which the twist travels, and immediately the twist leaves the said guide the strands join together and the cord is formed. A moveable guide with rollers may be used to accomplish the same purpose as the conical grooved guide. This guide being for the purpose of confining the strands to the requisite angle causes unity of motion, regularity of cord, and prevents vibration. The warps may consist each of a sufficient number of threads or rovings or of a single thread or roving of a proper size. Each passes upwards from its bobbin over its respective roller, to which it is guided by means of the hook, &c., thence being conveyed over the guide rollers and conical guide, above which the several covered threads or strands are laid together, passing then upwards over the speed regulator *X*, from which it is received by a winding-off spool *W*. The covering consists of a number of filaments arranged together so as to lie parallel and form a flat sliver or ribbon; it passes from the bobbin *L* to meet the warp at the junction of the two spreading hooks. In making laid cord composed of covered strands, the lower plate *E* is made stationary by inserting the pawl *x*, and rotary motion is communicated to the spindle *Y* of the flyer frame. The flyer frame being fast on its spindle rotates with it, and the wheels of the flyers, by revolving in gear with the stationary rack, receive rotary motion on their own axis, and cause the flyers *I, I* to rotate. The rotary motion of the flyers gives a slight twist to the warps as they are unwound from their bobbins by the speed regulator *X*, and at the same time causes the covering or plating sliver or ribbon to be wound round them. The winding on of the covering or plating takes place where it first meets the warp, and as it takes place always at the same point, must be uniform. The covering is laid smooth by passing over the guide rollers, and spread to its utmost by means of the spreading hooks, as the winding is performed. The rotary motion of the flyer frame lays and twists the several covered strands together, and forms the cord in substantially the same manner as common cord is formed in machines heretofore employed for that purpose.

If it be only required to make plated twist, such as is used for tassels, fringes, &c., the several warps, instead of being laid together after they are covered, are conducted to separate reels or spools, as each in itself constitutes what is known as plated twist. In that case, however, the flyer frame is made stationary by shifting the pawl. In making covered or plated cord, this machine does at one operation what by the usual process of manufacture requires five distinct operations, and it is estimated that by it the manufacture can be carried on in less than one-thirtieth of the space required for the same amount of work by the means now in use. The operation will be still further expedited by employing two or more bobbins *L* in each flyer to carry the covering material, each bobbin being arranged and operating like the single one represented and described.

The above description refers to a vertical machine, but the same result may be arrived at and accomplished by making it horizontal.

The machine was patented some time since by M. Zahn, and has had its details improved by Mr. Lewis.

SLATE'S IMPROVED BLAST FURNACE.

IN smelting iron ore, the usual practice has been to feed in the whole of the materials together at the mouth of the furnace, that is to say, throwing in first a barrow load of fuel, then one of ore, afterwards one of lime or flux, and so on, according to the proportions in which the different materials are employed. Mr. Archibald Slate, of Haverstock-hill, London, has introduced an improvement, according to which he makes the mouth of the furnace much wider than usual, and places a bridge supported by iron girders across it; from this bridge a cast-iron pipe descends vertically into the furnace, and is continued a

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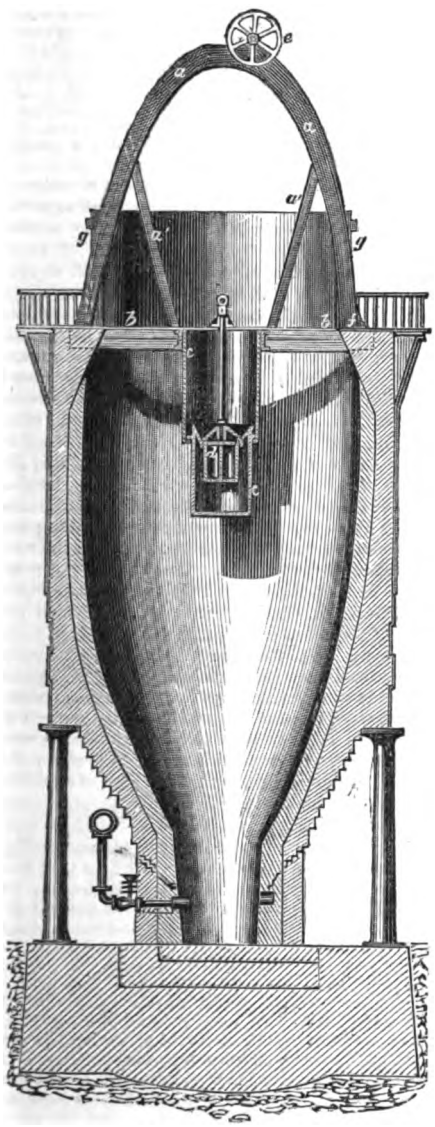
considerable distance downwards beneath the surface of the materials in the furnace. In working the furnace, the greater portion of the fuel is fed in through this pipe, and the other materials are fed to the open mouth of the furnace, as heretofore, exterior of the pipe, and all round it.

The annexed engraving is a vertical section of the furnace. *a*, *a* are arched girders passing across the mouth of the furnace, and from them are suspended by the bars *a'*, *a'* the bridge *b*; from it descends into the furnace the cast-iron pipe *c*, which for convenience he makes in two parts, so that the lower portion, which is most exposed to heat, may when it becomes worn be readily removed without interfering with the



upper portion of the pipe. The lower portion of the pipe is lined with fire-brick, as is shown. It contains within it a valve *d*, which is furnished with a rod, and by a chain attached to the rod, and passing over the pulley *e*, the valve may be raised when desired. Round the top of the furnace is a gallery *f*, and there is a screen wall *g*. Round its inner edge are scuttles or passages, by which the materials are introduced into the top of the furnace exterior to the pipe *c*. In working the furnace the inventor introduces into it by the side scuttles the ore and the lime or flux together, with, by preference, about one quarter of the whole of the fuel employed, and this either in the form of coke, or it may be of raw coal. The remainder of the fuel is fed into the pipe *c*, by preference in the form of small coal, and after each barrow load has been tipped into the pipe, the valve *d* is raised to allow the fuel to descend. When this valve is closed it prevents the draught of the furnace ascending the pipe *c*, and compels it to pass up all round through the ore and lime.

MACHINERY FOR TURNING.

FIG. 6.

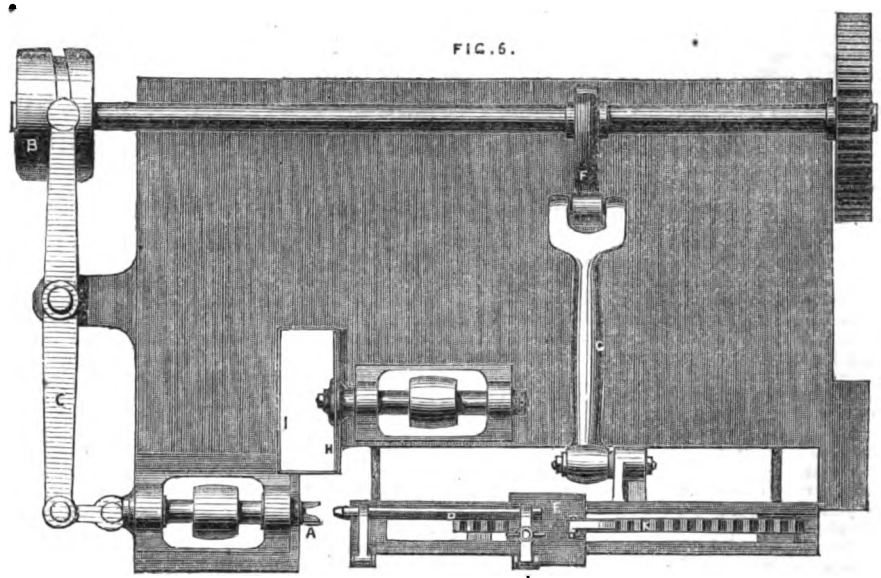


FIG. 7. FIG. 8.

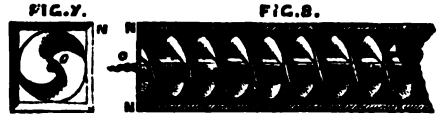


FIG. 9.

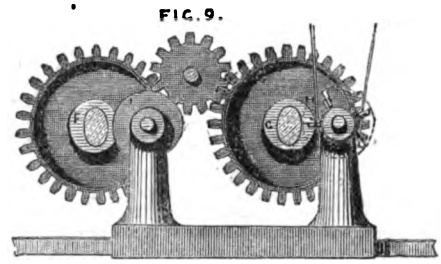


FIG. 12.

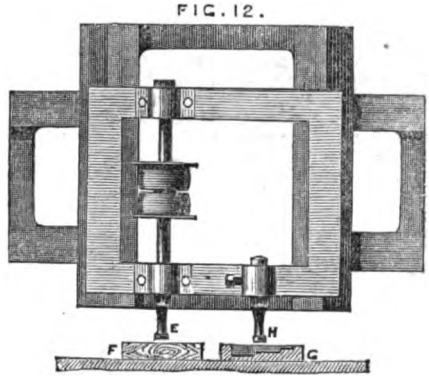
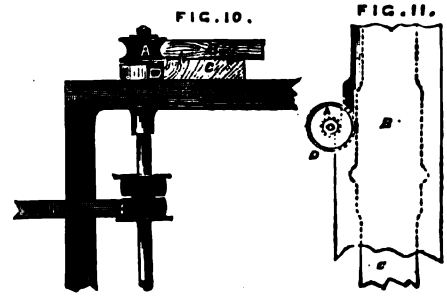


FIG. 10. FIG. 11.



MACHINERY FOR TURNING.

ON SOME APPLICATIONS OF THE COPYING OR TRANSFER PRINCIPLE IN THE PRODUCTION OF WOODEN ARTICLES.

By John Anderson, Esq., F.R.S.,
Inspector of Machinery, Woolwich Arsenal.

(*Concluded from p.* 190.)

The machinery for effecting this object is variously arranged; one of the best combinations is shown in Fig. 6. The head stock containing the cutter, *A*, in addition to the revolving motion of the spindle has a longitudinal movement imparted to it by means of the grooved cam *B* and the lever *C*; the wooden rod to be cut, *D*, being held firmly by the saddle, *E*, the headstock and cutter are gently pushed against its extremity, thus forming the conical end to the rod, and are then withdrawn again.

The second operation is to cut off the plug. To accomplish this the bed and saddle, *E*, carrying the wooden rod, *D*, are placed upon the top of a rocking frame, which also is moved by a cam, *F*, and connecting rod, *G*, but in a direction at right angles to the sliding motion of the headstock. When the conical end has been formed and the headstock drawn back, the woodholder, *E*, is pushed transversely against the circular saw, *H*, and the finished plug drops into a box, *I*; after which the saddle, *E*, is brought back into line with the headstock, and an intermitten self-acting feed motion, *K*, pushes the rod of wood forward into the position for forming another plug.

In some of the earlier machines the saw made a transverse movement to cut off the plug; by that arrangement the plugs and the chips were mixed together in the same heap, and the labour for their separation cost more than for the manufacture; but by the new arrangement, the plugs and the chips are kept separate, and the cost in wages is thereby reduced more than one-half.

A modification of the copying principle employed in a machine for forming square holes or mortices in wood is another example.

It consists of a combination of a square box-chisel with a screw augur working within it, shown in Figs. 7 and 8. The chisel, *N*, forms a square socket of the same external dimensions as the required mortice, having its four cutting sides chamfered inwards. Within this chisel and combined with it there is a revolving screw augur, *O*, having an independent circular motion, its cutting edge being flush with that of the chisel. The action of the machine consists in forcing the square chisel against the wood with a pressure sufficient to make an incision, and the augur drills out about ⅞ths of the required hole, the chisel making the round hole square, and with its bevelled edges pushing the chips against the running augur, by means of which they are withdrawn.

The Blanchard turning lathe contains a modification of the copying principle, susceptible of endless application in the production of irregular forms; it is used in turning gun stocks, spokes of wheels, shoe lasts, busts, and similar articles.

It may be described as two lathes placed side by side and parallel with each other, as shown in Fig. 9, the one lathe containing the pattern *F*, the other the lump of material, *G*, out of which the article is to be formed, and both lathes having the same motion. The sliding rest which holds the turning tool *H* also carries a dumb instrument, *I*, for tracing the pattern

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F, and by means of a weight or spring this tracer is kept in contact with the pattern. As usually constructed the turning tool, *H*, consists of a revolving wheel, having its periphery fitted with cutters, and driven by an independent strap at about 2,000 revolutions per minute. The tracer, *I*, is also of the same external circular shape and size as the tool, and is capable of turning freely on its axis. The action of the machine consists in imparting to the cutter *H* the motion of the tracer *I*, as produced by the irregular surface of the pattern *F*; the tracer being in contact with the pattern, as the latter turns round the tracer moves out and in accordingly; and as the material, *G*, in the second lathe has the same motion as the pattern, and the cutter has the same outside form as the tracer, it necessarily produces the same shape as the pattern; and the slide rest that carries the cutter and tracer being made to slide along in the usual manner brings out the required copy of the pattern, one man being able to attend on several machines.

The Blanchard lathes employed in the workshops of the War Department are variously constructed: in some the cutter and tracer are both mounted on a transverse slide rest; in some they are suspended like a pendulum; in another, which is found to be a very superior arrangement, the tracer and cutter are mounted together on a rocking frame, the centre of motion being near the floor. By both the latter modifications the friction is greatly reduced, and the action is more delicate in tracing the exact outline of the pattern than with the slide-rest motion.

A wheel fitted with cutters similar to that used in the Blanchard lathe has been employed with great advantage in forming different curves by means of a single instrument. This is done on the principle that if a piece of wood is passed under the cutting wheel in a line parallel with the axis of the wheel it will form a groove corresponding with the circle of the wheel's circumference; but if the wood is passed along the face of the cutting wheel it will produce a flat surface. Curves between these two extremes are obtained by adjusting the apparatus to intermediate angles.

The manufacture of scabbard linings affords another illustration of this copying principle. The wood is first cut roughly into shape by means of the endless band saw. The next operation is to shape one side of the exterior surface: to accomplish this the rough piece of wood is laid in a wooden holder which is susceptible of a longitudinal movement, and which by means of guides is constrained to describe a curve the same as that of the scabbard; this movement is made under a revolving cutter having the transverse shape of the scabbard; the two combined motions produce the required form. The other side is formed exactly in the same manner, the finished side being laid in a holder of the exact form, in order to have the two sides placed exactly opposite to each other. These two operations complete the exterior. The third operation is to cut out the receptacle for the sword: the wood already shaped externally is laid in a holder, into which it fits firmly, this holder being made to move in the proper curve under a revolving cutter the shape of the sword. It is then placed in a fourth holder over a circular saw to widen the upper end in order to receive the thick part of the sword; after which the end is laid under a circular knife having a vertical movement by means of which the point is cut to the proper shape. The accuracy of manufacture by this method is of course greatly superior as compared with the system of hand labour by means of which they have been made hitherto; also the rapidity of manufacture is greatly increased, two boys being able to produce 500 scabbard linings daily.

The same combination of movements is frequently arranged in a different manner, by means of which mouldings or such work can be formed on the edge of irregular surfaces. The circular cutter of the required form is placed on the top of a vertical revolving spindle, as shown at *A*, Figs 10 and 11. The piece of wood, *B*, to be operated upon is fixed to a holder, *C*, which has been cut to the shape in the longitudinal direction. The operation consists in pushing this holder against a fixed collar, *D*, surrounding the spindle; consequently a combination of the form of the holder and also of the cutter is transferred to the piece of wood.

In the Small Arm Factory at Enfield, that intricate piece of mechanism, the gun stock, is produced entirely by machinery. It will be well understood how very difficult it is to make such articles perfect both in form and dimensions; it is comparatively easy to make things nearly correct, but to attain to perfect fitting from the machine involves conditions which are not ordinarily realised. With the machinery in question this absolute fit is secured at the rate of from 1,000 to 1,200 gun stocks per week, leaving only the exterior smoothing to be done by hand. The object of the present paper is not to describe the machines in detail, but only the principle of cutting; for it requires upwards of a dozen machines to produce a gun stock, each being differently arranged to suit its special operation; but the general principle in all is the same, and if understood may be readily applied in an infinite variety of ways for the performance of other operations.

The cutting out is effected by means of a revolving bit or drill, *E*, as shown in Fig. 12, made in the required form and driven at a great velocity, 6,000 revolutions per minute; this being kept very sharp is capable of producing a clean smooth hole, and if pushed against the wood, *F*, sideways, or the wood pushed against the drill, will cut its way in any direction. In order to guide the drill in cutting out the required shape, there is placed alongside the gun stock, *F*, a hard steel pattern, *G*, of the required form; and upon the frame which carries the drill, *E*, there is fixed a dumb tracer, *H*, of the same external form as the drill. This tracer being connected with the same framework as the drill, and both having the same vertical or horizontal movements, it follows that if the tracer is brought into contact with the pattern, *G*, the drill will be brought into contact with the wood, *F*, and will drill its way accurately according to the truth with which the tracer is pushed round the pattern.

Owing to the intricate form of the gun lock, bits of different sizes are required to cut out the wood to fit it correctly: this is effected from a single pattern in the following manner. The machine is provided with a number of revolving bits of different dimensions, each accompanied by a tracer of exactly the same external form; and the machine is so constructed that each in succession can be brought into operation. At the commencement the larger bits are introduced; these clear out wherever the larger tracers can find an entrance into the pattern; and having done their part, the smaller bits are substituted, and at last a very delicate drill for touching off certain points too minute for its predecessors. Thus the whole operation is accomplished with the most rigid accuracy, and with a rapidity truly wonderful; for, including the fixing of the stock and the several changes of the drills, the whole may be performed under a minute.

The question naturally suggests itself, How can this accuracy be secured, seeing that the revolving drills are more liable to wear than the dumb tracers, and that such a condition must necessarily alter the dimensions of the recess produced by the drills, even if it give the proper shape? The method of compensating for wear is very ingenious and deserves to be generally known. The conical hole in the end of the running spindle into which the drills are fitted is made very slightly eccentric; the drill is also made eccentric on its shank to the same amount. Both the end of the spindle and the drill are graduated round the circumference. When the drill is new it is set to run truly central, by placing the two eccentricities opposite to each other, and thus to cut out its own diameter; but as by continued sharpening it necessarily wears, the time arrives when it requires to be altered in its position in the spindle, by throwing it slightly out of centre; and owing to the high velocity with which it revolves, any disadvantage arising from the eccentricity in the working is not perceptible, while the accuracy and correctness of the fit are rigidly maintained.

LONDON FIRES IN 1858.

TWENTY-EIGHTH ANNUAL REPORT.

By Mr. WM. BADDELEY, *C.E., Inventor of the Portable Canvas Cisterns, Farmers' Fire-engine, Improved Jet-spreaders, &c.*

"The statistics of London fires are by no means devoid of interest, and the time may come when they will form an index to the social advancement of the people; for, in proportion as houses are built more and more fire-proof, and habits of carefulness become more and more diffused, the number of destructive fires will assuredly lessen."—*Knight's London.*

(*Concluded from page* 192.)

THE fires in many provincial towns, as well as in the metropolis have been of a very serious character during the past year.

Mr. Hewitt in Liverpool, and Mr. Rose in Manchester, have had fires enough to keep their fire police in good working order; while Plymouth has afforded frequent opportunities for Mr. Marshall to continue to distinguish himself by his masterly management of the West of England Fire Brigade.

Wynnstay Hall, the ancient family mansion of Sir William Watkins Wynn; Trowscoed Hall, North Wales, the seat of E. S. R. Trevor, Esq.; and Donibristle House, the seat of the Earl of Moray, in the Firth of Forth, have all fallen victims to the devouring element. Two railway viaducts, one near Stafford on the Trent Valley line, the other on the Selby and Market Weighton railway, have been destroyed by locomotive cinders falling between the wood-work. The Salisbury station of the South Western Railway Company has also been burned down, as is supposed through a defect in the flue of the waiting room. A very important improvement in the construction of fire-proof floors and roofs has been perfected and patented recently by Mr. Bunnett, of Deptford, whose numerous inventions and improvements in connection with the engineering department of buildings is so well known. The present improvement consists in the employment of a hollow brick so formed that each brick supports and is supported by the six bricks which surround it, by which means immense strength is obtained; tie-rods are passed under, or through the hollow bricks to wall-plates of angle iron, so as to relieve the walls of any thrust. Arches may be constructed either quite flat, or with a very trifling rise, by means of these bricks, at an expense slightly, if anything, greater than ordinary floors. Mr. Bunnett has also designed a light metallic staircase, of a simple and cheap construction, to be used in conjunction with his brick floors and roofs; so that fire-proof houses stand a fair chance of becoming general; if they do not, it will not be on account of the expense. The term "fire-proof" must be taken in a qualified sense; no buildings can be strictly "fire-proof," because calorie will calcine stone and fuse iron. In warehouses filled with masses of combustible materials the amount of heat is often irresistible, but in ordinary dwelling-houses where there is nothing beyond the usual articles of furniture to burn, there seems now to be no difficulty in obtaining a practically fire-proof building at a moderate cost.

At a meeting of the St. Pancras vestry, in October last, a vestryman called attention to "the dreadfully unprotected state of the northern districts of the metropolis for want of fire-engines in case of fire," and thought that an application from that vestry, representing a parish containing 200,000 inhabitants, might have some effect on the insurance companies; he therefore moved, "That the attention of the fire-insurance offices of London be called to the requirement of a fire-brigade establishment in Camden or Kentish-towns." The motion, of course, was carried unanimously, and doubtless "had the effect" on the insurance companies (especially of those who keep no firemen or engineers) of exciting their laughter at the selfishness and ignorance of the parishioners of St. Pancras, who are continually calling upon Hercules to help them, but never put their own shoulders to the wheel. The St. Pancras people complain that there is not a single brigade engine-station north of Holborn! A fact which only reflects the more disgrace upon themselves, for not supplying by proper local arrangements this notorious and lamentable deficiency. In St. Pancras, which is one of the largest metropolitan parishes, the authorities are so apathetic as regards the calamities of fire, that they provide but a single engine, kept in an obscure part of the parish, which, in case of fire, is taken from the workhouse by a pauper crew—frequently idiots and cripples—without any person competent to direct its operations. At a mid-day fatal fire in Camden-town, a few months before the above meeting took place, the parish engine was immediately sent for from St. Pancras workhouse, scarcely a quarter of a mile distant; more than half-an-hour elapsed before it arrived, and when, after the loss of much time, it was got to work, its performance excited the ridicule and execration of the spectators, and was made the subject of special complaint at the coroner's inquest, but without any beneficial result. Perhaps there is hardly another parish in the metropolis containing a larger amount of *uninsured* property than St. Pancras, for the protection of which no efficient provision is made. If the inhabitants, who have so much at stake, initiate no steps for its protection, how can they possibly expect the insurance companies to do so, who have so small an interest in the matter? The inhabitants of St. Pancras, with their usual cupidity, wish the insurance companies to provide such an efficient fire-engine establishment in that locality as will enable the housekeepers to save the greater part or the whole of their insurance money; the insurance companies are, however, very unlikely to adopt such a suicidal policy. There is no doubt that the mistaken view of these matters which so extensively pervades the public mind, is greatly encouraged by the fire-brigade assuming to be the universal and exclusive extinguishers of fires, a duty for which, especially in suburban districts, this force is wholly inadequate. Where a better understanding of these matters prevails, the

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suburban parishes are adding to or improving their local fire establishments. This has been done in Shoreditch, Hackney, Marylebone, Camberwell, and Kensington; in the latter parish a novelty has been introduced in the shape of a voluntary fire-brigade on the American principle, consisting of nine young men, tradesmen's sons, of the locality, who hold themselves in readiness, night and day, to go out gratuitously to extinguish any fires in the neighbourhood; Mr. Dunford, the overseer of Kensington, being their superintendent. An excellent first-class fire-engine, built by Mr. Merryweather, of Long-Acre, with the dress and accoutrements of the men, were paid for by the vestry of the parish. Within a very few days of their formation, this corps was called into action, and acquitted themselves admirably. During the last five months of the year several occasions called for the exertions of the volunteers; several fires have been extinguished, and many thousand pounds worth of property have probably been saved by their prompt and indefatigable exertions. Although their attendance at fires is gratuitous, non-attendance when called subjects the volunteers to a fine, but no occasion has yet occurred for its infliction; on the contrary, they have ever shown themselves ready, zealous, cool, and courageous, and it is probable their excellent example may be followed in other suburban parishes—certainly with advantage. The parochial fire-establishment of Islington, which has remained unaltered for the last twenty years, is now under the consideration of the vestry, with a view to improvements, and placing it on a footing adequate to the vast increase of buildings and population in this wealthy and extensive parish. The past year has seen the last of the London firemen-watermen. In consequence of the increasing infirmities of Mr. Connorton, who has for so many years past been the foreman of the West of England firemen, that office have been compelled to pension him off, and to disband the corps. At Michaelmas last the West of England became subscribers to the London Fire-engine establishment, and the only *legal firemen* now existing in the metropolis are the parish-engine keepers, and the whole question of fire-protection demands the attention of the Legislature. "In fact," says a recent writer, "a committee of the Board of Works should grapple this question of life and death, and wholesale destruction of property by the most terrible of the elements, as a great whole; resolved to set it down on a broad and satisfactory basis, if they would merit the approval of their countrymen for a performance of more importance than even the defication of the Thames."

13 Angel Terrace, Islington,
February 19th, 1859.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

At an ordinary meeting, held March 8th, 1859; W. Fairbairn, F.R.S., &c., President, in the chair; a conversation having taken place respecting Sir W. Armstrong's new gun, Mr. Roberts stated that he had, very many years ago, constructed a rifled cannon for the purpose of firing elongated shot coated with lead. Dr. Smith considered that the great merit of the new gun consisted in the manner in which the internal tube of steel was enveloped with wrought iron. The difficult problem of forming a perfect compound structure had received solution in the hands of Sir W. Armstrong, while others had failed.

Dr. Joule read an extract from a letter he had some time ago received from Professor W. Thomson.—"I have had an apparatus for Atmospheric Electricity put up on the roof of my lecture room, and got a good trial of it yesterday, which proved most satisfactory. It consists of a hollow conductor supported by a glass rod attached to its own roof, with an internal atmosphere kept dry by sulphuric acid: the lower end of the glass rod is attached to the top of an iron bar, by which the hollow conductor is held about two feet above the inclined roof of the building. A can, open at the top, slides up and down on the iron bar which passes through a hole in the centre of its bottom, and, being supported by a tube with pulleys, &c., below, can easily be raised or lowered at pleasure. A wire attached to the insulated conductor passes through a wide hole in the bottom of the can, and is held by a suitable insulated support inside the building, so that it may be led away to an electrometer below. To make an observation, the wire is connected with the earth, while the can is up, and envelops the conductor—its position when the instrument is not in use. The earth connection is then broken, and the can is drawn down about eighteen inches. Immediately the electrometer shows a large effect (from five to fifteen degrees on my divided ring electrometer, in the state it chanced to be in, requiring more than one hundred degrees of torsion to bring it back to zero, in the few observations I made). When the surface of the earth is, as usual when the sky is cloudless, negative, the electrometer shows positive electricity. But when a negative cloud (natural, or of smoke) passes over, the indication is negative. The insulation is so good that the changes may be observed for a quarter of an hour or more, and when the can is put up the electrometer comes sensibly to zero again, showing scarcely any sensible change when the earth connection is made, before making a new start." Dr. Joule stated that he had recently witnessed experiments with Professor Thomson's new Atmospheric Electrometer, the merit of which consisted in its extreme sensitiveness, and the facility with which accurate observations could be made with it.

A paper was read by Mr. Richard Roberts, M. Inst. C.E., entitled "Proposed Improvements in Pharology."

After adverting to the remarkable fact that the great majority of wrecks and collisions occurred in the immediate vicinity of the beacons intended to guard against them, Mr. Roberts mentioned that amongst the numerous schemes propounded for the improvement of our present system of pharology, that of Mr. Herbert, of the Admiralty, who proposed to moor a series of floating lighthouses of great power of illumination, in a direct line up the centre of the English and other channels, appeared the most worthy of attention. He (Mr. Roberts) perfectly agreed with this suggestion, to which his attention had been first called by Mr. Murphy's paper, read in section G of the British Association, recently held at Leeds, when it at once occurred to him that the principle of gyration might be advantageously employed to neutralize the action which the wind and waves exert upon floating-light ships.

After briefly describing the principal features of the catoptric and dioptric systems, Mr. Roberts stated that the latter was inapplicable to floating beacons, owing to their great oscillation, and that they were therefore still furnished with 12 in. reflectors, whose power was comparatively small. He felt convinced, however, that the more fully the system of Mons. Fresnel became understood, the more certainly would it be preferred to the catoptric system, over which it possessed, among other advantages, that of producing about four times the amount of light as the effect of the combustion of the same quantity of oil.

It was, however, essential to the adoption of this system, that the light apparatus be kept upright and free from oscillation, to obtain which desideratum Mr. Roberts proposed entirely to change the form of the vessel, making that portion of it which was immersed hemispherical, and that which was above water the fustrum of an inverted cone, as he thought that this form would present less resistance to the wind and waves, where these were expected to act from every point. In certain situations, however, a double-pointed vessel might be advantageously used.

In the centre of this float Mr. Roberts proposed to build a tower (whose lower end should project through the bottom of the float to serve as a keel) carrying a lantern as in shore lighthouses, and containing the necessary accommodation for the light keepers, &c., and within this lantern he proposed to place a dioptric apparatus of the second power, whose light being placed forty-five feet above the water line, might be seen at a distance of nine miles. Immediately below the light apparatus he would place a fly wheel suitably mounted on gimbals, and driven through the medium of certain wheels and shafts by a small engine, which, with its boilers, would be placed on the third deck of the float, or this wheel might be caused to revolve at its proper speed by two relays, each of three men. The engines and steam might be used for a variety of purposes, as to sound bells or whistles, hoist coals aboard, prevent the adhesion of snow to the lantern, &c.

Mr. Roberts proposed to moor the float by three anchors, to each of which he would attach two heavy cables, passing through hawse pipes 120° from each other; the tension on these he would regulate by a suitable windlass, and he fully believed that by this system of mooring the float (which together with the tower he would construct of iron), and by causing the dioptric apparatus to rotate (about one hundred times per minute), the desired object would be attained.

A NEW PLOTTING SCALE FOR SURVEYING LAND.

After the meeting, at the Institution of Civil Engineers on Thursday last, Mr. J. G. Austin explained a "Double Off-set Plotting Scale," for the use of Civil Engineers, Land Surveyors, &c., The invention was described to consist in the projection of the line upon which the plotting was to be performed, at a distance from the edge of the scale, by means of the "station pointers," so as to admit the smallest off-set being plotted on either side of the scale. The instrument was readily affixed to the paper and board, by placing the "station pointers" upon the line to be plotted upon, keeping the scale in use always on the left hand, and the lower pointer exactly at the station from which the line proceeded. Then, by turning the milled-headed screws at each end, the instrument was fixed immoveably during the operation of plotting. Should the length of the line exceed the capacity of the scales, the distance plotted must be denoted on the map, the instrument released by reversing the screws, shifted forward, refixed, and the work continued; but should the line be shorter than the capacity of the scale, the position of the instrument could be determined by the zero line of the off-set scale, without the necessity of extending the line to the length of the instrument. The scales could be adapted to suit the operator, could be made of any material in customary use for such purposes, or the principle could be adapted to any existing scales. The off-set scale was intended to traverse between the edges of the lateral scales, and the distance upon the line was to be determined by the edge, and the off-sets plotted on either side of the zero line. The instrument was said to be simple in its use, to save much time in the operation of plotting the details of railway and general surveys, to insure accuracy and avoid the possibility of error from shifting, and as the surface to be plotted upon could be seen, it enabled the smallest off-set to be denoted on either side of the line, with greater ease and correctness than by the customary mode.

THE MERSEY STEAM FRIGATE.

The Mersey, 40, screw steam frigate, Captain H. Caldwell, C.B., went out of Portsmouth harbour at noon yesterday, to test her speed at the measured mile in Stoke's Bay. The results of the trial gave great satisfaction both to the contractors for the engines and the Government officials on board. There was not the slightest appearance of "priming of boilers" or "heated bearings" so common in first trials. This is all the more extraordinary, as the Mersey gives the highest return of indicative horse-power of any ship yet tried out of Portsmouth harbour. Her nominal power is 1,000 horse, but on the trial yesterday it was worked up to the enormous power of 4,000 horses. The average results of speed obtained in the four runs at the measured mile gave 13·290, or better than 13¼ knots; pressure of steam, 20; vacuum, 24; revolutions, *maximum*, 56, mean, 55¼; diameter of screw, 20; pitch of ditto, 29; immersion, 6 inches; force of wind, 1·0; direction of wind, N.W.; draught of water forward, 20 feet 8 inches; ditto aft, 22 feet 7 inches; coals on board, 850 tons; consumption of fuel at full speed, about 140 tons every 24 hours; thermometer in engine-room, 62·0; ditto, stoke-hole, 100·0; ditto, on decks, 52·0; length of stoke-hole, 68 feet 10 inches; breadth of ditto, 10 feet; number of fires, 32. The tops of the boilers are 3 feet under the load water line, and another important feature is that the engines are placed abaft the mainmast, which may in consequence be stepped in the keelson. Three auxiliary or "donkey" engines are fitted on board, two to supply the boilers, and the other as a steam fire-engine; this is fitted with a 4½ in. copper pipe from the ship's side, under the beams of the orlop deck, fore and aft, with seven 2½ in. pipe branches up through the lower and main decks, each branch with two nozzles to screw on lengths of hose, and four branches on to the upper deck, with the same means of screwing on hose lengths. In the event of a fire breaking out in any part of the ship, it is only to turn on the main cock at the ships' side, set the steam fire-engine to work, and any amount of water can be instantly conveyed to any part of the ship. In the event of a fire breaking out in the orlop, or lower decks of the ship during action, the engineer and his staff could at once deluge the part with water, and extinguish any fire without the necessity of ringing the fire bell, and calling the crew away from their guns, or creating the confusion and alarm which would ensue under existing regulations. Should any portion of the pipes be shot away, turn-cocks are fitted so as to turn the part injured off, and not impair the efficiency of the rest. To make the engine complete for the purposes it is intended for, it should have a small boiler fitted for its special service, and not have to draw upon the main boilers, as, in addition to its usefulness as a steam fire-engine, it also by an ingenious and simple contrivance hoists all the ashes up from below, pumps out bilge water, and draws water for washing decks. The

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Mersey's armament consists of, on the upper deck, 12 8-inch pivot guns, 10 feet 6 inches long, throwing a solid shot of 68.5. Main deck, 28 10-inch guns, 9 feet 4 inches long, throwing hollow shot of 84lb. The total weight of the guns (without carriages) on the upper and main decks is 178 tons 3 qrs. 2 cwt. A broadside from her would give to an enemy in action 1,652lb. of iron. We understand that all steam-ships are in future to be fitted with steam fire-engines on the Mersey's plan.—*The Times* of yesterday.

ELECTRO-MAGNETISM.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

Cork, March 12, 1859.

GENTLEMEN,—I have to thank Mr. Blair for the valuable information which he has given in No. 9, in answer to my query. His idea of the cause of the increase of magnetic power is quite correct. In accordance with his suggestion I have made a few additional experiments, the results of which I send herewith. The cores used were of solid round bar iron, one inch in diameter, and the pieces applied were of bar of the same dimensions; the battery used was Callam's; cells of pint size; coil 5 inches in length; central aperture 1¼ in.; primary wire, four layers of bell wire size in one length; secondary coil, four layers of moderately fine wire.

With an 8-inch solid core inserted into the coil, and fixed as high above the hammer as sufficed to give power just enough to keep it in slow motion, I found that the application of any piece of iron, however small, to the top of the core appeared to produce an effect proportionate to its size, but taking the acceleration of the vibration as a test, it required a piece of about 2 inches to produce any *marked* effect; a piece of 8 inches gave quick vibrations, and every addition of length, up to 29 inches, produced additional acceleration. I did not try any piece beyond that length. The effect was the same when bundles of wire were substituted for the solid core and applied pieces. Contact was not necessary for the development of the effect. The approximation of the pieces to the core induced an increase of intensity, less of course than that produced by contact.

I next tested the lifting power of the cores, and obtained the following results:—

With one cell of the battery attached—

An 8-inch core sustained from its lower pole.....	4 lbs.
A 29-inch " " "	11 "

With two cells attached—

An 8-inch core sustained	9 "
" " with 8-inch bar applied at top	14½ "
" " with 29-inch " "	19 "
A 29-inch core sustained	25 "

In the latter case the magnetism was concentrated in the lower pole, the top pole had but very faint attractive power. I next replaced the 8-inch core in the coil, and attached four cells of the battery; with that addition of power the core sustained 21 lbs. So that by taking the length of the core we obtain (roughly) as much increase of magnetic power as we do by doubling the battery power. The next result was rather contradictory. Although the magnetic power of the core was so greatly increased by the additions made to its length, as shown both by its lifting power and by its increased effect on the hammer, still I could not detect any marked increase in the shock from the secondary coil, although such was perceptibly the case when four cells of the battery were used with the 8-inch core instead of two. This, however, I attribute to the small dimensions of the coil and its defective construction. Perhaps some of your readers who are in possession of better apparatus will test this. An increase of magnetic intensity in the core ought to produce a corresponding increase of power in the coil; and if it is found to do so, we have evidently a ready means of increasing the power of these machines by a very simple addition to the apparatus.

I am, Gentlemen, your obedient servant,

THOS. C. HAINES.

Law Case.

MIDLAND CIRCUIT, WARWICK.—March 23.

NISI PRIUS.—(Before the Lord Chief Justice CAMPBELL and a Special Jury.)

REGINA *v.* BOND.

Mr. Macaulay, Q.C., Mr. Serjeant Hayes, and Mr. Beasley appeared for the prosecution; Mr. O'Brien for the defence.

This was a prosecution instituted by the Master and Wardens of the Gunmaker's Company of London—under an Act of Parliament intituled an Act for Insuring the Due Proof of Gun-barrels in England—for counterfeiting proof marks. The Act requires that gun-barrels shall go through two distinct proofs by severe charges of gunpowder, and be marked with certain marks; after the first proof, which is made when the barrel is in a rough state, a mark is impressed, which is called "the provisional proof mark;" the second mark is made when the gun is finished, and is termed "the definitive proof mark."

Four gun-barrels were sent by the defendant to one Harris, at Birmingham, for the purpose of being worked up for him by Harris, and they were impressed with what appeared to be the provisional proof marks. Evidence was adduced which clearly showed that these marks were counterfeit, and that an offence against the above-mentioned Act had been committed.

The LORD CHIEF JUSTICE summed up the evidence, observing that the Act was a most salutary one, and

The jury returned a verdict of *Guilty*.

The prisoner was sentenced to two months' imprisonment.

NOTICES.

B. CLEVERTON.—Your somewhat lengthy letter shall receive due attention, and if, on careful perusal, it is deemed suitable for publication it shall appear.

J. C. WEST.—The proposal to discharge groups of cannon simultaneously by electricity was made long since.

CAPT. NORTON.—Too late for this number.

W. G. NORRIS.—Your letter is under consideration.

M. WOOD.—Mr. Walker's address is 17 Cowper-street, City-road, London. We are very much of your opinion respecting inventions for war purposes.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

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Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

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Muirhead's (J. P.) Life of James Watt, 2nd edit., 16s.
Reynold's (J.) Beginner's Algebra, fcp. 8vo, 2s. cl.
Zoological (The) Garden, with coloured illustrations, 8s.

Our Weekly Gossip.

Sir William Armstrong—who is to be invited to a public dinner at Newcastle-upon-Tyne in the course of a few days—is about to provide a lecture-room for the Newcastle Literary and Philosophical Society. The expense thus generously borne by Sir William will exceed £1,200.

Printed forms have been delivered to the leading men and foremen of the Royal gun factories in Woolwich Arsenal, prohibiting, on pain of instant dismissal, any information to be given relative to the department, except to naval and military officers in Her Majesty's service.

The trial trip of the Mersey, the largest steam frigate in the British Navy, has proved a great success, as will be seen by the report copied from the *Times* of yesterday on another page. This immense vessel is of no less than 3,727 tons displacement, and with engines of 1,000 nominal horse-power, steams at the rate of more than 13 knots per hour.

The steamers which are appointed to run between Suez and Australia under the Peninsular and Oriental Company's new contract, are the Benares, the Salsette, the Malta, the Northam, the Emen, and the Columbian. The power of these vessels ranges from 300 to 520.

We learn from a correspondent at Havre, that the suit of Mr. H. D. P. Cunningham against M. Bronard, for an infringement of his patent for self-reefing top-sails (mentioned in a correspondent's letter at page 191 of our last number), has resulted in a decision entirely favourable to the English inventor. M. Bronard is able to appeal to a higher court if he please, but the grounds for an appeal are extremely slight and unpromising.

The committee appointed by the British Association, at their late meeting in Leeds, to inquire into and report upon the performances of steam vessels, had an interview with the First Lord of the Admiralty on Tuesday afternoon. The deputation consisted of Vice-Admiral Moorsom, Lord Clarence Paget, M.P., the Earl of Caithness, the Marquis of Stafford, M.P., Lord John Hay, M.P., the Hon. A. Ellis, M.P., Mr. John Scott Russell, F.R.S., Mr. J. E. M'Connell, Captain Egerton, R.N., Mr. W. Smith, and Mr. H. Wright.

We cannot resist the temptation to put on record here the following kindly sentences penned by an eminent professional contemporary—the *Builder*—in its last number, although modesty forbids us to appropriate all their praise:—"This excellent journal (the MECHANICS' MAGAZINE) has of late been issued in an enlarged form, as an illustrated newspaper, and with various other improvements in detail. There is not a more practical or useful scientific journal in existence than the 'MECHANICS' MAGAZINE.'"

Captain Fowke, R.E., has patented a peculiar arrangement of portable fire-engine capable of being easily transported either by manual labour or horse power, and forming a compact and powerful fire-engine, the ordinary wood or metal cistern hitherto employed being dispensed with, whereby the efficiency and lightness of the engine are greatly increased. The patentee connects the slings to the centre of the body of the pistons or plungers of the pumps, and fixes the pumps and gear of the fire engine directly on to a wrought-iron axle mounted on large running wheels.

Professor Tyndall states, says the *Critic*, that he has submitted india-rubber and gutta-percha covered wires to a test of extreme severity, and has found the insulating powers of both substances excellent. He does not know which of them is best, and has never made an experiment with either of them in which hydraulic pressure was applied.

A deputation from the International Association for obtaining a uniform decimal system of measures, weights, and coins, waited upon the Chancellor of the Exchequer on Saturday, the 19th inst., to oppose the introduction of a change which they characterise as "the scheme for the decimilization of the pound avoirdupois," and which, though at first proposed only in reference to Her Majesty's Customs, must, they considered, be regarded as "having an ultimate view to the substitution of a new method of weighing goods in all public and private transactions without exception." We have the memorial presented to the Chancellor before us, but have not space for it, in this Number at least.

The drainage of the seaport town of Sheerness is just now exciting much attention among its inhabitants. The circumstances of the case are peculiar, the town consisting of two separate portions lying at some distance apart, and all of them below the sea level. We have taken some pains to look into the several schemes proposed, and strangely enough find that the best of them, as we think, is put forth in the editorial columns of a local paper, called the *Sheerness Guardian*. In this paper the whole question is discussed with much ability and exemplary temper, the writer evidently being practically acquainted with the facts, and very competent to discuss the engineering question raised.

The coal-miners of the Barnsley district have adopted a petition to the House of Commons, in which they urge the desirability of an eight-hours' Bill; that the machinery for raising coals should only work nine hours; that children under 14 years of age employed in mines shall only work half time; that owners of collieries shall be obliged to provide instruction in schools for the remaining four hours; that the adoption of the safety cage and other desirable scientific appliances shall be rendered compulsory; that the apprenticeship system shall be introduced into mines; and that a widow's and orphan's funds shall be provided by a tax of 4d per ton on all coals sold. Really some of these suggestions seem reasonable and just.

In a paper read last week at the Society of Arts, Professor Leone Levi exposed many of the devices to which both British and foreign manufacturers of the baser sort resort in order to secure the business which honest and able men create. We quite agree with Professor Levi in believing that it is most essential to remove any difficulty that may exist in our criminal law, for the purpose of visiting with high penalties those who counterfeit, pirate, abuse, and forge the names, cyphers, and trade marks of others, thereby defrauding the injured parties, obtaining money under false pretences, and otherwise perpetrating an open public deception and fraud. And it is also necessary to obtain similar guarantees from foreign powers, so that the courts of all civilised nations shall be opened for the suppression of such practices, by whomsoever, and against whomsoever, committed.

Admiralty agents have recently visited the Clyde Dockyards for the purpose of making minute inquiries with respect to the available means of building ships and engines. Two launches of some importance took place on Saturday; the Shannon, from the yard of Messrs. R. Napier and Sons, at Govan, and the City of Newcastle, from the establishment of Messrs. Scott and Co., Cartsdyke. The Shannon has been constructed for the West India Mail Steam Packet Company, and is the heaviest steam-ship ever built on the Clyde. Her dimensions are as follows:—length over all, 342 feet; length of keel and forerake, 330 feet; length on load line, 327½ feet; breadth of beam, 44 feet; depth to spar deck, 35 feet; tonnage (builder's measurement), 3,092 tons. The Shannon will be propelled by two side-lever engines of 800-horse power collectively;

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the cylinders are 96 inches in diameter, with 9 feet stroke; and the paddle-wheels will be fitted with feathering floats. The engines and boilers are completed at Lancefield Works, and the vessel is expected to be ready to take her station in the course of July. The City of Newcastle is intended for the navigation of the River Hunter, in New South Wales, and is to be fitted with oscillating engines of 150-horse power, by Messrs. Macnab and Co., Shaws Water Foundry. She is the fourth vessel turned out by these firms for the Hunter River New Steam Navigation Company.

The official (Admiralty) report of Messrs. Miller and Taplin on the merits of the plan proposed by Mr. C. W. Williams for consuming the smoke of bituminous coal when used in marine boilers, was delivered on Saturday. The reporters arrive at the conclusion that it is possible to consume the smoke arising from north country coal, by the use of Mr. Williams' apparatus, and by the modifications of it introduced by the Newcastle Steam Coal Association to some of the northern collieries, and now being introduced generally into the steam-tugs of the Tyne. In the experimental boiler, smoke was prevented when the firing was pushed to a greater extent than 30lbs. to the square foot of fire-grate; in one instance, the firing was for half-an-hour at the rate of 55½ lbs. to the square foot, with but very light smoke, and for the next hour at the rate of 40 lbs. to the square foot, without any smoke; and in another instance, when a steam jet was introduced to force the draught, the firing throughout the experiment was nearly 36 lbs. to the square foot, the jet being produced by 20 lbs. steam. The system of firing pursued was to charge each side of the two furnaces alternately, and to throw the coal on the front of the fires. When requisite, the incandescent fuel was pushed back at either side of the furnaces towards the fire-bridges, so that the gases arising from the fresh coals always passed over the hottest parts of the fire.

At the Cramlington West Hartley collieries, the Admiralty reporters mentioned above, inspected a modification of the apparatus of Mr. C. Wye Williams, consisting of a furnace frame fitted with two fire-doors, the hinges of which are so placed, that the doors open back to back, the upper part and sides of the door-frame being pierced with a number of holes, and the lower parts of the fire-doors having horizontal slits in them for the admission of air into the furnaces. The object of having two fire-doors on one frame, opening in the way described, is to cause the stoker to throw the coal to the sides of the furnace, instead of into the middle, and to force him to fire each side of the furnace alternately. This modification of Mr. Williams' plan was fitted to three boilers in constant work, and the prevention of smoke appeared to be almost perfect. At the Bedlington collieries the reporters saw another plan used with much success. The fire-doors here were double, but opened in the usual way; the dead plate of the furnace as well as the fire-doors had slits for the admission of air.

A paper from Mr. R. Hunt—a great authority on mining subjects—was read on Friday at the annual meeting of the Geological and Polytechnic Society of the West Riding on the mineral produce of Yorkshire. The amount added in 1857 to the national wealth by the mining and metallurgical industries of this great county was estimated as follows:—Lead, £173,250; pig iron, £1,013,142; iron pyrites, £1,572; coals, £2,168,800; stones, £105,374; total, £3,462,198.

"It is well known," says a correspondent, "that finely-powdered glass is a powerful *absorbent* of carbonic acid. Mr. J. Bruce Neil states that if the walls and ceilings, as well as the paper-hangings of our apartments are coated with a solution of water-glass, the carbonic acid is readily absorbed, and the temperature of the room reduced. A small quantity of chloride of zinc added to the solution, renders it a disinfectant-insorbent. Where gas is consumed, the same effects are evidenced in the absorption of the sulphuric acid. Paper-hangings so treated, in the event of a fire, are rendered, in a great measure, incombustible. This is evidently an improvement on the arsenical paper-hangings."

The same correspondent says:—"In the Zwintergarten Museum, in Dresden, about half a century since, was exhibited a *gun* (and probably the same is there now), which was capable of discharging itself 40 times successively, without intermission. Our gunmakers would do well to lose no time in paying the above museum a visit."

The following information, derived from the *Publisher's Circular*, is important. Messrs. Chambers announce a new Encyclopædia; "A Dictionary of Universal Knowledge for the People," on the basis of the latest edition of the German "Conversations Lexicon." The publication is first to appear in weekly numbers at 1½d., and is expected to form about seven volumes similar to the "Information for the People." The publishers state that the work has been in careful preparation for many years, that it will be abundantly illustrated with maps and engravings, be the cheapest and one of the most comprehensive encyclopædias ever published, and is, for the mean time, intended as the crowning contribution of the editors to cheap literature.—Messrs. Bradbury and Evans announce an important series of works to which they adapt their beautiful natural printing process; the prospectus includes the promise of four volumes on "British Sea-weeds," by W. G. Johnstone, with 220 nature-printed illustrations; of two volumes on "British Ferns," by Thomas Moore, F.L.S., reprinting the letter-press of the well-known folio work (some time out of print), with 110 new illustrations; and of one volume on "British Mosses," by Dr. Lawson, with 30 illustrations, to be followed by other works uniformly printed in large 8vo; some six volumes altogether may be expected during the present year.—Mr. Lovell Reeve has just disposed of his series of valuable popular "Natural Histories" to Messrs. Routledge and Co., who will in future publish them at a cheaper rate; the series numbers 24 volumes.

Our excellent contemporary, the *Photographic News* (which has most completely fulfilled the high expectations expressed by us on its first appearance), presents us with the following curious remarks on Micro-Photography:—Dr. Muller speaks of a micro-photograph which had been shown to him, which was scarcely perceptible to the naked eye but as a faint spot on the glass; but which, on being looked at through a microscope, was seen to be a full-length portrait of the Emperor Napoleon III., in a military costume. We have seen another which represented the well-known picture of the Queen and twelve naval officers in council; every feature of each individual being perfectly distinct on the application of a microscope of rather high magnifying power; although a threepenny-piece would have covered the entire photograph and something more. Mr. Alfred Reeves has recently forwarded to us a specimen of one of these minute pictures, which consists of a plate containing the portraits of the kings and queens of England since the time of the Conquest. Here, on a space not larger than the ¼th of an inch square, may be perceived a miniature "National Portrait Gallery" with a portrait of every king and queen surrounding her Majesty, who is properly made the centre figure of the interesting group. We have already referred on a previous occasion to some of the uses to which micro-photography might be put, but there are some others which we may briefly notice. Suppose, for example, that two portions of the same army are encamped at a distance of one or two miles apart, the communication being cut off by the enemy, or rendered almost impossible by the use of "arms of precision;" a very simple arrangement would enable the fullest written despatches to pass from one portion of this army to the other, without risk, and almost with the rapidity of electricity. The despatch is written, and a micro-photograph taken which reduces it within the limits of—if a long one—a square inch. This is placed inside one of the hollow conical bullets and the end closed with lead. The hoisting of a given signal would announce that a messenger was about to be despatched; and with the accuracy which distinguishes our improved rifles, a commander might have his despatches delivered with a speed and punctuality to which no post-office has yet attained. In the case of a beleaguered town, too, such a method of communication between its inhabitants and an army approaching to relieve it might be invaluable. It has not the drawback either of requiring men to have a special training for the purpose of carrying on these communications; all the manipulations necessary might be learnt in less than a week. Neither would there be any necessity for using a cypher, as there would be no risk of the despatch falling into the hands of the enemy, and hence there would be less chance of misapprehension of instructions than exists at present.

After the delivery of Major Rhodes' lecture on Tents on Monday evening last, at the weekly meeting of the United Service Institution, Mr. Andrew Smith stepped forward to read a paper on an electric gun, which was alleged to be capable of discharging sixty balls per minute with precision. We listened intently, but vainly, for a description of this curious instrument, and Captain Fishbourne, who presided, appealed as vainly to the speaker for something more than an unintelligible jumble of known and unknown words. We were favoured, however, with a picture or two of the improved weapon, but as these alone have in no way assisted our ignorance, we decline to engrave them for the confusion of our readers. We give the following extract or two from a printed paper handed to us at the meeting. They *may* make the whole matter clear to some minds, although we are, we confess, altogether incapable of precipitating a useful idea from them. "This gun," says Mr. Smith, "discharges with precision and effect, sixty shots per minute, without smoke and comparatively little noise; the propulsive force produced by the decomposition of water, causing a continuous discharge of the electric fluid, and the unequalled force of a thunderbolt. Lightning is a phenomenon presenting the appearance of a vivid flash of light or fire in the heavens. It is effected by electricity in its positive and negative relation between one cloud and another. . . . A flash of lightning may be defined as the electric fluid in a state of explosion; and when explosions do take place, its immensely expansive and vivid force is considered to be known: yet it is certainly but little understood. Indeed, the power is so gigantic that it is unearthly, and in its plenitude fitted only for the wielding by an Immortal. Nothing with which the territorial globe and its inhabitants are acquainted is so potent, so sudden, or so subtle. For ages past, this power has only subjected humanity both to alarm and wonder. It was believed to be a direct and occasional emanation from the Supreme Being. Mortals had no notion that the principal ingredient of those fearful and destructive flashes, which produced so wonderful and unearthly an effect, pervaded the whole creation, including their own system and person, as thoroughly, or indeed more so, than does the air we breathe. Its most potent application, however, viz., its explosion (in imitation of the lightning flash and thunderbolt) has been hitherto but lightly investigated. This very important feature of this wonderful power has been for many years Andrew Smith's aim to develop. Experimental analysis has shown, that a main, and indeed the essential ingredient in the process in the lightning flash is water; or rather its gases as decomposed by electricity, two in number, hydrogen and oxygen. This process, the lightning flash, Andrew Smith has found the means of effecting at will; and the immense power so produced he controls and directs. For its accomplishment the application of electric caloric, and of aqueous vapours, are the essentials. The principle may be summarily described as the generation of a gas of a most highly refined or sublimated quality, producing intensely elastic power, effected by the decomposition of water—after the manner of lightning itself. In the combination accomplishing this process, caloric, at a temperature effecting the fusion of electric metals, is one and a principal ingredient. One application of this potent element is to the projection of heavy missiles. Mr. Andrew Smith is able to do this with a power, rapidity, and accuracy, which has not been accomplished by gunpowder. The machinery consists of a gun or guns, made of wrought-iron of the soundest description, varied from those now in use only by some increase in length." There! the invention is now before our readers, and we shall be glad to learn that they understand it.

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated November 16, 1858.

2576. W. B. Johnson, Manager, and J. Shepherd, Foreman, of Manchester. Improvements in machinery or apparatus for adjusting the permanent way of railways.

Dated January 19, 1859.

168. J. H. Johnson, of Lincoln's-inn-fields. Improvements in apparatus for making cigarettes. A communication from J. L. L. Daimé, of Paris.

Dated January 24, 1859.

222. H. Owen, of Portswood, Southampton. Improvements in stockings.

Dated February 10, 1859.

378. G. L. Stocks, of Poplar, Ship Chandler. Improvements in steering apparatuses.

Dated February 17, 1859.

448. C. Fay, of Manchester, Railway Carriage Builder. Improvements in apparatus for working railway breaks.

Dated February 24, 1859.

502. J. Holms, of Glasgow, Gentleman. Improvements in machinery or apparatus for propelling vessels, ships, and boats.

Dated February 25, 1859.

512. C. W. Siemens, of John-st., Adelphi. Improvements in electric telegraphs and apparatus, and in supports for electric telegraphic line wires. Partly a communication from W. Siemens.

Dated March 2, 1859.

548. J. Valda, of London. Improvements in studs and other like fastenings for dresses, belts, or other purposes.

550. R. H. Collyer, of Alpha-road, Doctor of Medicine. A process of preparing materials for the manufacture of paper, and a machine employed therein, which machine is applicable for crushing, grinding, bruising, and reducing various substances.

552. F. J. Jones, of Aldermanbury, Manufacturer. An improvement in buckles and clasps.

554. E. Roche, of Marseilles, Manufacturer. Improvements in the manufacture of paper suitable for forming

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cigarettes and for other purposes, and also improvements in the manufacture of cigars.

556. W. E. Newton, of Chancery-lane. Improvements in the construction of barometers, or instruments to indicate pressure. A communication from A. Nobel, of Paris.

558. J. Kershaw, of Allerton, near Bradford, Overlooker. Improvements in means or apparatus employed in weaving.

560. H. Brown, of Galashiels, Selkirk, Woollen Manufacturer. Improvements in machinery for cutting and finishing the surfaces of woollen and other fabrics.

Dated March 3, 1859.

562. H. Kohn, of Berlin, Tailor. Improvements in articles of wearing apparel called coats.

563. J. Harrison, of Bermondsey, Builder. An improvement or improvements in the construction of rotating window-sashes.

564. T. Wilson, of Birmingham, Engineer. An improvement or improvements in breech-loading fire-arms.

565. A. W. Hale, of New Britain, United States. A new and improved machine for cutting or mincing meat, vegetables, &c.

566. J. D. Dougall, of Glasgow, Gun Maker. Improvements in fire-arms.

567. W. Jackson, of Colne, Lancaster, Shuttle-tongue Maker. Improvements in shuttles for looms.

568. W. Score, of Clapham-road, Chemist. Improvements in the manufacture of soap.

571. T. Cook, of Stowmarket, Carpenter. An apparatus for raising and lowering coffins and bodies, either for burial or disinterment.

Dated March 4, 1859.

573. C. F. Dennet, of Pall-mall, Gentleman. Improvements in bayonets.

574. M. Rider, of Todmorden, Mechanic. Improvements in, or applicable to, machines for preparing, spinning, and doubling cotton, and other fibrous materials.

575. J. Cowban and E. Andrews, of Burnley. Improvements in machinery or apparatus for spinning fibrous materials.

576. R. A. Brooman, of 166 Fleet-street, London, Editor of the MECHANICS' MAGAZINE and Patent Agent. An improvement in boiler stays. A communication from J. Perrier, of Nimes, France.

577. C. R. Mead, of Great Dover-st., Gas Engineer. Improvements in water gas-meters.

Dated March 5, 1859.

578. W. and J. Bailes, of Oxford-st. An improved ship's berth for prevention of sea-sickness, composed of wood and metal.

579. J. M. Dunlop, of Manchester, Engineer. Improvements in machinery or apparatus for cleaning fibrous materials.

580. J. Leigh, of Manchester, Surgeon. Improvements in the purification of coal gas.

581. J. Fraser, of Banff, Manager. Improvements in ploughs.

582. F. W. Parker, of Sheffield, Saw Maker. Improvements in sewing-machines.

583. E. Vigers, of Paddington, Gentleman. Improvements in the construction of ships and other vessels.

584. W. P. Savage, of Roxham, Norfolk. An improved machine for excavating, raising, and depositing soil.

585. F. Verdeil, Doctor, of Paris, and E. Michel, Chemist, of Puteaux, Seine. Improvements in treating madder.

586. G. Leach, of Leeds, Yarn Spinner. Improved machinery for reeling and leashing yarn or thread.

587. F. Morton, of Liverpool, Engineer. An improvement in the construction of strained fences.

Dated March 7, 1859.

589. H. W. Patrick, of Acton. An improvement or improvements in an apparatus for chemical and dental laboratories, or other manufacturing or experimental uses, which he proposes calling a "paragon laboratory forge."

590. D. Proudfoot, of Glasgow, Merchant. Improvements in Turkey-red dyeing.

591. A. Cabany, of Anzin, France, Engineer. A new system of quoins (wedges) for railways.

592. W. Palmer, of Long Eaton, Derby, Station Master. An improved railway carriage break, and coupling apparatus connected therewith.

593. F. Ayckbourn, of Vauxhall, Gentleman. Laminating indian-rubber cloths with paper sheets.

594. W. Gossage, of Widnes, Chemist. Improvements in the treatment of certain ores of copper for the extraction of metals therefrom.

595. J. Aspinall, of Great Tower-st., Civil Engineer. Improvements in evaporating in vacuo.

596. P. E. Aimont, of Paris, Civil Engineer. Improvements in the construction of waggons and other carriages for railways and ordinary roads, and of apparatuses connected therewith.

597. J. Orr, of Glasgow. Improvements in weaving ornamental fabrics.

598. J. P. Clarke, of Leicester. Improvements in the manufacture of reels for the winding on cotton, linen, thread, silk, or other fibrous materials.

599. J. L. Jullion and G. Pirie, of Aberdeen, Paper Makers. The manufacture of gelatine.

Dated March 8, 1859.

601. A. Booth and A. Booth, jun., of Manchester, Machine Makers. Improvements in machinery or apparatus for making or manufacturing tags for laces.

603. G. Twigg, of Birmingham, Manufacturer. An improved fusee-igniter for the use of smokers.

605. J. N. Ryder, of Bexley-heath. Improvements in preserving fruits, and in apparatus used for such purposes.

607. W. Clark, of Chancery-lane. Improvements in submarine telegraph cables. A communication from A. H. S. Treve, of Paris.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

628. N. Washburn, of Massachusetts. A new and useful or improved machine for rolling tyres for wheels. Dated March 11, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, March* 22, 1859.)

2491. J. Richmond, J. Quick, jun., and A. Fraser. Meter.
2502. E. E. Allen. Propellers.
2506. M. Henry. Fastenings. A communication.
2518. J. Corner. Screw rivets.
2528. J. Blethlyn. Fuel.
2536. A. Mickelthwate. Treating horn.
2542. G. T. Bousfield. Illustrating conic sections. A communication.
2548. J. Taylor. Steam engines.
2551. L. Petre. Ornamental with glass.
2555. A. B. Woodcock and J. M. Dunlop. Covering rollers, &c.
2556. D. Frodsham. Tubular steam boilers.
2557. M. Pullan. Drying yarns.
2558. J. A. Hopkinson. Steam boilers.
2564. W. G. Armstrong. Ordnance.
2568. J. G. Bunting. Horse-tamer.
2571. J. C. Boisneau. Horse-mill or gear.
2572. A. I. H. Parent. Buttons.
2575. C. J. C. Perry. Anti-collision dial.
2578. A. M. Bruère. Applying hydrogen gas.
2584. J. H. Tuck. Laying Telegraph cables.
2586. E. Welch. Tobacco.
2587. J. Robertson. Musical instruments.
2588. M. Scott. Breakwaters.
2591. J. Brennand. Ploughs.
2601. Sir C. T. Bright. Insulators.
2604. J. Leslie. Gas.
2615. J. Edwards. Trouser buttons.
2626. J. H. Johnson. Telegraph cables. A communication.
2630. T. S. Cressey. Casks.
2635. H. Ellis. Cultivating land.
2654. W. Ralston. Finishing fabrics.
2656. W. Gorman. Furnaces.
2662. R. H. Hughes. Lighting by gas.
2679. C. Parker. Looms.
2700. H. L. Pattinson. Utilizing the heat of slags.
2711. W. E. Newton. Steam-engines. A communication.
2730. A. E. C. Scheidel. Fastenings. A communication.
2751. L. Bissell. Trucks.
2761. M. Henry. Bone black. A communication.
2871. A. V. Newton. Bullets. A communication.
2959. J. Macpherson. Horns and hoofs.
91. W. and W. T. G. Bray. Locomotive engines.
448. C. Fay. Railway breaks.
463. S. Wheatcroft. Uniting lace to fabrics.
502. J. Holms. Propelling.
507. E. Price and E. Hawkins. Fish plates.
528. G. Horner. Hackling flax, &c.
549. J. M. Adams, D. Law, and J. Inglis. Fire-places.
566. J. D. Dougall. Fire arms.
580. J. Leigh. Coal gas.
581. J. Frazer. Ploughs.
589. H. W. Patrick. Laboratory forge.
590. D. Proudfoot. Turkey red dyeing.
596. P. E. Aimont. Waggons and carriages.
628. N. Washburn. Rolling tyres.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed March 18, 1859.

2106. J. Luis.
2108. J. B. Beasley.
2110. H. W. Grylls.
2114. H. Firmin.
2119. L. De Pariente.
2124. A. M. Perkins.
2130. R. A. Brooman.
2146. H. H. and W. F. Henson.
2150. G. L. Fuller.
2165. E. Thompson and W. Lazenby.
2172. G. T. Bousfield.
2210. M. Henry.
2246. E. Birchley.
2277. M. Sautter.
2298. W. E. Newton.
2553. M. L. J. Lavater.
2590. M. Caton.
2674. R. Bodmer.
3746. G. W. Bales.
2762. T. Bailey.
26. M. A. F. Mennons.
28. E. Balchin.
74. T. J. Claxton.
117. W. Wilson.
124. W. Craft & T. Wilson.
170. J. C. Reid and W. Milner.
188. J. Hick and W. Hargreaves.

Sealed March 22, 1859.

2129. T. Howe.
2140. D. Grant.
2145. R. A. Brooman.
2181. A. Normand.
2197. H. G. Collins.
2205. F. Trevithick.
2221. C. Hill.
2279. H. Parker.
2387. B. Goodfellow.
2455. D. Fryer, T. Leach, C. Watt, and W. Holmes.
2995. S. S. Bateson.
127. R. Romaine.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

630. H. Bessemer.
633. J. Mitchell.
640. P. A. De Fontainemoreau.
642. T. Bird and T. Rose.
657. E. S. Stott.
659. A. V. Newton.
666. J. W. Burton and G. Pye.
670. W. Drummond.
682. G. G. A. L. M. Schelhorn.
707. J. D. Dunnicliff and S. Bates.
711. W. Ball.
736. W. Ball.
790. F. Grice.

LIST OF SPECIFICATIONS, &c.

Published during the week ending March 18, 1859.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s d		s d		s d		s d		s d		s d
1821	0 5	1835	0 6	1846	0 3	1857	1 4	1871	0 3	1882	0 3
1824	0 7	1836	1 10	1847	1 4	1859	0 11	1872	0 6	1883	0 7
1825	0 6	1837	0 10	1848	0 5	1860	0 5	1873	0 3	1884	0 3
1826	0 10	1838	0 3	1849	1 1	1861	0 10	1874	0 3	1885	0 3
1827	0 6	1839	0 6	1850	0 9	1863	0 3	1875	0 5	1887	0 10
1828	0 3	1840	1 4	1851	0 10	1864	0 3	1876	0 6	1888	0 3
1829	0 3	1841	0 3	1852	0 3	1866	0 7	1877	0 3	1889	0 6
1830	0 3	1842	0 6	1853	0 7	1867	0 3	1878	0 3	1890	0 9
1831	0 3	1843	1 3	1854	0 3	1868	1 11	1879	0 8	1891	0 3
1832	0 9	1844	0 6	1855	0 3	1869	0 9	1880	0 7	1913	0 6
1833	0 3	1845	0 3	1856	0 9	1870	0 6	1881	0 5	1921	0 11

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LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Dates of Registration.	Nos. in Register.	Names and Addresses.	Subjects of Design.
1859.			
Feb. 9,	4150	W. and J. Sangster, Cheapside	Parasol.
,, 14,	4151	J. Whitehouse and Son, Birmingham	Bolt or fastener.
,, 28,	4152	W. Larke and Son, City	Slide cover.
Mch. 4,	4153	Oastler and Palmer, Bermondsey	Buckle.
,, 4,	4154	S. W. Silver and Co., Bishopsgate	Ventilator.
,, 8,	4155	Dawson and Macnicol, Glasgow	Shirt.
,, 9,	4156	G. Salter and Co., West Bromwich	Balance.
,, 10,	4157	Gray and Bailey, Birmingham	Roasting jack.
,, 16,	4158	C. Pullinger, Selsey	Rat-trap.
		PROVISIONAL REGISTRATIONS.	
Jan. 26,	1041	T. Williams, N. Wales	Washing mach.
,, 29,	1042	W. Eastlake, Plymouth	Portable stand.
Feb. 5,	1043	G. F. Meads, Old Kent-road	Advertising.
,, 7,	1044	J. Edwards, Lambeth	Mantle.
,, 10,	1045	R. Brailey, Fitzroy-sq.	Desk.
,, 14,	1046	J. Beddington, Birmingham	Clip.
,, 14,	1047	Mason and Richards, Birmingham	Knob or handle.
,, 16,	1048	T. Quinlan, Dalston	Folding map.
,, 21,	1049	F. W. Campin, Strand.	Gas-stove funnel.
,, 26,	1050	T. Archer, Cable-street	Advertising.
Mch. 1,	1051	J. P. Byrne, Dublin	Gun-stock.
,, 1,	1052	E. Webb, Lawrence Pountney-lane	Comforter.
,, 1,	1053	T. Hicken, Birmingham	Parasol joint.
,, 4,	1054	J. L. More, Dorking	Parasol.
,, 7,	1055	M. Frearson, Paddington	Candlestick.
,, 11,	1056	J. Brazier, Wolverhampton	Spring cramp.
,, 14,	1057	K. E. Morgan, Strood	Hooks and eyes.
,, 15,	1058	D. Brown, Lawrence-lane	Chess & draught board.
,, 17,	1059	R. Cayley, Bungay	Fumigator.
,, 17,	1060	H. J. and D. Nicoll, Regent-street	Gaiter.
,, 18,	1061	C. Watts, Harrow-road	Carriage pole.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINES, &c., 1698, 1699, 1707, 1732.

BOILERS AND THEIR FURNACES, 1700, 1705, 1716, 1735, 1758, 1761, 1763.

ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1713.

SHIPS AND BOATS, including their fittings, 1730, 1748, 1770.

CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines. *None.*

FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 1717, 1718.

FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1704, 1714, 1725, 1729, 1738, 1745, 1747, 1750, 1760, 1765, 1766.

BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c. *None.*

LIGHTING, HEATING, AND VENTILATING, 1703, 1727, 1735.

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1701, 1715, 1720, 1744, 1753, 1762, 1771.

METALS, including apparatus for their manufacture, 1706, 1721, 1754, 1764, 1767.

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CHEMISTRY AND PHOTOGRAPHY, 1746.
ELECTRICAL APPARATUS, 1702, 1708, 1736, 1740, 1742.
WARFARE, *None.*
LETTER PRESS PRINTING &c., 1758.
MISCELLANEOUS, 1697, 1709, 1710, 1711, 1712, 1719, 1722, 1723, 1724, 1726, 1728, 1733, 1734, 1737, 1739, 1741, 1743, 1749, 1751, 1752, 1757, 1759, 1768, 1769.

1697. A. KELLERMANN. *The employ of new vegetable substances for dyeing, and especially to replace cochineal dye.* Dated July 28, 1858.

The vegetable substances used are the flowers and leaves of the elm (*ulmus*). The flowers produce a red and green colour, and the leaves a yellow colour. *Patent completed.*

1698. A. BOUGAULT. *An improved apparatus for purging or clearing steam engines of their condensed water.* Dated July 28, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1699. M. JOHNSON. *An improved rotary steam engine.* Dated July 28, 1858.

This consists in placing a wheel or revolving piston within a case, with journals for the axis of the revolving piston to work in or through, and which axis may be sufficiently long as to receive a fly-wheel (if necessary), also a cog-wheel or wheels, or other gearing for taking off and applying the motive power. *Patent abandoned.*

1700. R. HOWARTH. *Improvements in furnaces for steam boilers for the purpose of consuming smoke and economizing fuel.* Dated July 28, 1858.

This consists in so arranging the furnaces that the smoke from a fire to which fresh fuel has been applied is conveyed over a fire on which the fuel is in an incandescent state. This invention is particularly applicable to boilers having two fire-places and two flues. The end of each flue has a damper, and these dampers are raised and lowered alternately. When fresh fuel is applied to one fire the damper at the end of the corresponding flue is lowered to prevent the escape of the smoke into the chimney. The smoke from the fresh fuel is conveyed through a side passage between the two fire-places, or through a flue made near the firing doors over the other fire which is in an incandescent state; by this means the smoke is consumed and a saving in fuel effected. *Patent abandoned.*

1701. J. MANTON. *A new or improved candlestick.* Dated July 28, 1858.

This consists of a candlestick in which the candle is raised and lowered by a rack and pinion. *Patent abandoned.*

1702. W. A. GILBEE. *Improvements in the preparation of hydrated oxide of chromium.* (A communication.) Dated July 28, 1858.

This consists in preparing hydrated oxide of chromium on a large scale for painting and printing every kind of tissue, and for colouring paper. It is manufactured by two processes:—1. By heating on the sole plate of a reverbatory furnace, kept at a dull red heat, a mixture consisting of one part of bichromate of potass and three parts of refined boracic acid, moistened with water. This mass is thrown while red hot into cold water, and washed with boiling water to completely remove the borate of potass which has been formed. The improved hydrated oxide remains behind. 2. Replacing in the first preparation the bichromate of potass by chromate of soda. *Patent completed.*

1703. W. E. NEWTON. *Improvements in gas meters.* (A communication.) Dated July 28, 1858.

This consists, 1, in so constructing a measuring drum, which operates with an oscillating movement, that the water which seals the measuring chambers, and also the valve by which the direction of the gas is changed from one chamber to the other, are contained within the drum itself. 2. In providing such drum with a weighted lever properly applied to operate the valves by the oscillation of the drum. *Patent completed.*

1704. J. TAYLOR, J. LANG, and J. UTTLEY. *Improvements applicable to self-acting mules for spinning and doubling.* Dated July 28, 1858.

This applies to that class of self-acting mules, where a cam shaft is employed for effecting the changes in the working of the operating parts, when such cam shaft is rotated by a friction and contact pulley. The invention consists, 1, in arranging the friction pulley, so that it will, when acting upon the "contact pulley," be pressed against it by the force of a spring or weight. 2. In arranging the action of the friction pulley so as to dispense with the spaces formed in the periphery of the contact pulley. 3. In driving the friction pulley by gearing from the short intermediate or going-on shaft. *Patent abandoned.*

1705. H. HARDEN. *Improvements in the construction of tubular steam boilers.* Dated July 28, 1858.

This consists in constructing tubular steam boilers with iron tubes having brass ends, or ends formed of "homogeneous metal" or "homogeneous steel," secured to the iron part of the tube by brazing or otherwise, the ends of the tubes being those parts of the tubes secured in the tube plates. *Patent completed.*

1706. J. MILES. *Improvements in annealing pots used in the manufacture of iron, steel, and other metals.* Dated July 28, 1858.

This consists, 1, in making annealing pots with two open ends, and closing one end by a moveable lid. 2. In making stands for annealing pots with gauge pieces to resist the tendency of the pot to collapse. *Patent completed.*

1707. E. A. COWPER. *Improvements in generating power from steam, and in engines and apparatus for that purpose.* Dated July 28, 1858.

The inventor cools the cylinder and piston by a current of water so as to condense a sufficient quantity of the steam to keep the surfaces sufficiently cool to prevent abrasion; he is thus enabled to employ superheated steam of high temperature. He superheats the steam by passing it through pipes in a fire or flue. *Patent abandoned.*

1708. W. BUCKINGHAM, C. HUMFREY, and L. R. SYKES. *Improvements in the construction of telegraphic cables.* Dated July 28, 1858.

These consist in forming the rope which encloses the wires of silk and other fibrous materials, either alone or in combination with animal hair, and saturating such rope with gutta-percha. The inventors mix the gutta-percha when in the melted state with finely-powdered glass, silica, &c. *Patent abandoned.*

1709. J. CLIFF. *Improvements in the manufacture of soap.* Dated July 28, 1858.

The inventor makes soap from soap suds, scowerings, and other greasy waters. *Patent abandoned.*

1710. G. CAVAGGIA and A. SPINELLI. *Improvements in obtaining and applying motive power.* Dated July 29, 1858.

This consists in making the expansive force of gases evolved by the slow combustion of nitrates subservient as a motive power, or prime mover, for driving machinery. *Patent abandoned.*

1711. J. MUSGRAVE. *Improvements in stalls and enclosures for horses, cows, and pigs.* Dated July 29, 1858.

The specification of this invention is too lengthy to admit of an intelligible abstract in our pages. *Patent completed.*

1712. A. GALLARD. *A new system of trusses.* (A communication.) Dated July 29, 1858.

The inventor replaces the flat springs used in ordinary bandages with a small lever in the cushion; he replaces the cushions with stamped plates slightly stuffed; he adds a small band and a screw to regulate the pressure. *Patent abandoned.*

1713. G. S. PARKINSON. *An improved connecting apparatus for working railway brakes, and effecting a communication between railway guards and drivers.* Dated July 29, 1858.

This consists, 1, of a system of communicating power by tension to the brakes through two or more carriages, and in so arranging the apparatus that the slack which would be caused by the working of the buffer rods is obviated, and the extra tension which would be caused by the drawing out of the draw-rod is allowed for. 2, of a means of effecting a communication between the guards and drivers. The invention is not described apart from the drawings. *Patent completed.*

1714. J. BRIERLY. *Improvements in machinery or apparatus for spinning wool and other fibres.* Dated July 29, 1858.

This relates to spinning on the mule wool and other fibre carded or prepared by the condenser, and consists in causing the spindles of the mule not to rotate, or to rotate slowly, during a part or the whole length of the draught, or taking in of the length of the sliver required to be spun at each draw-out of the carriage, giving little or no twist to the said sliver during such taking in. *Patent completed.*

1715. J. L. HINKS. *Improvements in machines for cleaning knives, forks, spoons, and such other articles as are or may be cleaned by polishing, also in machines for sharpening knives.* Dated July 30, 1858.

The patentee describes a machine consisting of rotating brushes upon horizontal and parallel axes, driven by a winch. For sharpening knives he attaches to the foundation board a piece of leather covered with emery. *Patent completed.*

1716. J. F. W. FEATHERSTONHAUGH and F. WISE. *An improved self-acting apparatus for admitting water to steam boilers and indicating the water level.* Dated July 30, 1858.

The patentees use a float, which carries a rod passing through an opening in the top of the boiler, enclosed by a glass case placed on the boiler, through which the end of the rod is seen, and which is marked with divisions to indicate the level of the water. The float is also connected with a valve or tap communicating with the pump, the passages of the valve or tap being arranged so that when the water in the boiler is below the proper level communication with the pump is opened by the falling of the float. *Patent completed.*

1717. J. LUIS. *A machine for cutting up almonds for the use of confectioners and others.* (A communication.) Dated July 30, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

1718. J. LUIS. *An apparatus for cooling beer and other liquids.* (A communication.) Dated July 30, 1858.

This apparatus is composed of two tubes, one in the other: one tube is pierced with holes, and conducts the liquid to the watering-pump, the other conducts air from a ventilator to precipitate the liquid into the receiver. *Patent abandoned.*

1719. J. LUIS. *A new system of infusion apparatus.* (A communication.) Dated July 30, 1858.

This consists, 1, of an infusion apparatus with two vessels, one above the other, with a filter-box in the second vessel and a water-level indicator; 2, of a similar apparatus with two filter-boxes; 3, of an apparatus with the two vessels standing side by side; 4, of a water-level indicator alone. *Patent abandoned.*

1720. G. W. REYNOLDS. *A new or improved cradle.* Dated July 30, 1858.

This consists of a cradle turning upon a horizontal axis or centres. Connected with the axis of the cradle is a coiled spring, which can be wound up by a key. The said spring is connected by a train of wheels and an escapement with the axis of the cradle, and when it is wished to rock the cradle the spring is wound up and the cradle set in motion. *Patent abandoned.*

1721. J. SPENCE. *An improvement in the manufacture of sheet, hoop, and nail-rod iron.* Dated July 30, 1858.

This consists in manufacturing such sheet, hoop, and nail-rods from puddled steel, or steel produced from pig-iron in the puddling furnace. *Patent abandoned.*

1722. J. WATKINS. *Improvements in machinery or apparatus for the manufacture of tallow and other candles.* Dated July 30, 1858.

Here the patentee employs an upright deal pillar, on both ends of which are screwed steel gudgeons, which work in sockets fixed in the flooring and ceiling. The pillar is perforated with six mortices, through which six beams are passed, and secured to the pillar by pins. On the ends of each beam are placed the frames for dipping the candles, each frame carrying twenty-five "broaches." The pillar is set in motion by the attendant, and the machine in its revolution will convey each frame of candles to and from the dipping mould. This dipping mould is so constructed that by the use of a lever or levers the wiping board passes over it, by which the ends of the candles are regularly wiped. *Patent completed.*

1723. C. and F. SCHIELE. *Certain improvements in "hydro-extractors," or centrifugal drying machines, and in the method of lubricating their bearings, which method is also applicable to other bearings where lubrication is required.* Dated July 30, 1858.

The patentees employ a wire-gauze chamber of a comparatively small diameter. They also employ an archimedian screw or worm inside this chamber, which in revolving turns the wire gauze by the friction of contact, and is so arranged that the wire-gauze chamber may be retarded somewhat by the feed of the material to be operated upon, or by a brake, so as to have a less number of revolutions than the worm, by which means the material (for instance, the sugar liquor) is propelled from one side to the other continuously. To obtain a continuous lubrication, they employ tooth or worm gearing to secure the turning of a wheel, which brings up the oil to the surfaces from a reservoir below. *Patent completed.*

1724. H. BESSEMER. *Improvements in the treatment of pit-coal, and in the separation of foreign matters therefrom.* Dated July 30, 1858.

This consists in separating pyrites, shale, carbonate of lime, &c., from pit-coal, by immersing the coal and its impurities in a fluid the specific gravity of which is greater than pure coal and less than the substances to be separated therefrom. *Patent completed.*

1725. T. WEBB and J. CRAIG. *Improvements applicable to spinning, doubling, winding, and warping yarns or threads.* Dated July 30, 1858.

This consists of spinning, doubling, winding, and warping upon tubes constructed of paper. *Patent completed.*

1726. J. DAVEY, H. SIMS, J. MAYNE, W. HODGE, and J. GERRANS. *An improved construction of valve, applicable to various descriptions of engines or machinery.* Dated July 30, 1858.

This relates particularly to the clack valve, and consists in making a circular groove in the cover of the valve. The groove is of a dovetailed form in section, and has placed in it a ring of wood, covered with leather, &c., which forms a tight joint. *Patent completed.*

1727. J. H. JOHNSON. *Improvements in candlesticks or holders for candles.* (A communication.) Dated July 30, 1858.

This consists in the use of a screw spindle having spiral threads formed upon it, such spindle being contained within the hollow of the candlestick. The upper end of the spindle carries a "save-all." *Patent abandoned.*

1728. N. S. DODGE. *Improvements in treating waste vucanized india-rubber.* (A communication.) Dated July 30, 1858.

The patentee claims—1, the method of treating waste vulcanized india-rubber with a view to its re-application to the manufacture of vulcanized india-rubber articles, by first disintegrating such waste and boiling the same in water until a soft plastic material is obtained; 2, the method of treating such waste with asphalte, coal-tare resin, pitch, shellac, &c. *Patent completed.*

1729. J. S. BAILEY. *Improvements in machinery for combing wool and other fibrous materials.* Dated July 31, 1858.

This relates to rotary machines, in which taking combs are mounted on a rotating comb-frame, and which combs take wool, &c., from a feeding apparatus, and transfer it to transfer-combs also carried by the rotating comb, which transfer-combs deliver it to a receiving comb. The rotating frame also carries carding frames, which have, simultaneously with the rotary motion of the comb-frame, a rotary motion on their own axis, which surfaces clean out the wool, &c., after it has been deposited on the receiving comb. The patentee dispenses with the transfer-combs, and mounts the card or other cleaning surfaces on another rotating frame. This frame revolves in such relation to the taking comb-frame that the cleaning surfaces transfer the wool from the taking comb to the receiving comb, and after it is deposited on the receiving comb take effect on the wool so as to clean it. *Patent completed.*

1730. H. DOUGLAS. *Improvements in freeing screw propellers from wreck or gear with which they may become entangled.* Dated July 31, 1858.

The inventor applies a sharp steel cutter, firmly fixed to the frame or other part in which the screw revolves, in such position that any rope, &c., that has hitched on the screw will be drawn by the rotation thereof underneath and along the edge of the fixed cutter. *Patent abandoned.*

1731. W. HARTLEY. *Improvements in the arrangement of slide-valves and side-pipes or valve-casings of steam engines.* Dated July 31, 1858.

This consists in so arranging the slide-valves and side-pipes, or valve-casings of steam engines, that the steam and exhaust-valves are worked independently of each other. *Patent completed.*

1732. W. C. S. PERCY. *Improvements in arrangements and mechanism or apparatus for the manufacture of bricks, tiles, pipes, and other articles made of plastic earths.* Dated July 31, 1858.

This consists of a variety of improvements arranged under fourteen separate heads, for an intelligible abstract of which we cannot give space. *Patent abandoned.*

1733. G. ASHCROFT and H. W. WOOD. *An improvement in hydraulic machinery.* Dated July 31, 1858.

Between an ordinary hydraulic pump, &c., the patentees introduce a vessel fitted with a piston working air-tight therein. To one side of this piston steam, air, or gas is admitted of the desired pressure, such pressure being exerted upon the water in that part of the vessel beneath the piston. The vessel is connected by a pipe to a hydraulic

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press, &c.; and as water is forced into the vessel a constant and uniform pressure of the water therein may be maintained upon the ram or plunger. *Patent completed.*

1734. G. DAVIES. *Improvements in apparatus for planing electrotype and stereotype plates.* Dated July 31, 1858.

This consists in combining with the stationary cutter one or more horizontally rotating cutters, by which the plate is reduced to the required thickness, and its surfaces made true or parallel with each other by once passing beneath the cutters; and in certain springs and guides employed to keep the face of the plate in contact with the surface of the bed in which it is placed. *Patent completed.*

1735. J. HOUSTON. *Improvements in the means of effecting the consumption of smoke in furnaces.* Dated July 31, 1858.

This consists in preventing the smoke from ascending directly from the ordinary smoke-box by a damper or valve, which shuts in, when required, the lower part of the stack from the atmosphere. At or near the top of the smoke-box is a reverberatory tube or pipe, and just above the smoke-box a blow-pipe, which blow-pipe will cause the smoke to return to the burning fuel and be destroyed; that which passes into the smoke-box will pass through the reverberatory pipe into a chamber in which are jets of flame, which are intensified and directed by a blow-pipe, and this portion of the smoke will pass back into the smoke-box, and thus the whole will be consumed. *Patent completed.*

1736. H. CONYBEARE. *Improved apparatus and machinery for the laying of submarine telegraph cables.* Dated July 31, 1858.

This invention was described and illustrated at page 93, No. 6, of the MECHANICS' MAGAZINE. (New Series.) *Patent completed.*

1737. H. CONYBEARE. *Improvements in apparatuses for generating and superheating steam, and for producing the condensation of steam.* Dated July 31, 1858.

This invention was described and illustrated at page 172, No. 11, of the MECHANICS' MAGAZINE. (New Series.) *Patent completed.*

1738. G. T. BOUSFIELD. *Improvements in knitting machines.* (A communication.) Dated July 31, 1858.

Here when one of the feed-yarn breaks, instruments are brought into action which remove the corresponding presser from the beards of the needles, or which so change the position of the corresponding sinker that it no longer pushes the work from under the beards of the needles. The feed-yarn is passed through an eye formed in a rod, and when the feed-yarn breaks or fails this rod falls, and in so doing acts on a trigger, thus liberating a weighted arm which, in descending, withdraws a bolt and allows the presser to slide back in guides in which it is mounted. *Patent completed.*

1739. E. J. M. CETTI. *An improvement in barometers, gauges, and other analogous instruments.* Dated July 31, 1858.

This consists in making the glass tubes of the above instruments with the cistern and stop cock all in one piece. *Patent completed.*

1740. C. DE BERGUE. *Improvements in submarine telegraphic cables, and in machinery for paying out or laying down the same.* Dated July 31, 1858.

This invention was described and illustrated at page 157, No. 10, of the MECHANICS' MAGAZINE. (New Series.) *Patent completed.*

1741. E. AGNENI. *Increasing particularly the effect of decorative pictures, landscapes, drawings, and prints.* Dated August 2, 1858.

Here the inventor engraves the outline of such paintings, drawings, &c., upon the quicksilver of looking glasses. He scratches out such reflecting apparatus and applies upon the cleared part of the looking-glass his artistic production. Likewise he applies at first the artistic subjects upon the single glasses, outlining the same afterwards with the reflecting substances. *Patent abandoned.*

1742. W. H. CRISPIN. *Improvements in the construction of electric telegraph cables.* Dated August 2, 1858.

Here the telegraphic wires receive an external coating of gutta percha, then another coating of the like material combined with hempen fibre, the whole being finally surrounded with an external covering of ordinary rope. *Patent abandoned.*

1743. G. S. HILL. *Improvements in hydro-pneumatic machinery.* Dated August 2, 1858.

This invention is based upon the principle that atmospheric air will sustain a column of water varying from 28 to 32 feet in height, as indicated by the barometer. The machinery consists of a water-wheel of about 28 feet in diameter, a cistern or well underneath it, and a tank 3 or 4 feet in depth fixed above the water-wheel. This tank has an aperture at the bottom fitting with a sliding hatch to open parallel with the buckets of the water-wheel for the water to flow through. There are to be fitted to this tank as many pumps as are requisite, according to the power required for pumping the water from the cistern or well below into the tank above, which pumps are to be driven by gearing from the water-wheel. The machinery is set in motion by opening the aperture at the bottom of the tank, when the water will rush through into the buckets of the wheel with considerable force due to the column of water in that tank, and thus give it a continual motion. *Patent completed.*

1744. J. W. SCHLESINGER. *A new or improved machine for roasting and basting articles of food.* Dated Aug. 2, 1858.

Here a spit revolves horizontally, and is driven by a spring movement acting through a train of wheels. The spit carries a set of arms, which, revolving with the spit, actuate upon a cam fixed on the inner end of a shaft turning at right angles to the spit, the outer end of which shaft carries a jointed lever standing out in a parallel line with the spit, and at the extreme end of this lever is attached a spoon which rises and lowers as the arms on the spit actuate upon the cam. The spoon brings up the fat for basting. *Patent completed.*

1745. R. R. JACKSON. *Certain improvements in machinery or apparatus for sizing yarn.* Dated Aug. 2, 1858.

This applies to sizing machines in which the yarn is conveyed on guide-rollers past a number of heated chests for drying the yarn, and consists in connecting these guide-rollers with the size-roller, and with the carrying or delivering-roller in the front of the machine; and in driving them either from a separate counter-shaft or from any shaft in the machine. *Patent abandoned.*

1746. G. DAVIES. *Improvements in the manufacture of bituminous mastics.* (A communication.) Dated Aug. 2, 1858.

This relates to the manufacture of bituminous mastics having the native asphalte of the West Indies for their base. These bituminous masties are composed chiefly of crude resin oil, native asphalte of the West Indies, and earthy or calcareous matters. *Patent abandoned.*

1747. S. HINE. *Certain improvements in machinery or apparatus for twisting, doubling, and retwisting and winding silk, or other similar fibrous material.* Dated Aug. 2, 1858.

This consists in the use of two bobbins (containing the single thread of silk, &c.), one on each side of the spindle or flyer; the threads to be twisted or doubled are brought from the bobbins over two separate pulleys, and thence over the ends of two small balanced levers, from which the two threads descend to the quill or bobbin upon the spindle, where they are doubled together in the usual manner. *Patent completed.*

1748. C. MORTIMER. *Improvements in apparatus for raising and lowering ships' boats.* (A communication.) Dated Aug. 2, 1858.

Here the lower blocks of the davit tackles have attached to each of them a metal ball which fits into a corresponding socket fixed to the boat, and these sockets are so placed that whilst the weight of the boat is on the tackles the balls remain firmly held by the sockets; but when the weight of the boat is taken off the tackles by the sea, the balls fall freely out of the sockets, and the boat goes free. *Patent abandoned.*

1749. W. B. B. HARVEY. *Improvements in fly or screw presses.* Dated Aug. 2, 1858.

Here the screws of such presses are connected with the piston of engines, which make partial rotations within the engines. *Patent completed.*

1750. J. L. NORTON. *Improvements in apparatus for drying wool and other substances.* Dated Aug. 2, 1858.

Here the wool, &c., is placed on an endless apron, which moves into and through an enclosed chamber. The apron is formed so as to allow of air passing through it freely, and through and amongst the wool, &c., placed thereon. *Patent completed.*

1751. E. and W. HEYWOOD. *Improvements in the construction of metallic pistons.* Dated Aug. 2, 1858.

This consists in a mode of applying springs to the wedges acting on the wearing rings of pistons to keep them in contact with the internal surface of the cylinder within which the piston works. The wearing rings are each made in two segments. A wedge is inserted between the ends of the segments at one side, and a centre pivot is applied between the other two ends. This pivot prevents the escape of steam into the body of the piston. The wedge is made with an internal projection, which is acted upon by a coiled spring; by this means a constant pressure is kept up on the wearing ring. *Patent abandoned.*

1752. H. GREAVES. *Improvements in constructing streets and roads, and thereby facilitating traffic, and providing for the more convenient conveyance of sewage, drainage, gas and water supplies, and telegraphic wires along the same.* Dated Aug. 2, 1858.

The patentee forms the foot pavement of open work plates or grids of cast iron, and leaves a space beneath, along which the pipes for gas and water may be laid. The curb is also of cast iron, in the form of a hollow surface channel, having openings along its sides for the water from the roadway and foot pavement, and communicating at intervals with tanks sunk to a lower level for receiving the solid matters. There are arrangements for a railway included. *Patent completed.*

1753. M. BILLING. *Improvements in metallic bedsteads and cots.* Dated Aug. 2, 1858.

This relates to the head, foot, and side rails. The inventor employs a tubular form of metallic frame or beading, having a longitudinal slot opening, corresponding in width to the thickness of the pannelling to be inserted therein, so that by twisting or corrugating the edges of the said pannelling the same may be securely held. *Patent abandoned.*

1754. W. TAYLOR. *An improvement in the manufacture of iron.* Dated Aug. 3, 1858.

This consists in causing a stream or streams of hydrogen gas to enter into molten crude iron while yet in the crucible of an iron-smelting furnace. *Patent completed.*

1755. G. DAVIES. *A process and apparatus for the extraction of oils for illumination and lubricating purposes, and of carburetted hydrogen gas from the native bitumen of the West Indies.* (A communication.) Dated Aug. 3, 1858.

Here the apparatus is similar to that employed in the manufacture of coal gas. *Patent abandoned.*

1756. T. GREENHALGH. *Improvements in apparatus applicable to steam boilers.* Dated Aug. 3, 1858.

This consists, 1, in an apparatus by which the supply of feed-water is regulated; 2, in an apparatus by which notice is given when the water of a steam-boiler descends below a certain level; 3, in an apparatus for allowing steam to escape when the pressure in the boiler exceeds the required limits, part of which forms a mercury safety valve. These apparatuses are not described apart from the drawings. *Patent completed.*

1757. J. SHAW. *A machine for the manufacture of pasteboard and cardboard.* Dated Aug. 3, 1858.

This consists in pressing together sheets of paper by means of rollers; the several sheets of paper being caused to adhere by a glutinous substance. *Patent abandoned.*

1758. R. CUNNINGHAM. *Improvements in the production of letter-press printing surfaces, and surfaces used in reproducing ornamental patterns or devices by printing or otherwise, and in the apparatus connected therewith.* Dated Aug. 3, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1759. J. STEEL. *Improvements in brewing and distilling.* Dated Aug. 3, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1760. G. BELL. *Improvements in embossing and printing dies, and in the manufacture of "lace," or perforated embossed paper.* Dated August 3, 1858.

The patentee claims—1, in constructing embossing and printing dies with a loose "centre" or "centres," or plugs having flanges or heels, which prevent the centre or centres from falling out when the die is inverted, but which allow them to be protruded by the action of a spring to a sufficient distance to admit of their being inked; 2, constructing embossing and printing dies with a loose or separate collar, and a loose or separate centre or centres, such collar being secured by screws in or upon a block containing a spring for protruding the centre or centres. Also constructing such dies with a projection or flange in the interior of the block, for preventing the escape of the die or plate which rests upon the spring. *Patent completed.*

1761. J. KINGSLEY. *Improvements in the construction of steam boilers.* Dated August 3, 1858.

Here the inventor proposes constructing boilers of wood of sufficient strength and thickness to be coated internally with a non-combustible and impervious substance. The furnace for heating the water is to be contained within the boilers. *Patent abandoned.*

1762. J. H. JOHNSON. *Improvements in inkstands.* (A communication.) Dated August 3, 1858.

The essential feature here is the use of a tubular piston or plunger, fitting air and fluid-tight into a corresponding well, formed in the bottom of the main receptacle for the ink and having a stopper at its upper end, which stopper fits air-tight into the neck of the inkstand, excludes external air from the main body of ink, and prevents evaporation. The object is to raise a small quantity of ink for use, into an expanded dripping cup at the upper end of the plunger. *Patent completed.*

1763. J. GREENWOOD. *Improvements in the construction of steam boilers and other apparatus for heating water or superheating steam, which improvements are also applicable when heating air.* Dated August 3, 1858.

Here the patentee forms the plates of the apparatus for heating water with deep undulations. *Patent completed.*

1764. A. V. NEWTON. *Improved machinery for forging nails and other articles.* (A communication.) Dated Aug. 3, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1765. C. DE JONGH. *Improvements in machinery for assorting and preparing for spinning silk and other fibrous substances.* Dated Aug. 3, 1858.

This relates principally to a previous patent of the patentee, dated May 21, 1856, and consists in dispensing with the use of certain bands used in combination with an endless apron for feeding the fibres to the travelling chains. Instead of these bands he proposes to carry the feeding apron further forward, and pass it round a roller of small diameter, which will admit of the apron being carried over the travelling holding surfaces to the point where it is required to deposit the fibres. *Patent completed.*

1766. C. CALLEBAUT. *Improvements in sewing machines.* Dated Aug. 4, 1858.

This is not described apart from the drawings. *Patent completed.*

1767. J. SPENCE. *An improved method of rolling sheets from puddled steel or steel iron.* Dated Aug. 4, 1858.

Here the inventor first anneals the bar, either by slow cooling from the rolls, or by a separate process. He rolls it until it requires to be doubled, and then passes it into a chamber and keeps the heat greatly below the welding point of steel. After doubling he passes the sheets but once or twice through the rolls. *Patent abandoned.*

1768. J. TAYLOR. *Pneumatic and hydraulic machines.* Dated Aug. 4, 1858.

This relates to the use of air or water for moving weights, and consists in constructing a machine for raising, lowering, hauling, or transporting weights with gearing, and applying oscillating or stationary cylinders, directly connected therewith and fitted with pistons and the usual apparatus for transmitting the motive power employed, and converting the alternate or reciprocating action into a continuous circular motion. *Patent completed.*

1769. J. J. RUSSELL. *Improvements in machinery for cutting and screwing the ends of tubes.* Dated Aug. 4, 1858.

Here each tube is introduced into and fixed in a hollow mandril which receives rotary and reversible motion by suitable gearing. That both ends of a tube may be acted upon without moving it from the mandril, there is on either side of the head stock a bed, or suitable guides, on each of which slides a carriage having a cutter, for cutting off a portion of the end of a tube, and also a die or screw tool for cutting a screw at the end of the tube. The end of the tube when being cut is supported by rollers. *Patent completed.*

1770. J. W. GILES. *An improvement in propelling vessels.* Dated Aug. 4, 1858.

Here the propeller is applied at or about the centre of gravity of the vessel, the shaft of the propeller being at an angle to the keel, and, by preference, at or about an angle of 45 deg. to the horizon. *Patent abandoned.*

1771. J. BADCOCK. *Improvements in apparatus to be applied to ladies' dresses and other articles of wearing apparel.* Dated Aug. 4, 1858.

This consists in combining an apparatus for looping up dresses with a petticoat, belt, or band, by attaching the looping-up apparatus to the upper edge of the petticoat, belt, or band, in place of to a separate belt or band as heretofore. *Patent abandoned.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, APRIL 1, 1859.

PATENTS FOR INSTRUMENTS AND MUNITIONS OF WAR.

With most indecent haste, to say the least, the law officers have pushed through the House of Commons the bad Bill against which we hastily protested in our last number; or it would probably be more correct to say that they have allowed it to be thus forced forward without taking the trouble even to read it. Last year they acted in this manner; for when pressed upon the subject they admitted that the International Patent Right Bill had actually passed through all its stages in the Lower House, and had gone up to the Lords, before they became at all acquainted with its nature. And yet that was a Bill which, if it had become law, would have virtually overthrown the whole of the existing patent laws! So bad was it that the Clerk of the House of Lords would not so much as lay it upon the table, but got it summarily condemned to the oblivion for which alone it was fit.

This year's Bill—for the Suppression of Patents relating to Instruments and Munitions of War—was introduced and read a first time on the 21st of March; on the 24th it was read a second time; on the 25th it was passed through committee; and on the 29th it was read a third time. Thus in one week it has been hurried through all its stages, and that a week in which the powers of the House have been most excessively taxed by the demands of a prolonged debate on a profound constitutional subject. Further, it has received most, if not all, of its readings at midnight, when a proper consideration of its provisions could not possibly take place. What its fate will be in the House of Lords remains to be seen; but that it will pass we can scarcely believe; for, in its present form, it contains not inherent weaknesses only, but absurd formal defects. For example, while the 10th clause runs, "It shall not be lawful for any person to take proceedings, by *scire facias* or otherwise, to repeal any letters patent for any invention in relation to which the said Secretary of State has certified as aforesaid," the marginal abstract of that clause reads, "No *scire facias* to be brought until final judgment in an action for infringement." The two are manifestly at direct variance with each other, instead of being identical.

But however disgraceful the passing of such a Bill through the House may be, we have to deal with deeper evils than those of verbal blundering. We believe the whole design and scope of the Act is bad. It is a measure which is alarmingly capable of being turned into an enormous engine of corruption. It will give the Secretary of State for War and his department a terrible power of doing wrong. It is absurd to speak of the matter as applicable to rare and exceptional inventions only. There are scores of inventions for improvements in instruments and munitions of war patented every year, and the Secretary for War may seal up any one or all of them, if he pleases, and if the inventors be willing. Now, is it right to give a Minister the power of dealing with scores of inventors annually—the power of accepting their inventions, paying for them with public money, and sealing up from the public eye all the information relating to them? On the other hand, is it right to put the inventor, even with his own extorted consent, so completely in the power of a Minister as this Act does? No provision is made for securing to the inventor his just recompense, by arbitration or otherwise. No security is given to the inventor by which he may be assured that if his invention is locked up he will be fairly rewarded for it. In fact, the Bill, if it does anything at all, puts both the public interests of the country and the personal interests of the inventor entirely at the disposal of the Minister for the time being. The effect of this will be to drive English inventors to foreign Governments with everything that is really valuable.

Now, is there anything in the proposed secret system to render these evils tolerable? We believe not. If Great Britain were a weak, defenceless State, liable to menace and open to attack, there might be some ground for attempting to keep its advances in the means of war secret, in order to give it a chance of temporarily augmenting its powers of resistance if assailed. A chance of this kind might be worth the evils which such a system would necessarily entail. But is it becoming in England to resort to a policy of this kind? Is it worth its while to submit to those concomitant evils? Is not, on the contrary, our best, and bravest, and most satisfactory policy that of attempting no concealment, and subjecting ourselves to no corruption, content at all moments to defend ourselves with weapons which all the world may see. We are beyond all question both the richest and the ablest people on the face of the earth, and no devices of secresy are needed in order to keep us in our proper position.

The system proposed by the Government Bill will never, we are firmly persuaded, work satisfactorily if attempted. Numerous cases which may readily occur to impede its operation suggest themselves to our minds. For example, directly the Government purchase and seal up a patent, numerous claimants for the whole or parts of the invention will, notwithstanding the attempt at secresy, spring up on all sides; and as some of these may be the proprietors of existing patents, it will be impossible either to satisfy them or to put them off with vague assurances. Again, supposing the Government give an inventor £10,000 for an invention, which they carefully seal up; what is to hinder any second person who may come to know what the invention is (by connivance with the first inventor or otherwise), from offering the same invention to the Government, and thus setting up a second claim for a like or any other amount? If the demand be refused, the threat of publicity or of communication with a foreign Government will be held out; if granted, the public will be defrauded. The like process may be repeated any number of times. Indeed, there is nothing whatever in the Act to prevent a man who has sold his invention to General Peel to-day from selling it by an agent to the Emperor Napoleon to-morrow, and to the Czar of Russia the next day. Of course he will put himself under covenants and agreements not to communicate it to others, and of course no honourable man would then communicate it; but there are others who would be quite capable of doing so; and in making laws we should put no premium upon roguery.

But, not to extend these remarks, we confidently state that, whatever opinions may be held as to the principle of the measure, its passage in its present form is viewed with apprehension by those who have excellent means of understanding its character. Several of the most eminent inventors of guns and projectiles have expressed themselves strongly against it, and it is our duty to protest in their name against its unseemly progress. With proper time for its consideration the measure might, perhaps, be made tolerable; but as it is, there is nothing to be said of it save by way of deprecating its further progress, for the present, at least.

THE LONDON MECHANICS' INSTITUTION—WHO FOUNDED IT?

Fame, although no more than a "flake of rainbow flying on the highest foam of men's deeds," is nevertheless about as great a thing as man can aspire to in this world, and a common instinct of justice makes us all desire that when a wreath of honour is to be bestowed the right head should be lifted up to receive it. Now, it is universally admitted that the establishment of the London Mechanics' Institution was the root of that great modern tree of knowledge, the fruits of which are the thousands of Mechanics' Institutes that now abound in the land. In confirmation of the fact we have the testimony of a meeting held on Monday last at Willis's Rooms, at which the Bishop of St. David's moved, Sir John Johnstone, M.P., seconded, and the audience unanimously resolved, "That the London Mechanics' Institution having been the first society of the kind instituted in England, *having called many hundreds of similar institutions into existence*, and having afforded instruction in science and the arts to more than 25,000 of its own members.....possesses a strong claim upon public support and sympathy." The claim of the Institution being thus admitted, the founder of it is, of course, deserving of immense credit, and has a just claim upon the regards of ourselves and posterity. Who, then, was the founder?

Two men, and two only, have been prominently put forward—not conjointly, but independently—as its founders, viz., the late Dr. Birkbeck and the late J. C. Robertson, our respected predecessor, who, in 1823, brought the Mechanics' Magazine into existence. Lord Brougham, also, has, it is true, sometimes been mentioned as the founder, but his claim is seldom urged, and his lordship himself insists upon preference being given to another. Were there any room for a valid doubt as to the actual founder we should decline to discuss the subject, notwithstanding our close and manifest connection with it. But we believe there is none. Let us look at the facts of the case.

In a letter from Lord Brougham, read at the meeting before referred to—a meeting held in aid of the fund for the purchase of the building occupied by the Institution—his lordship thus refers to the opposing claims put forward by the friends of Dr. Birkbeck and of Mr. Robertson respectively:—

> "Such a meeting as you announce," he says, "can never be held without bearing in grateful remembrance the founder of the Institution, and they who question Dr. Birkbeck's claims to this great distinction have only been able to state that others had some months before broached the idea of such a plan. But twenty or thirty years before, he had laid the foundations of all that has since been done by delivering a course of lectures to working men, so that the great step must be regarded as having been made by him at the beginning of the century, and not in 1823, when we both founded and endowed the London Institution."

Now, before we proceed with this discussion, we must beg the reader to observe precisely what it is we have to decide—viz., who founded the London Mechanics' Institution?—because Lord Brougham here confuses the matter most seriously. What is the "great step" to which he refers? If the paragraph means anything definite at all, it must imply (1), that Dr. Birkbeck's lectures to working men in Glasgow, in 1800-1, were the first notable step towards the education of mechanics; (2), that the editorial articles in the Mechanics' Magazine, in 1823, merely "broached the idea" of a mechanics' institution, and nothing more; and, (3), that "some months" after that article appeared Dr. Birkbeck—or he and Lord Brougham together, for his lordship says "we" at the end of his sentence—founded the Institution.

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We deeply regret the necessity we feel under of pronouncing and proving this view of the facts wrong, and most unjust to the memory of Mr. Robertson. Lord Brougham is an aged and honourable man, with a reputation so great and so pure that we would not lightly breathe upon it; but the truth is better than any human reputation, and we need not shrink from the right in any man's behoof. To the facts.

In No. 7. of the MECHANICS' MAGAZINE, for Oct. 11, 1823, Mr. Robertson published an editorial article (prepared at his desire by Mr. Hodgskin, his assistant), in which the establishment of an Institution, to be called "The London Mechanics' Institute," was advocated, and in which he announced that he was then "employed in maturing a plan" for giving effect to his desires in this respect. He further invited correspondence upon the matter, and the article concluded by saying:—"If we should see, as the result of this invitation, a probability of succeeding in our object, WE *will then call a public meeting for the purpose of submitting our plan for such an Institute*, leaving it with the meeting to dispose of it as they may think fit." The next week's number of the Magazine showed that the invitation was warmly responded to, and among other letters, one from Dr. Birkbeck to the editor, Mr. Robertson, was published, in which the Doctor said:—"It will afford me the greatest pleasure *to give you* any information which you may require respecting the original mechanics' class in Glasgow, and every *assistance* within my power in the formation of the Mechanics' Institute of London." In his editorial remarks in this number, (No. 8, for Oct. 18, 1823), Mr. Robertson concluded by saying:—"Finding the proposition which we made" (the WE should be particularly observed throughout this passage), "thus spontaneously approved and encouraged to a degree exceeding our most sanguine expectations; having no longer the least doubt as to the probability of success, we shall in our next announce the time and place of a public meeting to take the whole matter into consideration." In the next number it was stated that the arrangements were too far from complete to admit of the announcement of the meeting in it; but in the following number (No. 10, for Nov. 1), the meeting was appointed for 11th Nov. On that day—precisely *one month* after the first article on the subject appeared in the MECHANICS' MAGAZINE—the meeting was held, Dr. Birkbeck taking the chair by invitation (beyond doubt at Mr. Robertson's suggestion), and Mr. Robertson himself bringing forward the resolutions which were carried, and conducting the responsible business of the evening. Lord Brougham—then plain Henry Brougham, of course—was not even present, although he wrote an encouraging letter, and sent a draft for £20 upon his bankers. All these facts can be perfectly verified by simple reference to the first volume of the MECHANICS' MAGAZINE.

We will neither degrade ourselves nor affront our readers by commenting with any kind of elaboration upon the circumstances thus set forth. In every sense in which it is possible for a single man to found an institution—except that of finding *all* the necessary funds—Mr. Robertson founded the London Mechanics' Institution. That he was nobly aided by Dr. Birkbeck and Lord Brougham we most emphatically affirm, as Mr. Robertson himself repeatedly affirmed with the utmost cordiality. But as far as the actual origination of the Institution is concerned, there was another man who did more than they—and that was Mr. Hodgskin, who drafted the first editorial article, and was intimately and earnestly associated with Mr. Robertson in the earliest stages of the undertaking, *before either Dr. Birkbeck or Lord Brougham spoke, wrote, or knew anything whatever about it.* This ground it is impossible for us to give up. If the founding of the Institution be set aside, and the lectures of Dr. Birkbeck in Glasgow, 23 years before, be deemed the source of Mechanics' Institutes everywhere, then, of course, Mr. Robertson's claim to distinction as their founder ceases—and with it, we must be permitted to say, the Bishop of St. David's resolution, and a great deal more that certain modern friends of the Institution are doing their best to keep in existence.

If Lord Brougham can explain away the facts we have stated, well; if not, it is, we respectfully submit, incumbent upon him to retract the statement made in that part of his letter which we have quoted. No man can blazon abroad errors of the kind into which he has there fallen without detriment to his reputation; and it will grieve us deeply to know that the honoured name of Brougham has not been wiped away from a statement which *seems*, at least, to be "splenetic, personal, base."

TENT ARCHITECTURE.

IN the midst of this age of invention a man has only to open his eyes and look straight before him occasionally, and he will discover, notwithstanding all our skill, that many of the most common objects of life are still of the rudest possible character, or, at the best, but little removed from it. Let us take, for example, the case of tent construction, or of "tent architecture," to use a more ambitious designation, and what do we find? This: that while we have been spending year after year, age after age, century after century, in discussing Classical, Gothic, Early English, Late English, Perpendicular, Flowing, Geometrical, Decorated, and a thousand other styles of architecture in brick and stone, for the mere gratification of priestly prepossessions and artistic fancies mainly, we have been crowding our armies into tents of so bad a construction that they will neither keep out the water, nor admit the air, nor hold their place in a gale, nor effect satisfactorily any other object for which they are designed. That we may not fall into any exaggeration on this important subject, we will notice particularly the facts brought forward in the very instructive paper by Major Rhodes, the conclusion of which appears on another page of this Number—a paper which has a peculiar value, inasmuch as it treats copiously of a subject respecting which literature has hitherto been almost silent.

Now, Major Rhodes tells us that the canvas of which our British army tents are made is often bad; that neither the canvas nor the tent ropes are waterproof, and they therefore absorb so much moisture that their weight is often increased one-third; that for the reason just stated, the canvas allows damp to penetrate it; that the alternate wetting and drying of these non-waterproof materials rots them rapidly; that the ground fastenings are insecure, and sometimes yield to the stress of stormy weather—in which they are, of course, most necessary; and that the construction of these tents is such that they cannot be properly ventilated, and hence the troops occupying them are subjected to fever, diarrhœa, dysentery, cholera, and other deadly diseases. The reader has but to turn over a leaf or two and read for himself of the defects which Major Rhodes so clearly describes, and so variously illustrates by facts which cannot be questioned.

Fortunately, the defects which Major Rhodes has investigated are not left uncorrected. Bringing the experience of camp life, both at home and in the Crimea, to bear upon the subject, the gallant officer has given us a simple remedy, or rather an improved set of tents embodying the several remedies deemed necessary. The useful and practical character of his improvements our readers will at once discern. They involve the use of nothing cumbrous or costly, but furnish the means of providing the soldier with a firm, light, dry, and well-ventilated tent, which no civilian will ever be found to grudge him, and which no military officer should withhold from him. Yet our military authorities do appear—judging from the last paragraph of the Major's lecture—very slow in giving the new tents a proper trial. We ask not why—nor will the reader. Can an English public department do any good thing well or quickly?

The Hanoverian Government have, however, already had the tents examined and reported upon, and in confirmation of the high opinion of them which we have expressed, we will quote from the report of Colonel Richers to Major and Adjutant-General von Tschnirchnitz upon the subject. Colonel Richers says there were brought him in the camp at Wülfingen, three of Major Rhodes' tents, with the commands of His Majesty the King to pitch them in the camp of the 2nd Regiment of Infantry, and to examine them as to their suitability and durability. In respect of all the tents he says:—

"The interior space is much increased (beyond that of the Hanoverian army tent) from top to bottom; the men can stand upright without difficulty (this is not the case, however, with the very low watch tent), and the middle area of the tents is not diminished by the pole. There is a very useful arrangement within these tents for placing the muskets and accoutrements of the men, which, hardly decreasing the interior space of the tent, affords much convenience to the soldier. . . . The soldiers can readily lay hold of their own arms and accoutrements, even in the dark, without the slightest confusion or delay. The covering of the tents is of double white canvas, sewed together. It is a manufacture of wool and hemp. During the weather we had at the camp of Wülfingen, the tents were much warmer in the cool of the night than our linen ones, and much cooler than the latter in the heat of the day. In this respect, Captain Rhodes' tents have a twofold advantage over the linen tents of the Government. The pitching and striking of these tents offer no difficulties. The non-commissioned officers and privates, under my orders, learned the way after once seeing a tent pitched by the armourers (*zeughaus-officianten*), sent me for that purpose. Eight men, after very moderate practice, can pitch an hospital tent in from ten to twelve minutes; and four men a field tent in five minutes; the same with a guard tent."

After these general observations, he proceeds to give more special details of each tent, expressing his strong sense of their value.

If soldiers be worth anything at all—if it be not altogether an indifferent matter whether they are carried off by fatal zymotic diseases or not—if thousands of Englishmen, trained by years of incessant practice to the arts of marching and fighting, be really worth a little care on the part of their plumed and jewelled commanders, we ask that this question of how best to build the soldier's home may not be set aside or slighted. Seven-tenths of the mortality in our infantry are caused by zymotic, chest, and tubercular diseases. Let us save them, if we can—for their money value to us, if from no nobler motive.

ROYAL NAVAL ENGINEERS.

BEFORE the Admiralty can hope to make the engineers of the Royal Navy, as a class, what they ought to be they must do two things: first, they must cease altogether to enter as naval engineers men of inferior education and character; and, secondly, they must so far improve the position of the naval engineer as to render it acceptable and agreeable to young men of a superior kind. Lightly as it may be thought of by certain Admiralty functionaries, a reform in both these

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respects is of immense importance, even as a matter of economy. If it were possible to lay before their lordships the expense to which the country is put by the unnecessary deterioration of boilers and engines which often results from neglect and mismanagement, we should not, we think, require to urge important changes upon them week after week. But such an appeal to matters of fact ought not to be required. Let any man of sense and education acquaint himself with that untutored class from which assistant-engineers have of late years been taken, and then ask himself whether it can by any possibility be a prudent thing to commit costly and delicate machinery to hands like theirs.

Nor will it suffice to reply to these considerations by saying that better men are not to be had in sufficient numbers. That they are not is due only to the fact that such men very properly refuse to mix themselves with others in every respect their inferiors, or to enter the service at all until the invidious differences that separate engineers from other scientific officers are removed. Let us take, for example, the masters—a most exemplary and deserving class of officers, but a class who have no inherent superiorities to engineers, so far as we know. Now, in the first place, masters are allowed to have three years of the time which they serve as second-masters qualified for master to count for increase of full and half-pay and retirement allowances. Again, by Order of Council of 19th May, 1846, "Forty of the senior masters on the list have the option of receiving the retiring rank of commanders; the first twenty at 12s. 6d. per diem, and the rest at 10s. 6d. per diem. Their widows are allowed pensions of £60 a-year." Further, masters at sixty years of age, who are qualified for first-rates, and who have twenty years' service as masters, may retire with the rank of captain; the amount of their retirement pensions being paid according to the rate of half-pay which they have earned by service as masters. They are further allowed store allowance when in charge of stores, varying from 4s. to 2s. 1d. a-day, according to the rate of the ship; and they have likewise tuition money of £5 per annum for each young gentleman instructed in vessels not bearing a naval instructor. They have further means of increasing their ordinary pay by pilotage allowances, for taking the vessel to which they may be attached into various ports requiring a pilot. Finally, dockyard appointments are also open to these officers as master attendants and assistant-master attendants, on increased pay and allowances.

Now, in contrast with all this, we find that neither is the engineer's time served as assistant-engineer, or any part of it, allowed to count for chief-engineership; nor is he allowed retirement allowances; nor does his widow receive £60, but only £50, pension; nor has he any allowance on account of stores; nor does either tuition or pilotage money fall to his lot; nor has he any very promising prospect of a dockyard appointment. In all these respects the engineer is kept inferior to the master, although nominally placed on a level with him. And in making this comparison, there is another consideration which should not be lost sight of. The master, as is well known, acquires his professional knowledge in the service, while the engineer has to gain his before he can enter the navy at all. Now, this is a very important fact, and one which gives the engineer the first claim of the two upon the good offices of the Admiralty. Yet the engineer is, as we have shown, treated with marked indignity. He is so, indeed, in other ways beside those which we have mentioned. The utter want of cabin accommodation to which all but chief engineers are subjected, deters many qualified persons from entering the service. The art and the science of engineering are every day advancing, and unless men keep themselves acquainted with its progress, it is impossible for them to keep pace as they should with the improvements of the day. The naval engineer, more than any other man in the ship, should be a student; but how is it possible for him to study huddled up in an engineer's mess with the noise and distraction of half-a-dozen others pressing upon him? Another mark of indignity is to be observed in the fact that engineers are the only officers whose appointments are not given out to the reporters of the daily press in the lobby of Whitehall. All others, from the captain down to the clerk's assistant—nay even to your gunner, are most faithfully sent forth, the engineer of our steam navy being the only exception.

All that we ask for the engineer of the British navy, and more, has been done already by the Emperor Napoleon for the French engineer. In the French navy, the first-class engineer ranks with the captain of a line-of-battle ship; the second-class engineer with the captain of a frigate; the sub-engineer of the first and second classes, with the lieutenant of a line-of-battle ship; the sub-engineer of the third-class with the lieutenant of a frigate; and the engineer apprentice with the naval cadet. Surely, if France can thus give her scientific class due and unequivocal rank, there ought to be no insuperable obstacle in the way of that class obtaining its just recognition in this country. The Lords of the Admiralty have again, we are informed, declared themselves unable to entertain the claims which we have endeavoured to state as fairly as possible; but this should and shall in no way lessen our expectation of ultimate and even speedy success.

THE SHORTEST WAY TO AMERICA.

If travelling be, as has been said, "a fool's paradise," it is a paradise which many innocents delight in; and they all demand the means of moving over the greatest possible distances in the least possible time. We were conversing this week with a gentleman—certainly no fit candidate for the kind of paradise mentioned, but a very sensible and excellent man—who, no longer ago than January last, was doing daily duties at Bangkok, away in the remote kingdom of Siam, but who, since that time, has made a leisurely visit to Singapore, spent three days idle in Ceylon, as many more in Egypt, strolled a week away in Paris, warmed himself in the sun of London last week, shivered in the snow of London this, and in six or seven days from the time at which these lines appear, will sit cosily with his wife and babes at home in New York. If we go on travelling at this rate, and still demand shorter routes and swifter ships, shall we always, we are almost ready to ask, find one world large enough for us? Shall we not ere long be attempting to sail from planet to planet, and steam from star to star?

But, without stopping to consider such curious questions as these, it is to be remarked that the great gain in time which has been assured to travellers between England and America by the Lever line, or Galway route, ought if possible to be made permanent. That it can be, is very clearly established by a document before us, and to this we here propose to direct attention. It is a copy of the report lately made to the Admiralty by Captain Washington, R.N., Captain Vetch, R.E., and Mr. Barry Gibbons, C.E., on the capabilities and requirements of the Port and Harbour of Galway. The instructions of the Admiralty with regard to these gentlemen directed them to report on the following points:—1. Whether any part of the Bay of Galway is capable of being made a harbour of refuge, or whether the bay possesses such advantages as would render it eligible in any part as a harbour of refuge. 2. Whether from its position such advantages would invest it with claims as a packet station; and, 3. If so, what plan should be adopted to facilitate the landing and embarkation of passengers and goods, especially during the winter months. In accordance with these instructions, they took advantage of a short recess in the Refuge Harbours' inquiry, and proceeded to Galway on the 5th of October, and spent the following four days there, during which, in company with Captain Bedford, R.N., Admiralty Surveyor, who surveyed the bay and harbour of Galway in the year 1845, Mr. S. U. Roberts, C.E., county surveyor and resident engineer on the part of the Board of Public Works in Ireland, some of the Harbour Commissioners, the chief pilot, and the harbour-master of the port, they visited and examined the river Corrib, Lough Atalia, the docks, and the limestone quarries. They also embarked in a small steamer, placed at their disposal by the Harbour Commissioners, and steamed round the roadstead, visiting Mutton Island with its lighthouse, and the Margarita and Black Rock shoals, a short distance down the bay.

In the roadstead they singularly enough found the transatlantic steamer Pacific, just arrived after a voyage of less than six days from Newfoundland. Some colliers were lying near the steamer, waiting to complete her with coals, but, owing to a fresh breeze from the S.W., they were unable to go alongside; and heavy demurrage was being paid to the coal vessels, in addition to the extreme inconvenience caused to the steamer in not being able to prepare for her return voyage, for which all the berths were already taken.

In answer to the first question, the Commissioners report that Galway Bay is to a great extent a refuge harbour already formed by nature. Its approach from the ocean is well defined, it is easy of access, and free from outlying dangers. It has a width of twenty miles between the outer headlands which shelter the bay, while the magnificent natural breakwater of the Arran isles stretches across fourteen miles of the width, and arrests the force of the Atlantic swell, leaving on either side a navigable channel or sound about four miles in width, well defined by day, and admirably lighted by night. This bay is 25 miles in length, from the Arran isles to the town of Galway, and all within it is safe as far as concerns the main point of a refuge harbour, namely, the saving of life. Under Black Head, on the south side of the bay, a fleet of 19 sail of East Indiamen, in the year 1794, rode for several weeks while waiting convoy. In the event of a vessel being driven into the bay with loss of anchors and cables, or in a leaky state, as recently occurred to the Propeller steamer, she may be safely run upon the soft mud in New Harbour, at the head of the bay.

In respect to its claim as a packet station, the Commissioners sagaciously observe that the problem has been solved, and in a way such problems ought to be solved. The enterprise of the Lever Transatlantic Packet Company has demonstrated that Galway has such a claim. It is an established fact that large transatlantic steamers, carrying 300 passengers, have for months used Galway as a packet station, have performed their voyages with punctuality and safety, and on one occasion have made the passage from Newfoundland to Ireland in less than six days—the quickest passage on record.

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As to the landing and embarkation of passengers and goods, especially during the winter months, they deal with the latter part of this subject first, and consider, first, a landing quay; second, security in the roadstead; and third safety of navigation. Not only for the accommodation, but for the security of passengers, it is absolutely necessary that some immediate steps be taken to provide for the want of a landing quay. At present the large steamers are compelled from their draught of water to anchor in the roadstead at a distance of nearly one mile from the town, and to land their passengers and goods in hookers, open boats, or a small steamer. This may be accomplished at high water, but towards low water the discomfort and risk are very great, and such as no passengers should be subjected to. Mr. Roberts, C.E., the resident engineer, has prepared a plan, by means of which such temporary accommodation may be obtained at a trifling outlay. For the safety and the convenient placing of large packet steamers, three pair of moorings are stated to be required in the roadstead: two pair for the arriving and dedeparting steamers, and a third for a coal depot. And, lastly, the safety of navigation in approaching the harbour absolutely requires, in the judgment of the Commissioners, that a large conspicuous buoy and a red light be added, at certain points pointed out by them, to the present lights and beacons at the expense of the Ballast Board of Dublin. If these three simple works—the landing quay, the moorings in the roadstead, and the light and buoys—were executed at once, sufficient would be done to provide for the now pressing wants of Galway as a packet harbour; and passengers and goods might then generally be landed and embarked without risk, and the steamers might be navigated with safety, and lie at moorings in the the roadstead with tolerable shelter and security.

Should, however, the experience of twelve months prove that permanent packet station at Galway is required for Ireland, or for the general advantage of the United Kingdom, and especially for the carrying of the mails (and the present number of passengers, the amount of correspondence,* and the shortness of the voyage would seem to warrant such a conclusion), a more comprehensive scheme would become necessary, and such a scheme should embrace a harbour for national purposes, that is, a station for coaling and repairing steamers in time of war, for assembling convoys, for the relief of troops, and other military communications with the British North American colonies—a want that, sooner or later, must be provided for somewhere on the west coast of Ireland. Being on the spot, the Commissioners felt it to be their duty to consider such an extended plan, and instructed Mr. Roberts, C.E., to have the necessary borings and examinations made that would be required to enable a decision to be arrived at on some of the designs that have been suggested. They give a general outline of these designs, showing their leading features, with an estimate of their probable cost. We are happy to find that their report is in all respects favourable to the capabilities of the place.

Here, then, is good ground for believing that the distance to America, measured by time, has been definitively shortened by several days. All opposition to the Galway line from persons interested in the southern and western ports of England will and must prove unavailing. The public interest, and—what is more exacting—the public convenience, demand that the new route shall be kept open, and it only remains for rival ports to bear their injury as best they can.

* It is stated in evidence that two-thirds of the whole correspondence with the United States consist of letters to and from Ireland.

Parliamentary Proceedings.

CONDENSED FOR THE "MECHANICS' MAGAZINE."

THURSDAY, MARCH 24.

HOUSE OF COMMONS.

PATENTS FOR INVENTIONS (MUNITIONS OF WAR).

The Bill was read a second time.

FRIDAY, MARCH 25.

HOUSE OF LORDS.

THE WESTMINSTER CLOCK.

Lord CAMPBELL said the clock in the tower was expected to have been long before this of great service to the public, and especially to the gentlemen attending Westminster-hall, but it was not yet at work, although it had been placed in the tower for some time. The clock had four dials, and he observed on passing the tower that day that the fingers on each dial pointed to different figures. He understood that during his absence on circuit the clock had been at work for half an hour.

The Earl of DERBY said Sir C. Barry had stated that the chamber would be ready for the reception of the clock in the course of a week or ten days, but that Mr. Denison still required some work to be done in the tower.

HOUSE OF COMMONS.

PATENTS FOR INVENTIONS (MUNITIONS OF WAR).

This Bill passed through committee.

TUESDAY, MARCH 29.

HOUSE OF COMMONS.

PATENTS FOR INVENTIONS (MUNITIONS OF WAR).

This Bill was read a third time.

SOCIETY OF ARTS.

AT a meeting of the members of the above Society, held on Wednesday last, Mr. Fothergill Cooke in the chair, Mr. Alfred Varley read a paper "On the Practical Bearing of the Theory of Electricity in Submarine Telegraphy, the Electrical Difficulties in long Circuits, and the Conditions requisite in a Cable to insure rapid and certain Communication." Mr. Varley observed that the metallic core of a submarine cable should be composed of a conductor of the highest specific conducting capacity, that a decrease in the retardation which is caused by the induction that takes place in submarine circuits can only be obtained by increasing the thickness of the insulating material, but that it will be better to do this by enlarging the sectional area of the conductor as much as is practicable. In designing a cable there are many considerations besides those of its simple electrical qualifications which have to be entertained. The object to be obtained is the best result with the most economical investment of money. Are the proportions which were adopted in the Atlantic cable the best to insure this? The weight of the conducting coil in this cable is about 63 lbs. to the mile, the value of which, speaking roughly, would, I suppose, be about as many shillings; when served with gutta percha its value was raised to £40 per mile; the iron sheathing and getting the cable on board brought its value up to £100 per mile. In this cable, therefore, only four per cent., at the outside, was invested in the conductor upon which the transmission of the messages depended. If the views which I have brought forward are correct, a conductor of double the diameter would only produce half the amount of retarding force of one of half the size; such a conductor at the very outside would not cost more than £16 per mile; and the increased expenditure in serving such a conductor with gutta percha and giving it an iron sheathing would not, comparatively speaking, be very large. The expenses of the staff and the hire of ships would be about the same in both cases. The latter would be, perhaps, increased slightly, but not to any material amount. The paper, which was unusually long, was received at its conclusion with demonstrations of applause by a numerous audience, among whom were noticed Professors Walker, Tyndall, and Hughes.

INSTITUTION OF ENGINEERS IN SCOTLAND.

AT a meeting of this Society, on Wednesday evening, Robert Stephenson, Esq., M.P., and Prof. R. Clausius (of Zurich), were unanimously elected honorary members.

Mr. Hunt, the Secretary, introduced for discussion the subject of

PATENT LAW REFORM.

After glancing at the existing patent laws, Mr. Hunt said the reduction in the fees on patents in 1852 opened the door to a great number of perfectly worthless inventions, but perhaps the worst evil consisted in the patenting (or in most cases the merely provisionally protecting) of numerous really valuable inventions by parties not in positions to work out their ideas to practical and useful results. An evil arising from the great number of patents was the difficulty of ascertaining what was and what was not patented. It was extremely fortunate that when in 185- patents increased so enormously, steps were at the same time taken by the Government to mitigate this evil by printing and distributing the specifications. Notwithstanding this, the evil referred to must necessarily continually increase, and a further reduction of taxes must notably enlarge the rate of such increase. The reduction of patent taxes would doubtless be a boon to inventors and to the public, but the value of the boon would be considerably enhanced if a measure could at the same time be devised which would have the effect of reducing the number of patents for valueless and abortive inventions. It was suggested that with the view of remedying existing evils, any new patent act should contain clauses to the effect that:—1. Any publication of an invention by the inventor, for, say six months before the patent is applied for should not invalidate it. 2. The actual use during that period by another party not authorised by the patentee should invalidate the patent. 3. The publication during that period of a description of the invention should not affect the patent, excepting in so far as it might bear upon the patentee's claim to be an original inventor. This measure would certainly reduce the number of patents; but the cases in which it would cause the public to loose valuable inventions would be few or none. On the other hand, many of the valueless patents would be replaced by patents for valuable inventions, which did not get patented under the existing state of things. It was well known that many valuable inventions never had been patented—they had arisen in the ordinary course of business, and various circumstances had prevented their being patented, such as want of funds or want of faith. In a few months these inventions had proved themselves worthy of a better fate; but having been published, valid patents could not then be got for them. The writer believed there were more cases of this kind than was generally supposed. The proposed measure would extend protection to all future cases of the same kind. The Secretary's remarks concluded with a few observations respecting the Manchester proposals.

After remarks from various members, it was resolved that the Council of the Institution should consider the question, and call a special meeting, at which manufacturers and others interested should be invited to attend.

A paper was then read "On the effect of a third cylinder in the Clyde screw engine," by Mr. J. G. Lawrie, which was followed by a discussion.

Mr. D. MORE exhibited and described a combined engine-counter and clock, devised by Mr. A. Mitchell.

Mr. WALTER NEILSON presented a valuable model of one of the finest of the American river steamers, in the name of Messrs. Ross & Winans, of New York.

Mr. J. M. ROWAN exhibited a model of his improved marine engines and boilers.

RAPID MONEY-MAKING AT THE MINT.

WE learn that the mechanical resources of the Mint, although exerted to an unprecedented extent lately, are found quite inadequate to supply the constant demand for money made upon that establishment; and that, consequently, an addition to the motive power employed there is being made. A new steam-engine of 40-horse power is in course of erection, and this is intended to drive the laminating machinery. Since the year 1810, when the first coin was struck in the existing Mint, an engine of 30-horse power, supplied by Boulton and Watt, gave motion to this branch of the coining machinery; but, as has been said, the pressure for money is now so great that this very creditable specimen of early engineering is not equal to the task imposed upon it. The new engine was contracted for by Messrs. Hall, of Dartford, and is on the combined high and low-pressure principle. It will be placed side by side with its ancient predecessor, which will not as yet be removed. The united power of the steam-engines employed in the cash department is 66-horses, reckoning that of the new money-maker.

An extension of time is aimed at for the completion of the Tyne piers. The preamble of a Bill promoted by the Commissioners for this object has been declared proved by a Committee of the House of Commons; and the Bill has been so modified as to enable the Commissioners to accept the proposed Government grant for a harbour of refuge (£250,000).

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THE THEORY OF NAVAL ARCHITECTURE.

No. VI.

Let $y^6 = 24^7 . x$ be the equation to the curve $P_7 P_1 N_1$, represented in figure 13, (next column) in which $P_7 N_1$ and a line at right angles to it through P_7, are the co-ordinate axes. This figure may be regarded, like that of the previous example (p. 168), as a half midship section, approximating to the form of the midship section of a vessel of burthen. The breadth of the ship would be 48 feet to the outside of the planking; and the draught of water from the load line $P_1 N_1$ to the lower edge of the rabbet of the keel, 24 feet. Let, as before, the depth $P_7 N_1$ be divided into six equal parts, each being equal to four feet; and let a_1, a_2, a_3, a_4, a_5, a_6, and a_7, be the ordinates drawn through the points of division. From the equation to the curve, putting x equal to 24, 20, 16, 12, 8, 4, and 0 respectively, we have $a_1 = 24{\cdot}000$; $a_2 = 23{\cdot}460$; $a_3 = 22{\cdot}814$; $a_4 = 22{\cdot}008$; $a_5 = 20{\cdot}920$; $a_6 = 19{\cdot}184$; and $a_7 = 0$; applying the second Rule, and putting it in a form convenient for calculation,

Ordinates.		*Multipliers.*	
a_1 =	24·000	1 =	24·000
a_2 =	23·460	4 =	93·840
a_3 =	22·814	2 =	45·628
a_4 =	22·008	4 =	88·032
a_5 =	20·920	2 =	41·840
a_6 =	19·184	4 =	76·736
a_7 =	0·0	1 =	0·0
			370·076
(4 = common interval)			4
			3)1480·304
		Approximation =	493·435

It can be readily proved that the exact area of the figure we have taken as an example is equal to

$$\frac{8}{9} \times P_1 N_1 \times P_7 N_1 = \frac{8}{9} \times 24^2 = 8 \times 64 = 512.$$

The above approximation is therefore very far from the exact area, the error being 512 — 493·435 = 18·565, or above 3½ per cent.

Applying Rule 3, and putting it in form for calculation,

Ordinates.		*Multipliers.*	
24·000	×	1	= 24·000
23·460	×	3	= 70·380
22·814	×	3	= 68·442
22·008	×	2	= 44·016
20·920	×	3	= 62·760
19·184	×	3	= 57·552
0·00	×	1	0·0
			327·150
$\left(\frac{3}{8} \times 4 = \frac{3}{2}\right)$			3
			2)981·450
		Approximation	490·725

This method does not give a result so near the true area as the second Rule.

Applying the Rule, already given in the Table, for seven ordinates, which gives the approximating area when a continuous parabolic curve is made to pass through the extremities of the seven ordinates, we have

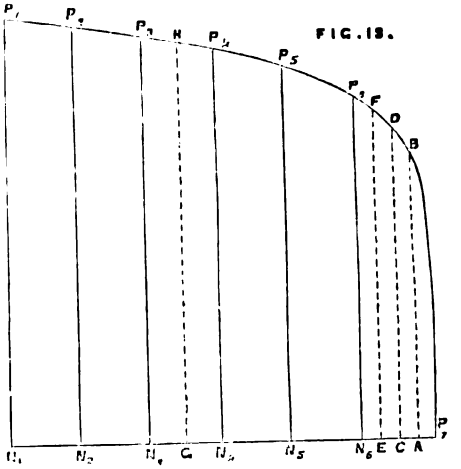
First and last Ordinates.	*2nd and 6th Ordinates.*	*3rd and 5th Ordinates.*	*4th Ordinate.*
24·000	23·460	22·814	22·008
0·0	19·184	20·920	272
24·000	42·644	43·734	44016
41	216	27	154056
			44016
24000	255864	306138	
96000	42644	87468	5986·176
984·000	85288	1180·818	
9211·104	9211·104		
1180·818			
5986·176			
7)17362·098		$\left(\frac{m}{140} = \frac{4}{140} = \frac{1}{35}\right)$	
5)2480·2997			
496·0599	Approximation.		
512·00	True area.		
15·94	Error.		

This Rule gives a result, in the present case, a little nearer the exact area than either the second or third Rules; but the error is still above 3 per cent—much too great to be disregarded by the naval architect.

We stated, when approximating to the area of a quadrant, that the errors mainly arose from the deviation of the approximating curve from the given curve in the neighbourhood of P_7, the two curves in their other parts being nearly coincident; the same is true in this case also.

From an inspection of Fig. 13, which is drawn to scale, we perceive that the direction of the curve at the extremities of the equidistant ordinates deviates tolerably evenly from P_1 to P_6, but from P_6 to P_7 the direction alters very rapidly. In the part, therefore, between P_6 and P_7 especially, the ordinates should be placed near to each other. For example, let $N_6 P_7$ be divided into four equal parts, each being equal to one foot; and at the points of division let the ordinates AB, CD, and EF be drawn parallel to $P_1 N_1$; these three, together with $P_6 N_6$ and P_7, make five equidistant ordinates, to which the second Rule may be applied to find the approximate area.

FIG. 13.



Again, let $N_1 N_6$ be divided into two equal parts, each being equal to 10 feet; and at the point of division let $G\,H$ be drawn parallel to $P_1 N_1$; then $P_1 N_1$, $G\,H$, and $P_6 N_6$ are three equidistant ordinates, to which the second Rule may also be applied.

From the equation to the curve we have, putting x equal to 1, 2, 3, and 14 respectively,

$$\begin{aligned} AB &= 16{\cdot}132; \\ CD &= 17{\cdot}592; \\ EF &= 18{\cdot}507; \\ G\,H &= 22{\cdot}437. \end{aligned}$$

The area of the part between $P_1 N_1$ and $P_6 N_6$, since the common interval is 10 feet, is equal to

$$\frac{10}{3}\left\{P_1 N_1 + 4 . G\,H + P_6 N_6\right\}$$
$$= \frac{10}{3}\left\{24{\cdot}000 + 4(22{\cdot}437) + 19{\cdot}184\right\};$$

And, since the common interval is one foot, the area of the part between P_7 and $P_6 N_6$

$$= \frac{1}{3}\left\{P_6 N_6 + 4\,(AB + EF) + 2 \cdot CD + P_7\right\}$$
$$= \frac{1}{3}\left\{19{\cdot}184 + 4\,(16{\cdot}132 + 18{\cdot}507) + 2\,(17{\cdot}592) + 0\right\}$$
$$= \frac{10}{3}\left\{\frac{19{\cdot}184}{10} + {\cdot}4\,(16{\cdot}132 + 18{\cdot}507) + {\cdot}2\,(17{\cdot}392) + 0\right\}.$$

The whole area of the figure, or the sum of these two areas,

$$= \frac{10}{3}\left\{24\,000 + 4(22{\cdot}437) + 1{\cdot}1(19{\cdot}184) + {\cdot}4\,(16{\cdot}132 + 18{\cdot}507) + {\cdot}2\,(17{\cdot}592) + 0\right\}.$$

Putting it in a form convenient for calculation,

24·000	×	1	= 24·000
22·437	×	4	= 89·748
19·184	×	1·1	= 21·1024
18·507	×	·4	= 7·4028
17·592	×	·2	= 3·5184
16·132	×	·4	= 6·4528
0	×	·1	— 0·0
			152·2244
			10
			3)1522·244
			507·415 Approximation.
			512· True area.
			4·585 Difference.

The error here does not amount to one per cent., and we have only taken the same number of ordinates (seven) as in the other methods of approximation, but have placed them differently. These examples show very clearly that by placing the ordinates with a due regard to the curvature, and applying the second or third Rules, a very close approximation to the true area will be obtained, with a small amount of labour in the calculations.

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We should, however, strongly recommend the student to apply, in other examples, the rules before given in a table, for finding the approximate area when a continuous parabolic curve passes through the extremities of the ordinates; and they will find that the second or third Rules applied to the same cases, in the manner already pointed out, will give more accurate results, with much less labour in making the calculations.

The figures to which the rules may be applied, and their exact areas, and ordinates readily obtained are ellipses and parabolas. The ellipse is a figure too well known to require us to indicate the method of obtaining the lengths of the ordinates, and the exact area. The family of parabolas is perhaps not so generally known. The equation to the parabola from the vertex is $y^n = p^{n-1} . x$, in which p (the parameter) is constant in the same parabola, and in the example above given was equal to 24; giving x different values in this equation, the values of y, the corresponding ordinates, can be obtained.

The exact area corresponding to any length of axis, X—where Y is the ordinate drawn at the distance X from the vertex—is

$$\frac{n}{n+1} \cdot \left(Y \cdot X \right).$$

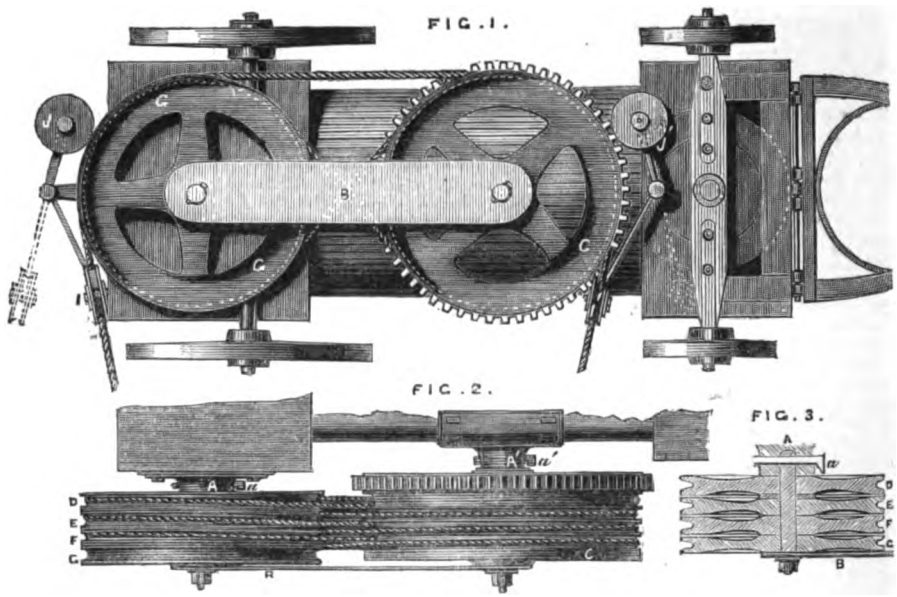
By giving n different values, tracing out the forms of the several curves, and finding the approximate areas in the manner already pointed out, the student will be enabled, when finding any curvilinear area the law of the curve of which is unknown, to fix the position of the ordinates, so as to obtain the greatest accuracy with the smallest amount of labour.

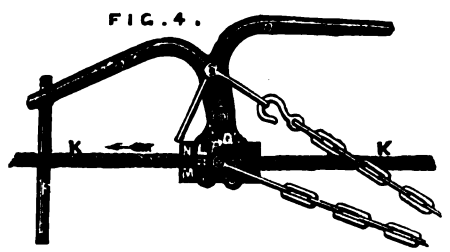
HALL'S PATENT AGRICULTURAL APPARATUS.

Mr. Collinson Hall, of Navestock, Essex, who is well known for his improvements in the application of steam power to agricultural operations, has introduced an invention which will greatly facilitate steam ploughing. Having had very ample experience of the difficulties which Mr. Hall's apparatus is designed to obviate, Mr. Fowler has taken steps to secure that apparatus, and has become the proprietor, we believe, of the patent granted for it to Mr. Hall. The invention is certainly a most valuable one, as it will obviate the principal defects of the existing steam-plough tackle. The following are the principal portions of Mr. Hall's specification of his patent:—

"Heretofore, in applying power to the cultivation of the soil by means of ropes, bands, or chains passing around drums or pulleys, the adhesion between the said ropes, bands, or chains and the drums or pulleys has, in the ordinary arrangements of apparatus, been found too small, and has in some cases been increased by additional contrivances. And my invention consists, first, of a new arrangement of drums or pulleys which obviates this objection. I employ a single drum or pulley upon one axle, and two or more drums or pulleys upon another. The rope, band, or chain is so passed round the drums or pulleys that one of the two, or more, which are upon the same axle turn in a direction opposite to that of the others, when the rope, band, or chain, is put in motion. The number of turns which the rope, band, or chain is made to take round the drums or pulleys will vary with the amount of power to be applied, the one increasing with the other. The arrangement described is that which I prefer; but I reserve to myself the employment of any and every equivalent arrangement whereby essentially the same action may be obtained. Secondly, in turning ploughs and other implements at the headlands, one wheel (usually the off-wheel) runs round and the near or opposite wheel remains at rest (in relation to its axis) or nearly so, and consequently obstructs the turning of the implement by encountering and displacing the soil. In order to remedy this evil, and thus facilitate the turning of the implement, I provide a small sole-piece or turntable, upon which the near wheel runs on reaching the headlands, and then is supported by it and turns upon it. Thirdly, in ploughing and otherwise cultivating by power it is, with ordinary apparatus, necessary for an attendant to signal to the engine driver (by means of flags or otherwise) when the implement reaches the headlands, that the engine may be stopped at a proper time. This signalling is often difficult and liable to failure, owing to certain states of weather, &c., and accidents to the apparatus sometimes result. To prevent this I connect with the implement a self-acting contrivance for loosening the rope from the implement at the required time. This contrivance may consist of an eccentric or a quick screw connected with a lever, and caused to join the rope ordinarily used and to be withdrawn from the rope by a fixed bar acting upon the lever; but any other equivalent contrivance may be employed for the purpose.

HALL'S PATENT AGRICULTURAL APPARATUS.

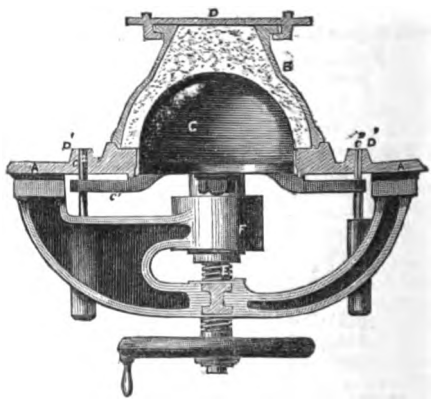




"In Fig. 1, 2, and 3 of the drawings hereunto annexed I have illustrated the manner in which I carry the first part of my invention into effect. Fig. 1 is a plan of the underside of a portable steam engine with my improved arrangement of drum and pulleys attached thereto. Fig. 2 is a side elevation of the said arrangement of drum and pulleys. Fig. 3 is a detached section of the set of separate pulleys on the same axle. The drum and sets of pulleys are suspended from the boiler by means of the cotters $a\,a'$, which are passed through the castings $A\,A'$ and the spindles of the drum and pulleys respectively. The castings A and A' are bolted permanently to the underside of the boiler, but the drum and pulleys may at any time be detached by removing the cotters $a\,a'$. The lower ends of the drum and pulley spindles are connected by a rigid bar of iron B, fixed by nuts screwed upon the threaded ends of the spindles. This bar gives perfect rigidity and all necessary support to the system of drum and pulleys without any other species of framework. C is the single drum upon the one axle, and D, E, F, G are the separate pulleys upon the other axle. The rope is wound about the drum and pulleys by preference after the fashion of a figure 8, as shown in Fig. 1, in order to get the best possible action. This arrangement renders it necessary that either the upper pulley D, or the lower pulley G, as the case may be, shall turn in a direction opposite to that of the remainder of the set. The whole system is driven by means of the cogged wheel H, into which gears a pinion driven by an upright shaft set in motion by gearing from the first driving shaft. $I\,I'$ are guide pulleys fitted in the simple manner shown for guiding the rope on to or off from the drum and pulleys, and J, J' are other guide pulleys carried by independent arms similarly fitted for keeping the rope in its proper grooves. The second part of my invention needs no illustrative drawings, inasmuch as any simple flat or concave sole piece, either working loosely within another so as to turn upon it, or simply remaining at rest itself and allowing the wheel to turn upon or within it, is sufficient for the purpose set forth. The manner in which I prefer to carry the third part of my invention into effect is illustrated in Fig. 4 of the drawings hereunto annexed. K is the ploughing rope which is supposed to be advancing in the direction of the arrow. L is a frame carrying a fixed block M, and a moveable block N, which is pressed upon by the toe."

JOBSON'S IMPROVED MOULDS FOR CASTING.

Mr. Robert Jobson, of Wordsley, Stafford, has introduced and patented an invention which has for its object improvements in apparatus used when making moulds for casting shells and other articles. For these purposes the pattern is made with arms carrying pins or projections, which enter sockets or receivers in the table or plate on



which the box is placed, and when in the first instance the pattern has been correctly adjusted on the table on which the flask or box is placed to have the sand rammed, the pins and the ends of the sockets (which receive them) are filed off, so as to make the ends of the pins and of the sockets coincide. By these means should any sand or material get in between the table and the pattern, the least incorrectness in the placing of the pattern will at once be detected by the workman when he

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passes his fingers over the pins and the sockets. In some cases like means are resorted to in placing cores into moulds.

In order to dispense as much as possible with hand labour, in order to remove the sand after it has been used, and to damp it and to bring it into position to be again used by the moulders, apparatus is arranged whereby the sand is shovelled on to sieves, which are worked mechanically; the sand is damped, and the sifted sand is carried by a screw in a suitable trough or tube to the mixer, where fresh sand and other matters are added, and whence the sand is conveyed through another trough or tube by a screw into a position to be used by the moulder.

Again, in order, where heavy boxes or flasks are used, to reduce manual labour, a peculiar form of crane or apparatus is used, which consists of a quadrant, over which a chain or band passes; this quadrant receives motion by the moulder turning or giving motion to a fly-wheel, on the axis of which is a pinion which takes into and drives a cog-wheel, and on the axis of this is a pinion which takes into a curved rack fixed to the quadrant, which is counterbalanced when necessary, and which, in addition to turning on a horizontal axis, also turns to the right and left of the post or upright which carries it.

Fig. 1 shows a vertical section of so much of a table and apparatus used for forming sand moulds as will enable us to describe the peculiar character of Mr. Jobson's improvements. *A* is the table on which the flask or box *B* and the pattern *C* are placed when forming a sand mould in the box or flask *B*. The table *A* may be stationary on a suitable stand or frame, or it may be arranged in a suitable frame in such manner as to move on axes, necks, or gudgeons, and to turn thereon or therewith, so as for a time to bring its under surface uppermost, and its upper surface with the flask or box thereon undermost; the latter arrangement is preferred. When the table *A* is fixed, the box or flask *B* and the mould therein will have to be lifted and turned over in the ordinary manner; but when the table or surface *A* is made to move on or with axes, necks, or gudgeons, the table or surface *A* with the box or flask *B* and pattern *C* may be turned over by moving the table or surface *A* on or with its axes, after having first placed the cover *D* on the mould box or flask, in which case the flask or box will be temporarily fixed to the table or surface *A*, and when brought below there must, as heretofore, be provision for detaching and lowering the flask or box and the mould therein. The pattern *C* shown in the engraving is a half sphere, but any suitable pattern may be used in the place thereof, according to the article desired to be cast in the mould. The pattern *C* is formed with four arms *C'*, *C'*, with pins C^2, C^2, which enter sockets *D'*, *D'*, formed on the table or surface *A* as is shown, or in any other convenient manner. The pattern *C* is moved and partly withdrawn from the mould by means of a screw *E*, which passes through the fixed screw nut *F*. In constructing and adjusting the pattern and parts connected therewith in the first instance, in order to insure great exactness of castings made in a succession of moulds produced on the same patterns, the pins or projections C^2, C^2, are allowed to project through and beyond the sockets, and when the pattern *C* has been accurately adjusted in respect to the upper surface of the table *A*, the ends of the pins or projections C^2 are to be accurately filed off or removed, so that they may be smooth and flush with the ends of the sockets, by which means the workman, when he is about to make a mould in a box or flask placed on the table, will by simply passing a finger against the ends of the pins or projections C^2 and their sockets, immediately ascertain whether the pattern is correctly in position, and if not, he may readily adjust it correctly by moving the pattern upwards or downwards till the ends of the pins C^2 are exactly flush with the ends of their sockets. The arrangement and form of the pins or projections and their sockets may be varied, and such is the case in respect to the apparatus for moving the pattern. In like manner may cores be made with projections and moulds with sockets or receivers, so as to enable the workman readily to judge when a core is properly placed within a mould.

The European and American Steam Shipping Company is to be dissolved. A proposal made by Mr. J. L. O'Beenie to charter, on the part of a number of gentlemen, the eight ships of the company for three years was not accepted.

IMPROVED WATER-PRESSURE MACHINERY.

By Sir W. G. ARMSTRONG, C.E., F.R.S., Engineer to the War Department for Rifled Ordnance.

[Before his great gun gave Sir William Armstrong his novel pre-eminence, he was well known among engineers as the most successful improver of water-pressure machinery, and in the last volume of the Mechanics' Magazine we reported an elaborate lecture of Sir William's upon the subject. The official report of the proceedings of the August meeting of the Institution of Mechanical Engineers having now come to hand, we are enabled to lay before our readers illustrations of the improved machinery, with Sir William's own description of the same. We cannot do this without repeating a few sentences which appeared in our last volume; but we prefer to do this rather than render the paper incomplete. Although written in the third person, the paper which follows is by Sir William himself.]

The subject of water-pressure machinery first attracted the writer's attention about twenty-three years ago, on occasion of his noticing a small stream of water which flowed from a great elevation down a steep declivity and turned a single overshot wheel near the end of its course. Observing that the portion of the fall which was thus utilised by the wheel was not more than a twentieth part of the whole descent, he was forcibly struck with the inadequacy of the wheel as a means of realising the power of such a fall; and conceiving it practicable to render the entire head available by bringing down the water in a pipe, and causing it to act by pressure upon a suitable machine at the bottom, he applied himself to devising an engine to be worked by such a pressure. Other inventors, guided by the same idea, had been previously led to apply water-pressure in various ways to driving machinery, although the employment of that power had never been extensively adopted; but with these applications the writer was at the time wholly unacquainted.

After meeting with many difficulties and discouragements, the machine was produced, which after many years of seclusion in a lumber-room has now been brought out for inspection upon this occasion. It is, as will be perceived, a species of rotary engine, admitting of a continuous and uniform flow of water through it, and exempt from all contracted passages. This machine was tried first in Newcastle, with the pressure from the street pipes equivalent to a column of about 200 feet; then in Gateshead, with a still greater pressure; and in both cases it yielded a very high effect in relation to the theoretical power of the moving column.

Up to this time the writer's object had been merely to provide a machine for turning to profitable account the power which great altitude gives to mountain streams; believing then, as now, that when roads and railways have rendered accessible the valleys where such streams abound, the water which descends from the heights will ultimately prove an efficient source of motive power. But having then had practical experience of the power residing in street water-pipes, he conceived the idea of applying such power to the cranes at that time so slowly and expensively worked by hand upon the quay of this town. Accordingly after duly considering the means of effecting this purpose, a working model of a hydraulic crane was constructed, and exhibited at a meeting of the Literary and Philosophical Society of Newcastle, where it was connected with the town water-pipes, and went through the several operations of lifting, lowering, and slewing in a very satisfactory manner. The next step was to carry this scheme into actual practice; and in the year 1846 the first hydraulic crane was erected at the upper end of the Newcastle Quay, where it has ever since continued to do good service in discharging ships. The crane model exhibited to the present meeting is nearly identical with the original model, and does not differ materially from the first actual crane erected in this town.

The writer was soon enabled to introduce the hydraulic crane at Liverpool, and shortly afterwards at the New Dock at Grimsby, where, at the instance of his friend, the late Mr. Rendel, the engineer who constructed that dock, he also applied the same kind of machinery for opening and closing the lock gates and sluices. An extensive system of water-pressure machinery was accordingly carried out at that dock; and the result afforded the first practical demonstration that the pressure of a column of water could be advantageously applied as a substitute for manual labour, not merely for the cranage of goods, but also for various mechanical operations in connection with the entrances to docks. At all these places the effective column of water was about 200 feet head. At Newcastle and Liverpool the supply was derived from the pipes communicating with the town reservoirs; but at Grimsby a tower was built for supporting a tank, into which water was pumped by a steam-engine. In the former cases the irregularity of pressure, consequent upon the variable draught from the pipes for the ordinary purposes of consumption, proved a serious disadvantage; but this objection was not experienced at Grimsby, where the tank upon the tower furnished a separate source of power, undisturbed by any interferences. But the erection of a tower was a formidable undertaking, and so long as it remained a necessity, a great extension of the principle could not be anticipated. The writer therefore resorted to another form of artificial head, which possessed the advantage of being applicable, at a moderate cost, in all situations, and of lessening the size of the pipes and cylinders by affording a pressure of greatly increased intensity. The apparatus by which this is effected is named the "accumulator," from the circumstance of its accumulating the power exerted by the engine in charging it. The accumulator is in fact a reservoir giving pressure by load instead of by elevation; and its use, like that of every provision of this kind, is to equalise the duty of the engine in cases where the quantity of power to be supplied is subject to great and sudden fluctuations.

The construction of the accumulator is shown in the vertical section, Fig. 1. It consists of a large cast-iron cylinder *A* fitted with a plunger *B*, from which a loaded weight case *C* is suspended, to give pressure to the water injected by the engine. The load upon the plunger *B* is usually such as to produce a pressure in the cylinder equal to a column of 1,500 feet head; and the cylinder is made sufficiently capacious to contain the largest quantity of water which can be drawn from it at once by the simultaneous action of all the hydraulic machines connected with it. Whenever the engine pumps more water into the accumulator than passes to the hydraulic machines, the plunger rises and makes room in the cylinder for the surplus; but when, on the other hand, the supply from the engine is less for the moment than the quantity used, the plunger with its load descends and makes up the deficiency out of store. The accumulator serves also as a regulator to the engine; for when the plunger rises to a certain height, it begins to close the throttle valve in the steam-pipe so as gradually to reduce the speed of the engine, until the descent of the plunger again calls for an increased production of power.

With regard to the pumping-engine used for charging the accumulator, the most approved form is that of two high pressure cylinders fixed horizontally, with double-acting pumps directly connected with the piston rods. At first a simple plunger pump at each end of the cylinder was used; then, with a view to greater compactness, the pump behind the cylinder was discontinued, and the other made a double-acting one upon the combined bucket-and-plunger system. Finally, a modification of this form of pump was adopted, by dispensing with the slack in the bucket and substituting an external delivery valve *D*, as shown in Fig. 2. In this arrangement the out-stroke of the pump causes the water contained in the annular space surrounding the plunger *E*, to be forced into the accumulator, while a further supply of water enters behind the piston *F* through the suction valve *G*; in the in-stroke the water behind the piston is discharged through the delivery valve *D*, and half of it passes round into the annular space on the other side of the piston, while the remaining half is forced into the accumulator, the area of the plunger *E* being exactly half that of the piston *F*. Each stroke of the pump thus delivers the same quantity of water into the accumulator. This neat modification of the bucket-and-plunger principle, by which equally easy access is given both to the suction and the delivery valves, was the suggestion of Mr. Henry Thompson, the writer's late intelligent foreman.

The introduction of the accumulator in the year 1851 removed all obstacles to the extension of water pressure machinery, which has since been applied in nearly all the principal docks, and in many of the Government establishments in this country. Nearly 1,200 hydraulic cranes, hoists, and other machines of that description have been applied; and 125 steam engines, collectively of more than 3,000 horse power, are now daily at work to supply the pressure for working them. The system has also been adopted in many of the principal railway stations, not only for cranage, but also for working turntables, traversing machines, waggon lifts, hauling machines, &c. It is also extensively used for raising and tipping waggons in the shipment of coal, for opening and closing swing bridges, and for many other purposes. New forms of application are continually being developed, and no

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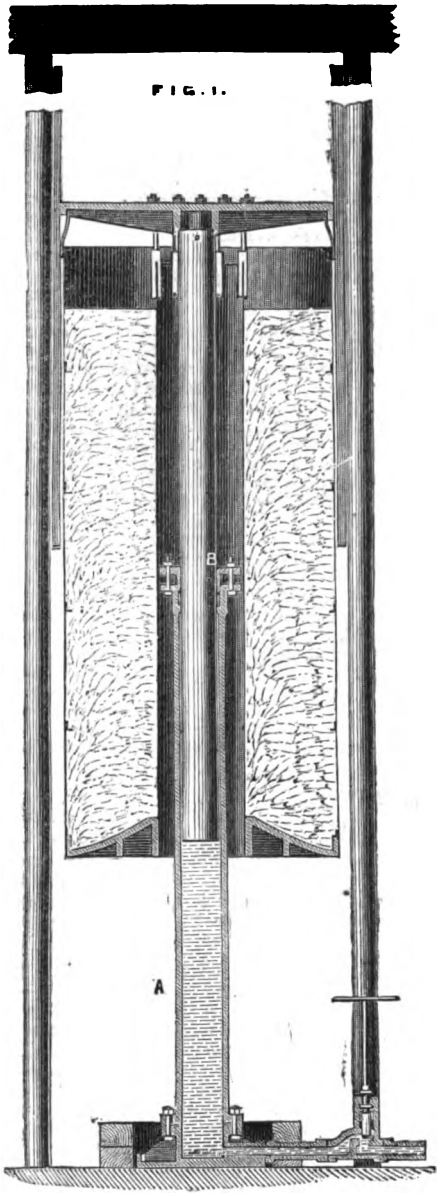
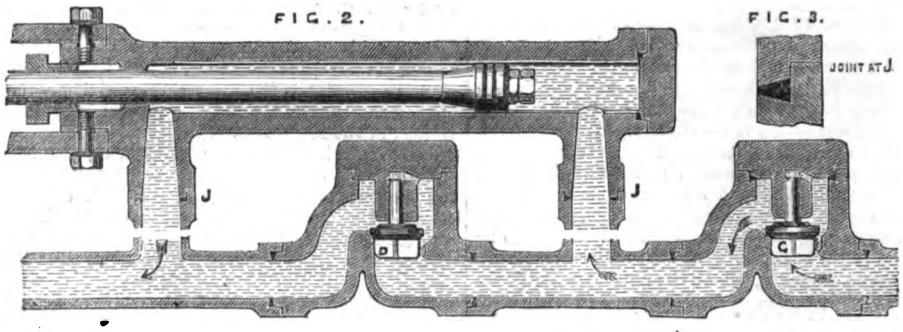
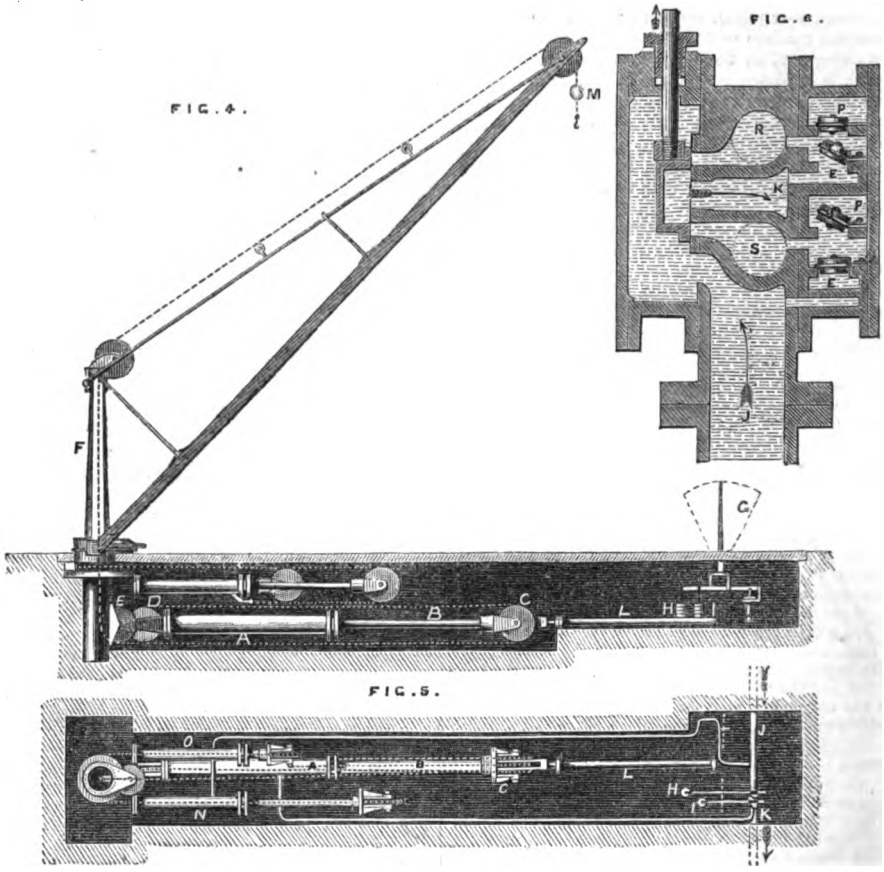
SIR WILLIAM ARMSTRONG'S IMPROVED WATER-PRESSURE MACHINERY.







doubt can be entertained of its capability of further extension.

The form of mechanism which prevails to the greatest extent in these various applications of water pressure consists of a hydraulic press with a set of sheaves used in the inverted order of blocks and pulleys, the object being to obtain an extended motion in the chain from a comparatively short stroke of piston. The general arrangement of the machinery for working a hydraulic crane is shown in Figs. 4 and 5; Fig. 4 being an elevation and Fig. 5 a plan. The pressure cylinder *A* for lifting the load is fixed horizontally below the surface of the ground in a chamber at the foot of the crane, and is fitted with the ram *B* carrying the pulleys *C* at its outer extremity. The lifting chain is made fast at one end to the cylinder *A*, and passes alternately round the moveable pulleys *C* and the fixed pulleys *D*, at the inner end of the cylinder *A*; and is then led round the guide pulley *E*, up the crane post *F*, and along the jib to the load. The motion of the lifting chain is controlled by means of the handle *G*, acting upon the inlet and outlet valves, which are kept closed by the weights *H* and *I*; by opening the inlet valve *H* the water is let into the cylinder *A*, from the pressure pipe *J*, and raises the load; and by opening the outlet valve *I* the water escapes from the cylinder into the exhaust pipe *K*, allowing the load to descend. The travel of the ram *B* in the outward stroke is prevented from exceeding the proper limit by the pulley block *C* coming in contact with a stop connected with the handle *G*, which closes the inlet valve *H*, and prevents the load from being raised too high. The return stroke of the ram is effected by the load suspended from the chain; and in the absence of any load a small supplementary ram *L* is employed to force the main ram *B* back, the slack chain being made to run out by the weight *M*.

(To be continued.)

ON MILITARY AND OTHER TENTS.

BY MAJOR GODFREY RHODES.

(Concluded from page 202.)

THE FIELD-OFFICER'S MARQUEE.

This tent is in shape and arrangement of its details, only a hospital marquee on a reduced scale. When pitched, it occupies about 126 square yards of ground, or 9 paces by 14; its weight when dry is about 173 pounds, and when wet 244 pounds, being an increase of 71 pounds. (See table of tents in the "Aide Mémoire to the Military Sciences," 1855-6.)*

THE CIRCULAR SINGLE-POLED CAMP TENT.

This tent, with some slight modifications, has been in general use in the British army for about 60 years (if not rather longer). Formerly, this tent consisted of one centre pole, without the short vertical wall with which the present conical tents are supplied; its height was 9 feet, its width about 12 feet, and it was capable of holding 12 men. A complete tent so constructed only weighed 43 pounds.

The following are the dimensions, &c., of the "circular conical single-poled tent" at present in use. I may premise by stating, that the British army tents vary both in size and weight. The diameter of this tent is 12 feet and 6 inches; height, or length of pole, 10 feet and 4 inches; accommodation for 12 to 14 men; weight of the linen tent (complete) when dry, is from 68 to 75 pounds, and when wet about 104 pounds. The height of the vertical circular wall is 12 inches, and its object is to give increased head-room to the soldiers when lying down. The number of pins required for this tent is 43; viz., 40 for the tension ropes and loops, and 3 for the long storm ropes. This tent is provided with one triangular entrance, and is deficient of a proper means of ventilation. The above sized tent contains about 512 cubic feet of capacity, allowing to each soldier about 64 cubic feet, 8 men per tent; about 51 cubic feet, 10 men per tent; about 42 cubic feet, 12 men per tent; and about 34 cubic feet, 15 men per tent.

GENERAL DEFECTS OF THE BRITISH ARMY TENTS.

Their general defects consist—1st., the canvas of which they are made is not always of the best

* This Marquee is not much used.

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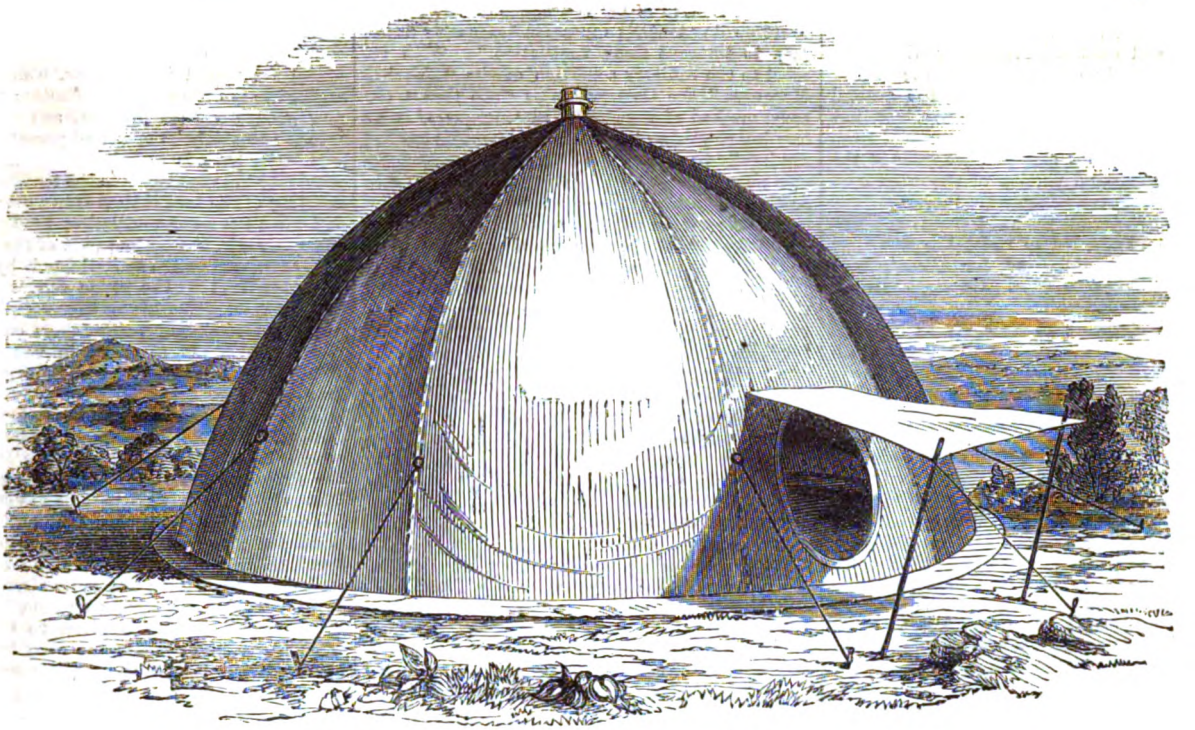
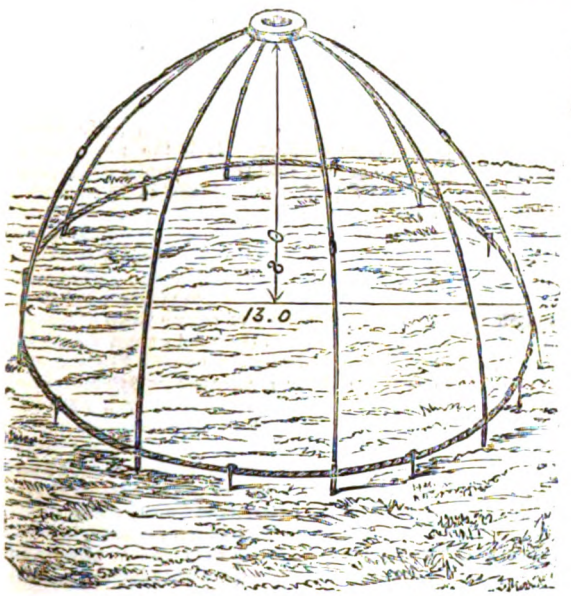
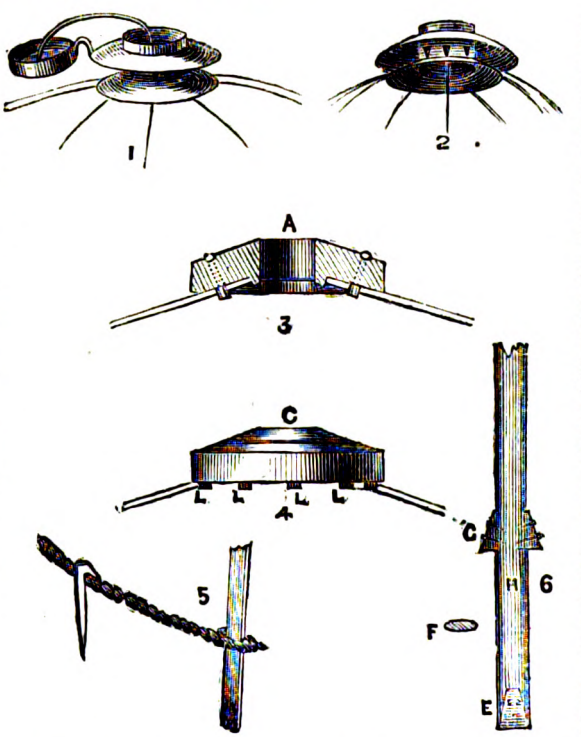


MAJOR RHODES' FIELD TENT COMPLETE.



FRAME OF MAJOR RHODES' FIELD TENT.



DETAILS.—1, *Ventilating cap with cover removed;* 2, *the same with cover on;* 3, *enlarged section of same with opening* A; 4, *external view of* 3, C *being cover, and* L L *lugs to receive ribs;* 5, *part of ground-rope and peg;* 6, *lower end of pole* H *with metal plate* E *and stop* G.

material. 2nd., the canvas and tent-ropes are not waterproofed; and, owing to their absorption of moisture, the weight of the tent is increased nearly-one third, and by their combined contraction, when wet, materially assist in pulling the wooden pegs out of the ground, thereby rendering the tent less secure during stormy weather. The alternate saturation and drying of the canvas and ropes must materially tend to rot them. 3rd., want of an improved method in the construction of the present army tents, from the apparent inability of applying to them, an efficacious and simple plan of thorough ventilation, &c., which, from the latter being very defective, together with over-crowding men into a confined space, is but too often the chief cause of those zymotic diseases—viz., "fevers," "diarrhœa," "dysentery," and "cholera," which latter are the greatest enemies to troops employed in active warfare. Young lads of 18 to 20 years of age are much more liable to contract zymotic diseases than men of 22 years and upwards; the former are generally deficient in physical strength, whereas the stamina of the latter being more fully developed, their constitutions are better able to bear the harassing fatigues incidental to armies in the field. To illustrate the point in question, I may perhaps be permitted to briefly mention "that during the campaign of 1809, some troops which were cantoned in the north of Germany, marched to Vienna, and, although the distance was only short, all the hospitals on the line of march were filled with sick: more than one-half of these men were under 20 years of age." Again, "during the year 1805, a French army, which was cantoned in the neighbourhood of Boulogne, marched about 400 leagues to join the grand army in Moravia, prior to the battle of Austerlitz, (fought 2nd December) but owing to the more matured physicalstrength of these men, (all above 22 years of age and 2 years' service) this long march was accomplished without leaving almost any sick in the hospitals on the line of route." With respect to No. 1 defect, I find that the two Commissioners (Sir John McNeill and Colonel Tulloch) reported in 1855-56, that some of the tents were of an inferior quality, and that in many instances the army was obliged to use the bell tent for hospitals, instead of the marquee, although the latter was far more appropriate for such a purpose. No. 2 defect: I have already called your attention to the increased weight of the army tents when wet; and, with respect to their general deficient waterproof qualities, I can state, from personal experience, that in the autumn of 1848, I was encamped for about two months with a detachment of my regiment

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(then 2nd battalion 60th Rifles), at Kilkenny; and although the weather was not unusually wet for Ireland, still a misty dew penetrated the canvas, and rendered everything within the tent uncomfortably damp. During the winter of 1854, when I was in the Crimea, the general complaint of the British army tents was, that they were neither waterproof nor ventilated, and I can well remember the wet and puddled state of the windward half-ground portion of the interior of many of the tents, caused from the incessant beating of the rain and wind against the canvas, which latter was so ill adapted to resist the combined action of the rain and wind, for a continuous period of sometimes 10 days. On the contrary, the "Turkish circular conical tent" was dry, warm, and waterproof, owing to its covering being of double cotton canvas; besides, from its great width and comparative lowness, it withstood the fearful hurricane of the 14th of November, when nearly all the British and French tents were blown down. With reference to the deterioration of the tents from the effects of the variation in the weather, I find, on reference to page 123 of the printed "Report of the Sanitary Commission," which was despatched to the seat of war in the East in 1855-56, that in the month of May, 1855, the Commissioners recommended the striking and removal of some tents to a fresh surface, owing to the damp state of the ground inside the tents. The commissioners were informed that "the supply of tents was deficient, and that it was impossible to strike the tents pointed out, as they were too much decayed to admit of removal." No. 3. Defect: With respect to the very important subject of defective ventilation, &c., of the present army tents, I beg to bring to your notice the recorded opinions of several professional men. The late Dr. Robert Jackson, "Inspector-General of Army Hospitals," states, that "There is great room for improvement, in the manner ordinarily employed for covering troops from the inclemency of the weather, during a campaign." He recommends the use of a carpet of painted canvas to be laid on the ground, inside the tent; and by preventing the ascent of moisture, generated by the raised temperature within the tent, from its occupation (more particularly by the immediate, or near contact of the heated bodies of the men with the surface of the earth), would greatly tend to lessen those evils (arising from the contaminations of the air) to which soldiers are subject, when crowded together in close or unventilated tents. The Doctor recommends "a tent with a light roof," but acknowledges "that the application of it is connected with trouble." He further states, that "a roof, similar to that of a marquee, is liable to be overturned by strong winds, and a tent with close walls is liable to be contaminated." I must again refer to that valuable "Report of the Sanitary Commission" in respect to the general want of ventilation of our army tents. They state "That the most obvious sanitary defect in the tents was their want of ventilation."—"It is usual on a march for 12 to 15 men to sleep under a bell tent.—The cubic space for each soldier is 51 to 64 cubic feet, but the consequent evils from overcrowding tents would be greatly mitigated by ventilation. The indispensable necessity of renewing the interior atmosphere of the tent is indeed fully recognised, for there are a few small openings for this purpose near the apex of the tent, but they are of two small a size to be of use." Again, "We had occasion to examine the ventilation during the outbreak of cholera in May, 1855, and were struck on entering the tents by the foulness of the atmosphere. This led to inquiry, and we found the men were perfectly aware of this defect, and complained of it themselves, especially in the mornings." "At the same date we found instances of sick being treated under bell tents, and in going into one of these, we saw pans of peat charcoal on the floor, and were told by the surgeon that, were it not for the use of charcoal for absorbing the emanations from the sick, the air of the tent would have been unbearable—a very sufficient proof of the great necessity for a better ventilation." The Commissioners again state, "that to remove as far as practicable the evils of overcrowding tents, it appears indispensably necessary to improve their ventilation." With respect to the sanitary condition of the "Hospital Marquees," the Commissioners state that "the usual method of ventilation in 'marquees,' is by opening or raising the side walls; but this method can hardly be said to be sufficient, even in favourable weather, and still less is it when, from rain or high wind, the sides cannot be opened. Even in the fine weather, it was remarked that the air under the roof of the marquee was hot and stagnant (although the sides were open), because there was no provision for its escape above." The Commissioners state that "the whole question of ventilation, as regards field hospitals, is one of very great importance;" and with respect to the rapid recovery of the sick and wounded, they state that "well-ventilated field hospitals answer much better, than would be fulfilled by a much larger amount of ill-ventilated cubic space." Consequently, "to well ventilate a field hospital is, in other words, to save transport." They pointedly remark, that "a permanent and independent means of ventilation is particularly required at night, when the doors and side hangings are closed." In their concluding remarks, they state "that the atmospheric impurities arising from overcrowding and defective ventilation of tents and huts, were a frequent predisposing cause of zymotic disease." And that "as the neglect of the sanitary condition of camps, tents, barracks, and hospitals has hitherto, in all countries, climates, and seasons, been the cause of the largest amount of loss in armies, the whole subject (closely connected as it is with the physical efficiency of Her Majesty's forces) demands in future a practical development, commensurate with its importance to the public service." During the last three years and five months of the Peninsular war, at the period when the greatest activity prevailed, the mean strength of the British army amounted to 61,511 men, and the sick to 13,815, being 22¼ per cent. The mean ratio of inefficiency from wounds did not exceed 1¼ per cent. The average strength of the British army in the Crimea, during the ten weeks intervening between the 5th May and the 14th July, 1855, was 38,507 men. The total admissions into hospital were 22,541, or 58 per cent. of the force; the per-centage of deaths from wounds (exclusive of deaths in the field) was 20 per cent.; whereas 74½ per cent. admitted into hospital, and 96 per cent. of the total mortality from disease, originated from zymotic cases, such as fevers, &c.

MAJOR RHODES' TENTS.

With the view of supplying a remedy for the several defects of the present army tents, I will now briefly describe some tents of my own invention, not that they, being my own, merit a greater attention, but that I believe the proposed improvements will materially add both to the health and comfort, in all countries and seasons, of dwellers in tents, and I further hope may render "Tents and Tent Life" more acceptable. From the exposed diagrams, you will perceive that I have applied my system to three forms of tents, in all of which the same principle of construction is embodied. No. 1 represents the skeletons or uncovered frames of my field and hospital tents, from which you may easily comprehend the simplicity and strength of their construction. The frames are composed of stout ribs of ash, bamboo, or any other flexible material. When required to pitch the tent, the prepared double-twisted ground rope or band is hooked together, and laid to the full extent of its own circle on the ground; the butt-ends of the flexible ribs are then inserted within the loops or openings already made in the circular rope, and when the latter has been stretched out to the form required, the butt-end of each rib is forced into the ground; and to facilitate this operation, the extremity of the rib is provided with a metal shoe in the shape of a wedge. The butt is also provided with stops, so that the twisted rope or band, now circulating round the butt, cannot slip up the rib, nor can the butt be forced into the ground beyond those stops. To render the ground-rope more secure, a peg is driven over it at the centre between each rib. The top ends of the ribs (if detached from the butts) are placed into sockets, which latter are secured to the top ends of the butts; the ribs are now gradually bent inwards, and then inserted into the socket-holes of a head prepared for them. The latter has a large hole through its centre, for providing top ventilation to the tent. The canvas covering of the tent is then drawn over the frame, and when the outer ventilating head-piece covers the inner one, the bottom part of the tent-covering is strapped to the ground-band, by the means of straps fixed to the inside canvas of the tent, near its base. The tent is thus complete; but to add increased stability, eight short outside storm-ropes, previously attached to the canvas, are stretched out and pegged to the ground. To further add to the firmness of the structure, the outside valise or canvas bag, in which the whole tent was rolled up, is divided into two parts, and then buttoned to the inside of the lower part of the canvas of the tent, on buttons prepared for that purpose. On that part of the canvas which lies on the ground, are placed the butt ends of the arms, the knapsacks, and other articles usually required by a soldier in the field; by this extra weight being laid on the canvas ground curtain, at the sides of the tent, all round its base, not only greater stability is given to the tent, but, what materially benefits the men in a sanitary point of view is, that the usual ground currents of air which enter at the bottom of the tent, do not by the above means blow direct on the bodies of the men, thereby obviating the necessity of providing straw to place round the bottom of the tent, which at present is absolutely necessary to prevent the men from getting stiff necks: by this simple arrangement, the purchase of straw usually supplied for tents is obviated; and what must be clearly perceived is, that fewer men are liable to catch cold, consequently the hospitals would be much less encumbered, and the army rendered much more efficient. It is the prevention and not the cure of such trivial complaints that should be most attended to. When it is necessary to light a small fire within the tent, the exterior ventilating head can be uncovered, so that an easy and free egress of the smoke, is obtained. With respect to the saving of space, when ground is an object, I can pitch five of my hospital-tents on the same number of square yards of ground as is required to pitch (including room for the tent-ropes) one Government hospital-marquee—thus, one of the latter requires about 340 square yards of ground (or 20 paces by 19), whilst five of the former only require about 215 square yards of ground. The space necessary for one of my hospital-tents is about 63 square yards, or about 7 paces by 9. This, is a decided advantage, when but a small space can be procured for the encampment of troops. My field-tents can, if required, be pitched within a few inches of each other, thereby also occupying much less space than the circular conical government tents. The cube quantity of air contained in my tents is as follows:—"*Hospital-tent*," 30 feet long, 15 feet wide, and 10 feet high, is equal to 2,383½ cube feet; or about 119 cubic feet for each soldier, having 20 men in the tent; or for 30 men, about 79½ cubic feet each. "*Field-tent*," 13 feet diameter and 8 feet high, is equal to 531 cubic feet; or, for 8 men in a tent, about 66½ cubic feet each: and for 12 men, about 44¼ cubic feet each. "*Guard-tent*," 9 feet diameter, and 5 feet in height, contains about 159 cubic feet. An ordinary "single-poled circular conical tent," without any side walls, but occupying the same space of ground, and of the same height and width as my field tent, contains about 354 cubic feet of air, thus allowing about 44¼ cubic feet for each man, 8 men in the tent; and about 29½ cubic feet for each man, 12 men in the tent. I beg to state that all my tents are perfectly ventilated, and that the government tents are deficient in that most important particular. The number of cubic feet of air allowed to each soldier in many of the

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barracks in England is only 3 feet, whereas for prisons, the rule is 1000 cubic feet per individual. You will perceive that the colour of the canvas of my tents is grey, and that of the Government tents is generally white, or of a very light colour. The glare from white canvas is not only very objectionable for the eyes, but is also easily seen from a great distance, thereby often disclosing to the enemy, those strategical movements, which, if the colour of our tents were of a dark-grey, he would be ignorant of. In conclusion, I beg to read a few extracts from an official report on the "Suitability, &c., of my Tents," as applicable for military purposes, based on reports of their actual occupation by troops in the field, which his Majesty the King of Hanover has been pleased to grant me.* With respect to the adoption of my tents for military purposes, I beg to state, that having submitted, last year, plans and small models to several Governments, I have been honoured with orders, and have supplied three full-sized trial tents to the following States, viz., England, France, Austria, Prussia, Russia, Sweden, Belgium, and Hanover; but owing to the lateness of the season, and the fact of the troops having taken up winter quarters, my tents have not yet been practically tried, except by the Hanoverian Government. I may state, that although the "Special Military Committee," composed of several general and other superior officers commanding regiments, which were assembled in Dublin on the 3rd of July last (at my request, and by order of His Royal Highness the General Commanding-in-Chief), so strongly recommended that tents of my construction should be immediately sent to the camps of Aldershot and the Curragh, for the purpose of undergoing practical trials by the troops then under canvas; I regret to say that only one set has been ordered, and that, owing to its very late arrival last year at Aldershot, my tents have not yet been practically tried by the troops, but have been partially tested.

* These extracts were highly favourable to the inventor of Major Rhodes.

NEW CHEMICAL BALANCE.

By Mr. J. B. COOKE, of Liverpool.

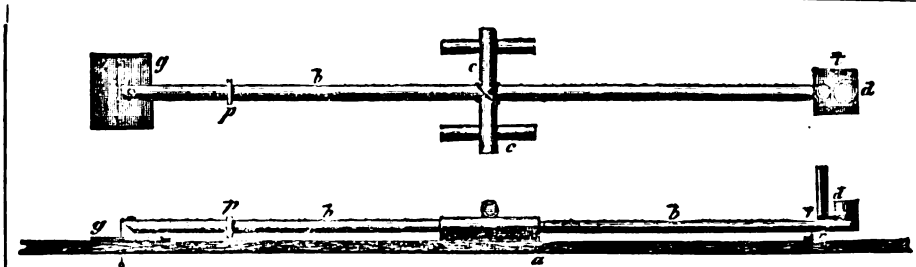
THE balance is an instrument of prime necessity to the exactitude of the results sought for in the operations of the chemist. But it is also a very expensive piece of apparatus, and its delicacy requires it to be guarded with the utmost care from the effects of damp, and the other vapours and fumes incidental to a laboratory. The following is the description of an instrument which has been in constant use for more than a year, and which is at once sensitive, effective, inexpensive, and not liable to injury. It weighs quantities amounting to 2.400 grains with an accuracy unmistakeably distinct to the $\frac{1}{100}$th of a grain.

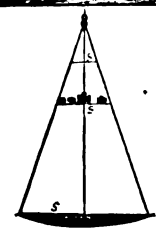
Though freely exposed to an atmosphere which in twelve hours covers a polished iron surface with rust, and which is often loaded with fumes of hydrosulphuric and other acids, it is now as sensitive as on the day of its construction.

The materials of which this balance is composed are to be found in every laboratory. Their first cost need not amount to 5s., and they can be put together by the chemist himself in the course of two or or three hours, so as to be in perfect working order.

To those operators whose object is the attainment of accuracy with the smallest expenditure of means, it is hoped that a desideratum is here supplied, although some of the points usually considered essential to a good balance appear to be disregarded.

The beam is formed of glass tube. A piece of barometer tubing of 12 or 18 inches in length, or even the full length of a barometer tube, if economy of space is not important, may be employed. Another glass tube of about three inches in length, and of diameter and thickness proportioned to the weight it is destined to bear, is attached to the beam tube at right angles, at about the middle point of each. Exactitude in any of these particulars is not essential. The





attachment may be made by any convenient means, say by fine iron wire, covered afterwards with sealing-wax melted on to it.

If a portable balance be desired, a suitable stand must, of course, be provided; but if the instrument be intended to occupy a permanent position, it may be made to work upon an open shelf, and the present description applies to the latter circumstances.

Two other glass tubes, of about two inches in length, are cemented longitudinally upon the surface of the shelf, parallel to and at a distance of $1\frac{1}{4}$ inches from each other.

They must be equal to each other in diameter, which must be greater than that of the beam tube, or they must be raised equally to some small distance above the surface of the shelf, so that, when the transverse tube attached to the beam is placed across and upon them, the beam itself, lying between and parallel to them shall be raised at its centre at least $\frac{1}{4}$-inch above the shelf. The three small tubes should be selected of good shape and polish.

By this arrangement the beam, when in equilibrium, is supported upon two points, which, owing to the roundness, smoothness, hardness, and chemical inertness of the material, approximate closely to mathematical points not liable to injury from oxidation or friction, Knife-edges working upon planes of whatever substance, are not theoretically so perfect in action as the above *points* of support, and it would be difficult with the finest art to make them practically more sensitive.

A piece of sheet-copper is fastened on to the shelf under the beam near each of its ends. An edge of each piece of copper running transversely to the shelf is turned up at right angles to serve as a support at such a height that when one end of the beam, loaded with its full weight, is resting upon one of them, the other end may be separated from its resting place by about $\frac{1}{10}$th of an inch. If the under-surface of the beam be blackened about these places of support, the separation shows very distinctly against a white surface placed behind.

The weights, and substance to be weighed, are both applied at the same end of the beam; the other end being compensated by a constant counterpoise; a peculiar form of scale pan is therefore required. It is convenient to have three tiers of pans hung in a pyramidal form at a suitable distance from each other by the same three silk strings. The largest and lowest is destined for the substance to be weighed. The middle one in size and position for the larger weights, and the smallest and uppermost pan contains the weights below 10 grs. This compound scale pan is suspended by a bent wire to a loop formed at one end of a short silk thread, which, passing vertically through a small hole in the shelf, and bisecting the end-section of the beam tube, is cemented with sealing wax on the upper surface of the tube. The thread should lie in a slight notch filed on the upper circumference of the end of the beam, and should hang freely from it, the lower circumference being ground away to prevent contact. The thread must also of course be carefully protected against contact with the sides of the opening in the shelf. The better way is to make an opening of about one inch square through the wood, and afterwards to cover over the greater portion by four slips of window-glass crossing each other, and leaving only a small hole in the centre for the thread. If this opening be large, the balance will be affected by currents of air which always occur upwards or downwards in such circumstances. The surface of the shelf between the centre of the beam and that end of it to which the pans are hung is divided into 10 equal parts by ink lines; and a platinum rider weighing $\frac{1}{10}$th grain is applied to this arm of the beam, and by traversing over each division marked on the shelf causes the variation of $\frac{1}{100}$th of a grain, and dispenses with the use of weights smaller than $\frac{1}{10}$th gr.

The sensitiveness of a balance is proportional to the approximation to each other of the centres of suspension and of gravity. In the present instance, the centre of suspension is the central point of the mid-section of the small tube attached to the beam, and since the weights of the beam itself and of the scale pans and their contents, are referred to a point much below this, some provision is required by which the centre of gravity of the whole mass may be considerably raised, and its position nicely regulated. The provision required is found in the mode by which the compensation is applied at the end of the beam destitute of scale pan.

On the upper side of the compensation-end of the beam is cemented horizontally with shellac, a table of window-glass of about 1 inch square surface. On this table again are cemented, by the same means, in vertical juxtaposition, two glass tubes; one about 3 inches high and $\frac{1}{4}$-inch in diameter, the other 1 inch high and $\frac{1}{4}$-inch in diameter. A quantity of dry pure mercury is then poured into the tall tube until the beam, whose scale-pan is loaded with about $\frac{2}{3}$rds the weight which it is destined to carry, is nearly in a state of equilibrium. If the tall tube be sufficiently high and narrow, it will then be found that the centre of gravity has risen above the centre of suspension, as will be evidenced by the setting of the beam at either end indifferently according as it is placed.

Mercury is now poured gradually into the shorter tube, and after each addition weights are added in the scale-pans to produce equilibrium. By every such addition the centre of gravity will be proportionally lowered, and may be brought with the utmost nicety within any assignable distance from the centre of suspension.

The adjustment will suffice for the purpose of the balance, when the transference of the rider over one division of the shelf towards the centre of the beam shall raise this end of the beam from its supports, and the replacing of the rider in its former position, shall restore the preponderance of the weights, and when on frequent trial this the invariable result.

The balance is thus left with an extremely small amount of overpoise. The substance to be weighed is placed in the lowest pan. Weights are removed from the upper pans, and ultimately the rider is moved over the arm towards the centre, to the point at which the beam is first caused permanently to resume its normal position. The sum of the weights removed, together with the number of degrees passed over by the rider reckoned as $\frac{1}{100}$ths of a grain, will be the weight required.

The advantages claimed for this balance are, easy construction, cheapness, non liability to injury from exposure or rough handling, the whole operation of weighing being confined to one end of the beam without loss of sensitiveness, and the separation of the large from the smaller weights.

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The annexed engravings illustrate, in plan view and side elevation respectively, the new balance. *a* is the shelf; *b*, the beam; *c c c*, three small tubes; *d d*, tubes for mercury; *s s s*, three scale pans; *g*, glass plates to cover; *h*, hole in shelf; *p*, platinum rider; *t*, small table; and *r r*, copper rests.

he method of mounting is not inferior in sensitiveness to that of the best constructed instruments, and the limits of its sensitiveness are far from being reached in the specimen above described. As an illustration of this assertion, the following rough experiment is adduced. The writer constructed a balance, of which the beam was a tube of thick glass 22 inches long, and one inch in external diameter, and weighing alone $1\frac{3}{4}$ lb. The scale pan was loaded with a weight of 1 lb. The compensation was then readily effected with mercury to such accuracy that the translation of a platinum rider weighing $\frac{1}{10}$th gr. along the beam, over a space equal to $\frac{1}{15}$th of the length of the arm, sufficed to change the preponderance in favour of the one arm or the other, according to the direction of its transference. This roughly-formed balance therefore, which, exclusive of the scale pan, did not occupy two hours in construction and preparation for use, was sensitive to a weight of $\frac{1}{100}$th of a grain, or to $\frac{1}{700000}$th part of the weight to be estimated, and about $\frac{1}{3000000}$th part of the whole weight supported on the fulcrum.

NOTICES.

We are compelled to postpone until next week. Plato (On Iron Dwellings), S.B. (On the Atlantic Cable), Captain Norton (On Concussion Fuze), and articles on Fishing Tackle and Jobson's Apparatus for Crushing.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of insertions less than 13; for 13 insertions, 4d. per line; and or 52 insertions, 3d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

The demand for Mr. E. J. Reed's paper—

On the Modifications which the Ships of the Royal Navy have Undergone during the Present Century, in respect of Dimensions, Form, Means of Propulsion, and Power of Attack and Defence,"

has been so great that the Journal of the Society of Arts, the Mechanics' Magazine, and all other Scientific Journals in which it appeared in December last, are now out of print. The demand still continuing, it has been deemed desirable to reprint it in a separate form. An 8vo. edition of it, in large type, and on fine paper, has, therefore, been prepared, and may now be had at the Office of this Magazine, price 1s.

ELECTRO-MAGNETISM.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

Gentlemen,—In the Mechanics' Magazine of Friday last (No. 13), I have read with much interest the account of Mr. Haines' experiments with different cores, which seem to have been made with great accuracy; and I doubt not they will be equally interesting to not a few of your readers. With regard to the concluding part of his letter, my first impression was, that by a suitable extension of the core the power of the coil might be increased, but on further reflection, I am convinced that by any addition to the core at one end we only condense or concentrate the magnetic polarity at the other, and, therefore, do not gain any augmentation in the total amount of magneto-inductive force exerted upon the primary coil, but probably rather a diminution in consequence of the diffusion of part of the magnetism in that part of the elongated core which extends beyond the coil. If this be the case, the only advantage obtained is increased energy at one of the holes of a bar electro-magnet—an advantage which may evidently, in some circumstances, be turned to good account.

I observe a typographical error in Mr. Haines' letter, which it may be useful to point out, namely, the word *taking*, which ought to read *tripling*.

Glasgow, 28th March, 1859. Geo. Blair.

LIST OF NEW BOOKS.

Brown's Mercantile Navy List, 1859, 7s. 6d.
Cassell's Popular Natural History, illust., Part I., 6d.
Chevreul's Laws of Contrast of Colour, new edit., 5s.
Crawley's (Capt.) Chess, its Theory and Practice, 2s. 6d.
Forbes's (J. D.) Occasional Papers on the Theory of Glaciers, 8vo, 10s. 6d., cl.
Illustrations of Natural History, coloured, 4s. 6d.
Simmons's (Capt. F. C.) Leading Principles of Gunnery, 8vo, [illegible], cl.

Our Weekly Gossip.

We learn that the secret system presses uneasily, as we anticipated, upon Sir William Armstrong, especially since the novelty of his invention has been called in question—openly by some, privately by many. This fact has, if we are rightly informed, induced Sir William to proceed with his application for a patent in the usual way. His name will accordingly be found on page 210 of our last Number in the list of those who have given notice of their intention to proceed with their applications for patents. It should be understood that any person may enter an opposition to the granting of Sir William's patent, on the ground of want of novelty, on or before the 11th of April. It is probable, however, that those who would be best able to prove it old, if it be old, will be least likely to trouble Sir William with opposition. The absence of opposition will by no means establish the novelty of his invention.

The number of the "Commissioners of Patents Journal" for Tuesday last, March 29, although purchasable for 2d, will be of very great value to patentees and others. It contains a complete list of the specifications of patents for inventions enrolled under the Old Law (prior to October, 1852), with the prices at which the printed specifications of the whole are published. The list also includes all those old law patents with which specifications were not enrolled, together with memoranda of all surrenders and disclaimers. The average price each of the printed specifications is a few pence, but some of them are so bulky as to cost several shillings; 10s. 4d. is the highest that strikes our eye on hastily glancing at the list, but we remember having before seen one or two, if we mistake not, as high as 15s. The whole number of these documents is 14,359.

Captain Blakeley, whose improvements in ordnance are well known to the scientific public, writes to us as follows:—"We have all heard of the great 13-inch wrought-iron cannon, the gift of the Mersey Steel Company to the nation, yet its merits have been little discussed in public, probably because it was a gift, and a most generous one. The impression, however, has become general that this gun is cracked in the inside in consequence of firing. I myself fell into this error, when I saw the fissure, and have since spoken and written of the gun as having shown a want of sufficient strength. This makes it my duty to do what I can to remove the erroneous impression which exists, and I shall, therefore, be grateful to you if you will allow me to make known through your columns that I have discovered that the small fissures in the inside of the barrel of this magnificent gun have not been either caused or sensibly increased by firing, but were found when it was bored, and were pointed out to the officer of artillery sent to receive it."

The extraordinary piece of ordnance mentioned in the preceding paragraph by Captain Blakeley, will in a few days be permanently placed in its position to form part of the sea-defences of Portsmouth. Midway between Southsea Castle and the western auxiliary battery a bed of concrete has been made in the shingle seven feet in depth, and on this the gun, with its carriage, platform, and loading crane, will be erected. The gun commands the entrance to the channel of Portsmouth harbour. The following are the dimensions of the gun, as given in the *Times*:—Length of gun—From breech loop to muzzle, 16ft. 6in.; from base ring to muzzle, 13ft. 8in. Base ring—Circumference, 11ft. 4in.; diameter, 3ft. $7\frac{1}{2}$in. Muzzle—Circumference, 7ft. $1\frac{1}{4}$in.; diameter, 2ft. $3\frac{1}{4}$in. Bore—diameter, 1ft. 1in.; length, 13ft. $3\frac{1}{4}$in. Thickness of metal at breech, 1ft. 10in., at vent, 1ft. 3in.; at muzzle, $7\frac{1}{4}$in. Trunnions—Circumference, 3ft. $1\frac{3}{4}$in.; diameter, 1ft.; length of shoulder, $11\frac{3}{4}$in. Distance from centre of trunnions to base ring, 5ft. $4\frac{1}{2}$in.; to muzzle, 8ft. $3\frac{1}{2}$in. Circumference of gun round the centre piece or band, 12ft. 9in.; weight of gun, 22 tons; weight of shot, 3 cwt.; service charge of powder, 78lb. The carriage and platform were manufactured at Woolwich of teak, and are bolted together in the strongest possible manner. The carriage weighs 3 tons 2 cwt.; the weight of the platform is 4 tons.

"Electrical Physiognomy" is the only title we can find on the instant for a curious subject introduced a few days since to the members of the Club of the Scientific Press of Paris, by Dr. Mallet. A medical man named Ducheune, of Boulogne, has given much attention to curative electricity, and has thus been led to make a series of curious and important experiments by means of electrical currents on the duty of the various muscles of the human face, from a physiognomical point of view, and has produced a kind of chart illustrative of those functions for the use of those who take any interest in the study of physiognomy. The muscles of the face are set in action by electrical excitation, and the various changes produced are recorded by photography; so that M. Ducheune's chart is, in fact, an album of physiognomical photographs. The experimenter has naturally attached a nomenclature to his album; he calls the great frontal muscle the *muscle of surprise*, and says that its elevation indicates astonishment, attention, and surprise, and his may be studied conveniently at a theatre, at the moment of the rising of the curtain. The contrary action, ex ressive of reflection, is said to be caused by the depression of the brow caused by the action of the orbicular muscles in the eyelids; for this reason, the name given to this latter muscle is the *muscle of reflection*. The little muscle which prickers up the brow in the centre is named the *muscle of pain*. The pyramidal muscle which strides the roof of the nose is considered to indicate ferocity, and is called in the new physiognomical list the *wicked muscle*. The two zygomatic muscles are called the *laughing and crying muscles*; and so on throughout. In order to ascertain the degree of influence exercised by the muscles on the countenance, each was put in action apparently when the face was in repose, and to render the experiment more decided, the subject acted upon in most cases was an old man with a blank face partly paralysed. The muscles were first made to contract one by one, and the results tabulated as expressive or inexpressive; they were then made to contract in twos and threes, and the effects of these contractions are called *concordant* or *discordant*, according as their simultaneous excitement produces the effect of a single well-defined passion, or a mere grimace. One thing seems to be proved by these experiments, namely, that several physiognomical changes which were supposed to be the result of the combined action of two or more different muscles, are in reality produced by the contraction of one single muscle or pair of muscles alone. The experiments were made on one side only of the face, so that each photograph has an excited and a non-excited side. These two might not very inappropriately be called physiognomical positives and negatives. This application of electricity and photography combined may be of great use to artists.

Aluminium could heretofore be cast, moulded, forged, and chased like other metals, but there was a difficulty, or, at any rate, great inconvenience, in soldering it. This has confined the application of the metal to such objects as could be produced in one single piece, and, as all practical men know, this class excluded a very large majority of articles not only of ornament, but also of utility. A silver coffee pot, for instance, often consists of from ten to twelve pieces; the spout is made in two pieces soldered together, and is then of course soldered on to the body; the cover mostly consists of at least four or five pieces. The shops of Paris are filled with small ornamental articles generally struck up in one piece; and plates of aluminium have been largely used in contrast with gold, and with ornamental and carved woods, in the fabrication of small coffers and boxes, and in the ornamentation of cabinet work. But the lightness of the metal makes it peculiarly applicable for many articles of utility, and therefore it has been an object of considerable interest to find an easy mode of uniting several pieces together. M. Mourey, of Paris, has given much attention to the subject, and, having succeeded in his object, he has thrown open his discovery to the world by describing and experimenting upon it before the members of the *Society for the Encouragement of National Industry*. This gentleman, having failed in all his attempts to solder aluminium as other metals are soldered by preparing the two edges and at once uniting them by means of a more fusible metal or alloy, was driven to various experiments, and the following is the plan he now recommends:—He prepares each piece separately by covering its edge with a preliminary solder, composed of aluminium and zinc, and he then unites the two edges by means of another solder containing a larger proportion of aluminium; and he thereby obtains a perfect joint. He prepares the edges with a mixture of turpentine, balsam of copaiva, and lemon juice; the pieces are placed over hot charcoal, and a jet of flame is blown along the part to be soldered; the joint is then covered with morsels of an alloy composed of six parts aluminium and ninety-four parts zinc; these being melted adhere to the surface and are pressed down by means of small tools made of aluminium. The difficulties of the operation are said to be not greater than in the case of hard soldering of copper. When the two parts to be united have been prepared as above described, they are held together in the usual manner, and soldered by means of an alloy consisting of eighty parts of zinc and twenty parts of aluminium. The joints thus made may be worked or touched up as though they consisted of the unalloyed aluminium.

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Mr. J. Downie, of North Woodside Ironworks, has read a paper to the Glasgow Philosophical Society on a new design for river steamers for passenger traffic. Mr. Downie proposes a sort of compromise between Yankee and British vessels—a steamer with the main deck lowered four feet from its present level, the side plates partly removed and replaced with strong plate glass, the side plates to be used in stiffening the hull, and a roof run the whole length fore and aft over the maindeck. A vote of thanks was given to Mr. Downie for his paper, but opinions were expressed that such a vessel as was proposed would scarcely be safe with an upper deck of the nature described, as there would be danger of an upset if the passengers ran to one side of the ship. Mr. Neilson thought that the objection might be removed by narrowing the upper deck.

The new rifled Ordnance Department, in the course of organization in Woolwich Arsenal for manufacturing Sir W. Armstrong's guns, under the superintendence of Mr. J. Anderson, according to existing arrangements, will commence operations early in the month of May. Sir W. Armstrong, it is said, has expended upwards of 7,000*l.* on the initiatory experiments to test the efficiency of his invention.

Mr. F. A. Abel, the chemist to the War Department, has been making a series of experiments on the practising ground of the Royal Engineers at Brompton, Chatham, with an invention of his for firing charges of mines, blasts, &c, by magnetic agency, instead of by the old plan of fuses and slow matches. The experiments have been carried out in presence of a number of Royal Engineer officers of eminence now at head-quarters, all of whom have expressed themselves satisfied with the trials.

Dr. Lardner recommends a resort to destructive agents intended to operate not mechanically, like existing instruments of war, but chemically, for war purposes. Compounds are known, he says, in chemistry which, when exposed to the air, spontaneously ignite, diffusing through the surrounding atmosphere gases, or vapours, of odours so insufferable that men forced to respire them would be rendered utterly incapable of all effectual action. Shells charged with such compounds, exploding in the gunroom of a vessel, or anywhere between decks, would, without destroying life or limb, disable the enemy. There are others of a more formidable character. There are the "kakodyles," of which arsenic is one of the constituents, which on exploding not only diffuse exhalations which render the surrounding atmosphere so fetid as to be absolutely insufferable in respiration, but impart to it also qualities which are poisonous in the most deadly degree. These compounds being eminently volatile explode spontaneously when exposed to the air. In burning, the metallic arsenic, one of their constituents, combining with the oxygen of the air, forms fumes of white arsenic, which, being diffused through the surrounding air, kill all who breathe it. But the laboratory can furnish agents still more destructive. There are compounds into which the gas called cyanogen enters in combination with arsenic. A shell charged with such a compound upon exploding would produce terrific effects. By the explosion of such a shell the surrounding air would be instantly impregnated with the vapours of two of the most fearful poisons known in medicine. Before such agents, says the Doctor, gunpowder would "pale its ineffectual fires."

Messrs. Miller and Taplin have delivered an official report on the comparative merits of Newcastle and South Wales coals for steam purposes. They state the result of their experiments to be that the Welsh coal is 5·3 per cent. better than Newcastle in economy, but that the latter is 1·5 per cent. better than the former in regard to the rate of evaporation. On the whole, the advantages of the one description of coal over the other are scarcely appreciable, and the report recommends that another trial should be made in the Government Dockyards by Government officials without the presence of either interested party.

At the date of the last report of the chief inspector of the Manchester Association for the Prevention of Boiler Explosions, that society had 1,486 boilers under inspection. Of these 107 are found to be defective, from causes classified as follows:—Corrosion 20, of which 6 were dangerous; fractures, 3; safety valves over-weighted and otherwise out of order, 31; pressure gauges out of order, 20; water gauges out of order, 17; feed apparatus out of order, 5; blow-off cocks out of order, 9, 1 dangerous; and deficiency of water, 2. Ten boilers are reported as without glass gauges; 28 without blow-off cocks; 3 without pressure gauges; and 7 safety valves had the spindles passed through stuffing boxes.

A body of workmen, 300 to 600 strong, are about to be set to work on the Crinan canal, on which a serious accident recently took place.

The death is announced at Edinburgh of Mrs. Taylor, widow of the late Mr. James Taylor, whom Scottish writers contend was the first to apply steam to the propulsion of vessels, having launched a small steamboat on Dalswinton Loch in October, 1788.

One of Boydell's traction engines is now working between Manchester and Little Hulton. Another item of Manchester news is the appointment of Mr. Joseph Baxendale as "Corporation Astronomer," in the room of the Rev. H. H. Jones, deceased.

Mr. W. T. Ansell has undertaken the management of the Levant telegraphs.

The work of clearing the Nene of the dams placed in it by the Nene Valley Drainage Commissioners is being actively pushed on, but the complete removal of the piles of the Waldersea dam will not be effected for a week or two. The wings are cleared away, and an opening has been cut for the passage of the water, so that there is now no impediment to the drainage. The Wisbeach Corporation insist on the removal of every obstruction in the river up to Peterborough.

At a meeting held last week by the Hexham Farmers' Club, the cost of cutting an acre of an average crop of wheat (28 bushels) by the various methods of reaping was estimated as follows:—By sickle, 12s.; by scythe, 9s. 6d; by machine with side delivery in swathe, allowing the machine to cut 12 acres per day, 3s. 10d.; by machine with back delivery, allowing 9 acres per day, 3s. 9d. The decided comparative economy of reaping machines is too obvious to require comment. The Hexhamites expressed a preference for machines with back delivery.

From the progress made on the Salisbury and Yeovil and Yeovil and Exeter lines, it is expected that through narrow guage communication will be established between Exeter and London in the course of eighteen months.

A report of the Ordnance Survey and Topographical Depot to the end of the past year 1858, was published last week. It gives a detailed account of the progress of county, parish, and town plans and military surveys. The expense for the Ordnance surveys to be provided for in the current year's estimates is £90,000. The sale of ordnance maps last year realised the sum of £5,499, including those supplied to public-offices, &c.

In spite of the decision of the Committee of the Stock Exchange, the works on the Aidin-Smyrna Railway are continued with energy. The difficult cutting at the beginning of the line has been finished; and what remains now up to the tunnel is one uninterrupted plain, where scarcely any earthworks are required. At the tunnel itself the diagonal shaft on the Aidin side has been sunk to 50 fathoms, during the first 25 or 30 feet through solid limestone rock, after which a layer of clay was found, very easy to work, and yet of sufficient consistency not to require masonry. Thus, the most formidable part of the line promises to give far less trouble than was expected.

"An attempt is in progress on the part of the Great Western Railway Company which is likely," says the city article of the *Times*, "should it prove successful, to destroy the only protection enjoyed by the public against a constant increase of the evils of the monopoly conferred by Parliament on this and all similar undertakings. A private Bill has been introduced, in a covert form, to enable them at pleasure to raise their fares for passengers and goods to an extent ranging from 50 to 100 per cent., as well as to acquire other powers with the view, apparently, of screening their arrangements from observation. It is stated to have been merely by accident that the trading community discovered the project in time to take steps for its defeat. The Bill is entitled 'A Bill for authorizing the construction of a railway for carrying the West London Railway over the Great Western Railway, by means of a bridge in substitution for the present level crossing; for revising the tolls of the Great Western Railway Company, and for other purposes,' and it was in this manner, by putting forth the change of a crossing into a bridge as the prominent object, that it was hoped to gain the means to tax to an almost indefinite degree the entire traffic of the west of England. A more unworthy contrivance has perhaps hardly been recorded in the annals of a respectable English company."

Galignani gives us an account of an improved gas-apparatus for heating test-tubes, and for other laboratory purposes, the invention of M. Bertholet. It consists of six lamps and as many chimneys, which may all be placed in any way the operator may require. Each lamp is composed of three horizontal iron cylinders 15 centimetres in length, and 2½ centimetres in diameter. Each of these cylinders has eight rows of very small holes parallel to the axis, and others in its bases, besides a large one in one of them, into which the tube conveying the gas fits. One of the cylinders is lower than the other two, and when a light is applied to the holes the small blue flames issuing from them may either be kept separate or made to join in a large vertical flame. It is in the midst of this flame the test-tube is placed, resting on supports of wire which traverse the chimneys of the lamps. These chimneys are tubes bent in the form of an inverted U, and are equal in number to the lamps. The operator is not exposed to any inconvenient radiation of heat, since the chimneys, which are of sheet-iron, hardly receive any warmth during the experiment, which shows that nearly all the caloric has been absorbed by the test-tube.

Dr. Russell, the special correspondent of the *Times* in India, repeats in the most explicit manner his assertion that on an examination of the new Enfields at Allahabad, conducted by Lord Clyde and Sir William Mansfield in person, with the assistance of military officers, a considerable variation in gauge and diameter was found in the barrels of the recently arrived muskets. "Captain Butt, of Her Majesty's 79th Highlanders, an excellent officer, skilled in musketry, found," he says, "by means of a gauge made for the purpose, that there were in the muskets of his company alone variations in diameter which would affect the loading. In fact, it is patent to every officer in the army who has been engaged in the war that at least 15 per cent. of the Enfields are rendered useless after firing 10 or 12 rounds. It is quite possible that some proportion of the Enfields are injured by ill-made cartridges or unskilful loading, but the question of the existence of a variation in the barrels is not at all affected by those accidents, as the difference has been ascertained by experiment and by practical use in the field. A correspondence has taken place on the subject, in which Colonel Dixon suggests that the barrels may have been injured by the men using violence to unfix their bayonets, and so compressing the tender substance of the iron tube, and then denies that there is any difference which can be appreciable in the field, or that any officer can detect it unless he be a professional 'viewer,' and a professional 'viewer,' I dare say, we shall have to set the question at rest, coming all the way from England to Allahabad to do it. It is desirable to dispose of the matter for the sake of the makers, and for that of the service. Why should not test gauges have been furnished to the arsenals here?"

Mr. John Anderson, assistant engineer for rifled ordnance, has, it is said, taken charge of the old Lancaster shell foundry in Woolwich Arsenal to commence the manufacture of Sir W. Armstrong's guns, 48 experienced men employed in the Royal Standard gun foundry having been transferred to that department. Various other arrangements have likewise been entered into for proceeding with the manufacture of the new guns without delay.

A correspondent, after reading Mr. Forster's lecture on aluminium, which appeared in a late number, has forwarded us a copy of a paper on Ammonio-iodides of metals read by the Rev. J. B. Reade, F.R.S., at the British Association in 1857. After the reading of the paper, Dr. Lee said:—"I would also observe that with respect to the last metal alluded to in the paper, viz., aluminium, Mr. Reade seems to have a particular object in not putting the solution of iodine in direct contact with the pure metal, as in the other examples. Here he takes an oxide of the metal, alumina, and by a new process attempts to solve the problem which has so extensively occupied the attention of practical chemists in extracting the pure metal from its compounds. Mr. Reade lives upon the great basin of Kimmeridge and Oxford clay in the Vale of Aylesbury. He is, therefore, really the owner of a fortune, lying, however, under his feet, but which only requires the wand of the chemist to transform it into pure metal and current specie."

MAP OF ENGLAND AND WALES.—An exceedingly well executed map of England and Wales, mounted on canvas, coloured, varnished, and attached to a roller, has been placed within the reach of every one who has 3s. 6d. to spend on so useful an article, by Messrs. Everett and Son, of Bouverie-street, Fleet-street, London. This production deserves mention in our columns as a specimen of what the mechanical arts are doing in the way of educating the masses. The map has been most carefully reduced by Mr. J. Cooper, from the great Ordnance map of England and Wales, and the southern parts of Scotland; it has all the lighthouses, sands, and soundings round the coast accurately laid down, and showing all the railway and mail-packet communications.

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Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated February 8, 1859.

350. J. Hosking, of Walworth Common, Oil Merchant. Improvements in the manufacture of lamps.

Dated February 24, 1859.

498. H. B. Barlow, of Manchester. Improvements in apparatus for condensing steam. A communication from F. Daina.

Dated March 2, 1859.

546. J. T. Carter, of Belfast, Flax Spinner. Improvements in machinery for crushing, bruising, and preparing flax, hemp, and other fibrous materials requiring such treatment.

Dated March 9, 1859.

609. J. Pilbrow, of Tottenham, Civil Engineer. Certain improvements in, or a new method or methods of obtaining and applying motive power, a modification of which is also applicable for pumping or forcing liquids, gases, and fluids, as also for measuring liquids, gases, and fluids.

611. Sir W. G. Armstrong, of Newcastle-on-Tyne, Civil Engineer. Improvements in rifle ordnance and its projectiles.

613. J. Erwood, of Goswell-st., Paper Stainer, and J. Skertchly, of Ashby-de-la-Zouch, Engineer. Improvements in the manufacture of glass, sand, and emery papers and cloths, and other similar articles used for like purposes.

615. J. S. Russell, of Great George-st., Westminster. Improvements in building ships and other vessels.

617. A. V. Newton, of Chancery-lane. Improved machinery for rolling horse-shoe iron. A communication from W. W. Lewis.

619. H. Fisher, of Birkenhead, Gentleman. Improvements in machinery or apparatus for cutting thin sheets of metal into strips, and for tempering sheets or strips of metal.

Dated March 10, 1859.

621. J. Yuill, of Glasgow, Ironmonger. Improvements in saddle trees.

623. H. Lodge, of Liverpool, Merchant. Improved means of protecting ships, batteries, and other constructions or buildings, from the effects of projectiles of various kinds.

Dated March 11, 1859.

625. J. C. Haddan, of Cannon-row, Westminster, Civil Engineer. Improvements in casting mortars and cannon.

627. S. Wheatcroft, of New North-road, Engineer. Improvements in the construction of goffering and rouching machines in order to render them self-registering and self-indicating.

629. F. Clarke, of Norland-sq., Gentleman. An improved mode of, and apparatus for, cutting, drying, and preparing peat to be used as fuel, or for other purposes for which it may be usefully employed.

Dated March 12, 1859.

631. J. Cunliffe, and F. Piggott, of Manchester, Manufacturers, and G. Mallinson, of Salford, Pattern Designer. Improvements in the manufacture of ornamental woven fabrics.

633. W. E. Newton, of Chancery-lane. Improvements in the manufacture of shoes and other coverings for the feet. A communication from C. Meyer.

635. J. T. Calow, of Staveley, Joiner. A compound action in cage machinery, with the apparatus connected therewith, having a perforated shield for saving life and property in the event of a rope, band, or chain breaking, or the engine-man drawing the cage too high at coal or other shafts, where slides are applicable, which said invention is also applicable to hoisting or other lifting machines.

637. J. Court, of Brompton-row, Gas Fitter. An improvement in nibs for gas burners.

639. J. Macnab, of Linlithgow, Designer. Improvements in telegraphing or signalling apparatus.

Dated March 14, 1859.

641. R. A. Brooman, of 166 Fleet-st., London, Editor of the Mechanics' Magazine and Patent Agent. An improved method of treating wool and other fibres in order to form threads. A communication from Messrs. Tavernier and Vouillon, of Paris.

643. T. Lightfoot, of Accrington, Calico Printer. Improvements in fixing colours on woven fabrics or fibrous materials.

645. C. H. Hurst, of Kennington-park. An improved wrench or spanner.

647. T. Patstone, of Birmingham, Warehouse Clerk. Improvements in shades or glasses for gas and other lamps, and in the supports of the said shades or glasses.

Dated March 15, 1859.

649. W. Langton, of Lambeth. Improvements in the manufacture of keys and wood fastenings used in constructing railways.

651. G. B. Galloway, of Newcastle-on-Tyne. Improvements upon, and in connection with, his former patents, and in the manufacture of fuel, and working steam-engines more economically.

653. W. Clark, of Chancery-lane. Improvements in the apparatus of electric lamps or lights. A communication from V. L. M. Serrin.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

656. G. Seymour, of Golden-sq., Gentleman. Improvements in making refined sugar, and making potash and soda from the residues. A communication from H. Leplay. Dated March 16, 1859.

667. J. Harris, jun., of Massachusetts. A new and useful or improved carpet-sweeper. Dated March 16, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, March* 29, 1859.)

2563. B. Predavalle. Motive power.
2599. C. Cowper. Combed fibres. A communication.
2603. H. Stott. Warping mills.
2608. E. T. Archer. Hat ventilators.
2617. C. F. Vasserot. Cooling. A communication.
2619. W. Ramscar and J. G. Scott. Fire-arms.
2621. H. Bailey. Heating razors.
2636. C. Tomlison. Taps or valves.
2637. C. Cuit. Railway breaks.
2638. W. Lea. Cocks and taps.
2639. R. A. Brooman. Dolls, statuettes, &c. A communication.
2640. H. Jordan. Navigable vessels.
2641. D. Evans. Tubular steam-boilers.
2645. H. Boden and T. Cooper. Braiding machinery.
2646. H. Gardner. Axle hub and wheel.
2649. F. A. Theroulde. Obtaining salts from marine plants.
2655. W. H. Dawes. Forge Hammers.
2663. R. A. Brooman. Cigar cases. A communication.
2668. C. Peterson Paper cartridges and paper.
2669. J. S. Nibbs. Lighting, heating, &c.
2683. J. Luis. Drawers. A communication.
2691. J. B. Booth. Spinning, &c.
2692. W. Richards. Gas meters.
2693. P. Griffiths and J. Brennand. Lubricators.
2710. G. Collier and W. Noble. Spokes for wheels.
2713. W. Parsons. Melting fat, &c.
2736. R. H. Bow. Railway chairs.
2760. G. Spiller. Knapsacks.
2764. G. E. Noone. Generating gas.
2781. H. T. Yates. Boards or sheets.
2784. W. E. Newton. Harvesting machines. A communication.
2825. J. Elder. Paddle-wheels.
2875. W. Clark. Agricultural implements. A communication.
2891. W. Clark. Telegraph cables. A communication.
2914. W. E. Dando. Lowering boats.
209. W. C. Homersham. Floating gridirons.
303. I. Clements. Curtain rings.
435. J. J. Russell. Heating and welding plates.
437. J. Seguin. Employing moving power of the tides.
526. J. Howden. Cutting metals.
544. J. Pile Floating docks.
559. J. Newcomb and J. G. Lovell. Motive power.
568. W. Score. Soap.
635. J. T. Calow. Cage machinery.
656. G. Seymour. Sugar. A communication.
667. J. Harris, jun. Carpet sweeper.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed March 25, 1859.

2161. W. Lander.
2169. J. Manning and T. Paul.
2173. T. Britt.
2216. M. Jacoby and F. R. Ensor.
2224. D. Scattergood and R. W. Smith.
2242. T. Roberts & J. Dale.
2272. W. Johnston and W. Ross.
2280. R. Ridley.
2306. G. T. Bousfield.
2326. A. W. Drayson and C. R. Binney.
2338. J. Grant.
2343. R. Griffiths.
2365. C. Clay.
2487. W. Ziervogel.
224. R. Bodmer.
325. J. M. E. Masson.

Sealed March 29, 1859.

2174. J. Wright.
2192. J. Rogers.
2203. L. A. Normandy, jun.
2269. J. F Swinburn.
2271. T. C. Shaw and F. H. Cooper.
2291. T. Ingram.
2308. L. Marcus.
2493. E. Alcan.
2809. M. A. F. Mennons.
221. W. Tasker, jun.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

677. J. H. Johnson.
678. J. Jones and A. C. Shirreff.
680. H. Brierly.
692. J. Robertson.
705. W. Foster.
708. G. H. and H. R. Cottam.
729. T. B. Daft.
739. C. J. Duméry.
740. W. F. Thomas.
747. J. Harrison.
749. J. Harrison.
765. A. Guido.
788. W. Roberts.
809. F. W. Kitson.
859. A. C. L. Devaux.
964. D. Lloyd.

LIST OF SPECIFICATIONS, &c.

Published during the week ending March 25, 1859.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s d		s d		s d		s d		s d		s d
545	0 6	1897	0 9	1906	1 1	1914	0 10	1926	0 3	1946	0 3
1811	0 3	1898	0 4	1907	0 3	1916	0 3	1930	0 3	1950	0 9
1858	1 11	1900	0 4	1908	0 3	1917	0 3	1933	0 10	1952	0 3
1891	0 9	1901	0 8	1909	0 3	1918	0 6	1936	0 3	1962	0 3
1892	0 3	1902	0 3	1910	0 3	1920	0 3	1939	0 5	1973	0 7
1893	0 10	1903	1 4	1911	0 3	1922	0 3	1940	0 5	1975	0 3
1894	0 3	1904	0 6	1912	0 3	1923	0 4	1942	0 7	2007	0 6
1896	0 6	1905	0 10	1913	0 7	1924	0 4	1944	0 3	...	...

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ABRIDGED SPECIFICATIONS OF PATENTS.

The abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

Steam Engines, &c., 1799, 1833.
Boilers and their Furnaces, 1774.
Roads and Vehicles, including railway plant and carriages, saddlery and harness, &c., 1794, 1805, 1809, 1812, 1834, 1835.
Ships and Boats, including their fittings, 1796, 1814, 1820, 1839.
Cultivation of the Soil, including agricultural and horticultural implements and machines, 1793, 1799, 1817, 1818.
Food and Beverages, including apparatus for preparing food for men and animals. *None.*
Fibrous Fabrics, including machinery for treating fibres, pulp, paper, &c., 1775, 1781, 1782, 1783, 1785, 1788, 1792, 1800, 1801, 1815, 1825, 1826, 1827, 1831, 1832, 1845.
Buildings and Building Materials, including sewers, drain-pipes, brick and tile machines, &c., 1787, 1810.
Lighting, Heating, and Ventilating, 1791, 1807.
Furniture and Apparel, including household utensils, time-keepers, jewellery, musical instruments, &c., 1790, 1806, 1818, 1829, 1836.
Metals, including apparatus for their manufacture, 1772, 1786, 1798, 1804, 1841, 1859.
Chemistry and Photography, 1783, 1816, 1819.
Electrical Apparatus, 1773, 1797, 1811.
Warfare, 1847.
Letter Press Printing &c., 1802, 1852.
Miscellaneous, 1776, 1777, 1778, 1779, 1780, 1784, 1792, 1795, 1803, 1808, 1812, 1813, 1821, 1822, 1823, 1824, 1828, 1830, 1837, 1838, 1840, 1842, 1844, 1846.

1772. W. Clay. *An improved manufacture of metallic hoops, bands, and other analogous articles.* Dated August 4, 1858.

This consists in making hoops, bands, &c., of steel. *Patent completed.*

1773. C. M. Archer. *Improvements in electric and submarine telegraph cables and wires.* Dated August 4, 1858.

This consists in manufacturing an elastic cylindrical spring or spiral cable, formed in continuous close rings, composed as to its inner core of the present materials, but manufactured in the form of what are known as "check springs." *Patent abandoned.*

1774. J. B. Pascoe and J. R. Thomas. *An improved method of and apparatus for feeding boilers of all steam engines with liquid without the aid of the force pump heretofore used.* Dated August 4, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1775. L. Hall. *Certain improvements in looms for weaving.* Dated August 5, 1858.

This applies to those looms in which shuttle boxes containing compartments for two or more shuttles are employed the object being to prevent by self-acting agents the injury to the warp threads which in looms of the ordinary construction is occasioned when a shuttle is thrown across the shed and against a shuttle in the opposite shuttle box. The invention consists also in a mode of constructing the drop box where the shuttle is made to act sooner on the swell, and the length of the lay bottom is reduced. The invention is not described apart from the drawings. *Patent completed.*

1776. J. Luis. *A new system of truss.* (A communication.) Dated August 5, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1777. J. Luis. *A machine for pulverizing shell, horn, and whalebone.* (A communication.) Dated August 5, 1858.

The object here is to supersede manual labour; the invention is carried into effect by an apparatus consisting of a rasper, a sifter and a mortar. It is actuated by any motive power. *Patent abandoned.*

1778. J. Luis. *A new waterproof tube without seams or girets, and in the apparatus connected therewith.* (A communication.) Dated August 5, 1858.

This comprises, 1, the union of india rubber and gutta percha with or without chemical and other ingredients as applied internally and externally to flax, hemp, cotton, or other textile hose. 2. The machinery for effecting the above process through the medium of steam or otherwise. *Patent completed.*

1779. J. Luis. *A machine for drilling and grooving the naves of wheels, and also to force the axle-box into the naves.* (A communication.) Dated August 5, 1858.

This machine is for preparing the mortices of the naves destined to receive the spokes of carriage wheels, to bore or screw out these naves, to force by pressure the axle-boxes to enter into the screw hole, and lastly, to pierce the iron if required. *Patent completed.*

1780. W. Moseley and W. S. Champness. *An improved self-filling reservoir penholder.* Dated August 5, 1858.

This consists of a tube of hard india-rubber, metal, glass, &c., terminating at the end where the pen is fixed with a fine hole. To the other end is attached a flexable chamber

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made of india-rubber &c., either spherical, tubular, or any other shape. *Patent abandoned.*

1781. E. LEIGH. *Improvements in machinery or apparatus for preparing and spinning flax, wool, silk-waste, or other fibrous material.* Dated Aug. 5, 1858.

This consists in the use of two bottom rollers, and allowing the top roller to bear upon them, the pressure of the top one being exerted and regulated by weighting mechanism. *Patent completed.*

1782. J. HENDERSON. *Improvements in machinery for weaving plain or figured fabrics.* Dated Aug. 5, 1858.

This relates to a former patent, and consists in forming the cross heddle of a series of V-shaped pieces of flattened steel, in the lower part of which is a hole through which the crossing warp is passed. The upper extremities of these pieces of metal are formed into hooks by which each instrument is suspended to two horizontal rods. The stationary longitudinal wires are formed of thin pieces of flattened metal, and have at one end a groove into which is fitted a short wedge-shaped cutting blade. By this improvement the blade is held firmly in its place, and can be removed without disturbing the wire when in its working position. *Patent completed.*

1783. D. MCCUMMEN. *Improvements in the manufacture or production of paper, which improvements are also applicable in the production of alkaline and other salts.* Dated Aug. 5, 1858.

This relates to the use of marine plants, heaths, or heather, and other vegetable productions for the above purposes. *Patent completed.*

1784. C. MATHER. *Improvements in shearing machines.* Dated Aug. 5, 1858.

The object here is the removal of nap or fibre from the surface of fabric. The machine is so arranged that every portion of the face of the fabric is brought in contact with spiral cutters, one of which revolves in a direction opposite to the others. Each spiral cutter has a ledger blade, in contact with which the spiral cutter works, and the face of the fabric is lightly pressed against the ledger blade by a bed having a concave surface over which the fabric is stretched. *Patent completed.*

1785. R. A. BROOMAN. *Improvements in knitting frames.* (A communication.) Dated Aug. 5, 1858.

The object here is to construct knitting frames to produce knitted fabrics, such as stockings, gloves, &c., each of a variable width, and with a selvage. The invention is not described apart from the drawings. *Patent completed.*

1786. W. CLAY. *An improved mode of manufacturing cast steel and wrought iron into ingots and other forms.* Dated Aug. 5, 1858.

The inventor mounts the melting furnace with retorts of fire-clay, having one open and one closed end, in a horizontal position. The retorts are charged at the open ends, and the ends luted, and the flame from the adjacent fire-places is caused to play round them and melt the metal. The retorts are then tapped and the metal flows into moulds. *Patent abandoned.*

1787. W. CLAY. *Improvements in the construction of certain descriptions of bridges and girders.* Dated Aug. 5, 1858.

This consists in the use of wrought steel for such purposes. *Patent abandoned.*

1788. A. V. NEWTON. *Improvements in the manufacture of lace.* (A communication.) Dated Aug. 5, 1858.

This consists, 1, in so acting upon the bars of lace machines, through the agency of jacquard cards or wheels, that the threads of the bars are made to tie in with the bobbin threads, so that two or more independent webs or fabrics of figured and embroidered nets or laces overlaying each other, and each the width of the frame, are simultaneously produced; 2, in making pearl work by the aid of metallic wires, which serve to hold the noses of the pearls until drawn off by the progressive motion of the net beam. *Patent completed.*

1789. W. E. NEWTON. *An improved mode of ornamenting textile fabrics.* (A communication.) Dated Aug. 5, 1858.

This consists in producing ornamental designs upon lace or net, by the application of various colours principally to the ornamented parts thereof. The inventor uses mineral colours prepared from metals. *Patent abandoned.*

1790. C. BARTHELEMY. *Certain improvements in hats.* Dated Aug. 6, 1858.

This consists in the application of japan varnish to the outside of hats. *Patent abandoned.*

1791. G. H. BOVILL. *Improvements in the manufacture of gas, also in the manufacture of coke and other fuel.* Dated Aug. 6, 1858.

Here the patentee combines with retorts from which gas is collected other retorts by which only coke is produced, the gases produced in these latter retorts being consumed, and serving by their combustion to maintain the necessary temperature both in the gas retorts and in the coke ovens. *Patent completed.*

1792. F. H. STUBBS. *An improved mode of communication between the guard and engineman on locomotives or railway trains.* Dated Aug. 6, 1858.

This consists in having an extra wheel attached to the guard's van, which can be raised or lowered as required by levers. When lowered and running upon the rail this wheel carries round with it an eccentric or crank, which crank by the aid of a connecting rod works an air-pump, and by this means air is condensed into a receiving vessel, which air is used in blowing a whistle. *Patent abandoned.*

1793. C. F. KIRKMAN. *An improved mode of treating sewage for agricultural uses, and for machinery to be employed therein.* Dated Aug. 6, 1858.

This relates to machinery for grinding, amalgamating, and deodorising sewage, and removing the impurities from the liquid, so that the water only will pass away. The solid parts of the sewage will be crushed and ground up, and then pass to another part of the machine, in which it will be united with some effective deodorising disinfecting agent, and then conveyed by pumps to receivers in which the heavy sewage will deposit itself, and the impurities being removed the water will pass off in a pure state. *Patent abandoned.*

1794. S. CAREY. *An improved system of forming the permanent way of railroad transit, also common tramway, and channel or watercourse, by the means of cast-iron plates or boxes, peculiarly constructed so as to make one continuous way or channel.* Dated Aug. 6, 1858.

This consists in forming a continuous line of cast iron plates or boxes, put together side by side, or end to end, for making a channel at the sides of streets; also for forming tramways either at the edge of a roadway next the curb or in any other part of the road; likewise for forming the permanent way of railways. *Patent completed.*

1795. G. WESTON. *A washing machine.* Dated Aug. 7, 1858.

This consists of a frame of wood or iron in which a number of wooden frames are caused to slide side by side in opposite directions. *Patent completed.*

1796. G. P. LOCK. *Improvements in the composition of paints for coating iron ships, and for other useful purposes.* Dated Aug. 7, 1858.

The inventor takes for the under coating of iron ore ground in boiled linseed oil about 50 per cent., of oil and turpentine about 50 per cent., and well mixed; for the outer coatings of white lead about 40 per cent., of blue mineral or copperas about 10 per cent., and of oil and turpentine about 50 per cent., also well mixed together. *Patent abandoned.*

1797. J. WALKER. *Improvements in the manufacture of electric telegraph cables.* Dated Aug. 7, 1858.

This invention was described and illustrated at page 141, No. 9, of the MECHANICS' MAGAZINE. (New Series.) *Patent completed.*

1798. J. WEBSTER. *A new or improved metallic alloy.* Dated Aug. 7, 1858.

This consists of nickel 6 parts by weight, tin plate scrap 12 parts, copper 57 parts, zinc 24 parts. *Patent abandoned.*

1799. J. SMITH, jun. *Improvements in agricultural steam-engines, and locomotive steam-engines to be used on common roads.* Dated Aug. 7, 1858.

The patentee claims, 1, supporting the boilers upon centres, or upon an axis situated in a horizontal plane, and transverse to the length of the boiler, the said centres or axes being situated below the centre of gravity of the boiler when the boiler is filled with water to the ordinary water level. Also, connecting one end of the boiler with the framing of the engine by a screw, or otherwise, so as to permit of the level of the boiler relative to the level of the framing being easily changed. 2, A mode of connecting the wheels which constitute the driving wheels when the engine is made locomotive, by a clip or clips connected with the shaft or axle, the said clip or clips being made to grip the naves of the wheels. *Patent completed.*

1800. J. LUIS. *A new twisting bobbin.* (A communication.) Dated Aug. 7, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

1801. J. LUIS. *A new covering, doubling, and twisting machine.* (A communication.) Dated Aug. 7, 1858.

The inventor employs, 1, a guide, allowing the produce to pass round the cylinder as many times as there are rollers. 2, A system of arms pressing on the matter not made, placed on a bobbin, thus giving the same pressure from the beginning to the end of the bobbin. The winders of the required size, which are filled by the matter made, give an equal pressure from the beginning to end on the matter coming from the cylinder; the weight and diameter increasing at the same time. An endless cord, crossed and doubled to make two, passes into the upper and lower grooves of a three-grooved pulley, but is divided by the distance of the three grooves. A third cord having its resting point on a great roller, receives its movement from another part, and keeps the two first in equilibrium by moving in the middle groove. By this combination, the spindle fixed in the three-groove pulley experiences much less friction, and is governed by three cords instead of one. *Patent completed.*

1802. J. IMRAY. *Improvements in apparatus used in printing.* Dated Aug. 7, 1858.

These apply to presses for printing two or more impressions in register on the same sheet. The table is sufficiently long to receive the two or more forms disposed at intervals along it. The patentee holds the sheet to be printed between a tympan and a frisket, which slide with the table under the platten to receive the impression from the first form. After the first impression has been taken, the tympan and frisket containing the sheet are retained under the platten by stops, and the table is made to slide onwards till the second form is brought to its place under the platten and a second impression is taken. Thus successively any number of impressions may be taken. Finally, the table is drawn back, bringing with it the tympan and frisket containing the printed sheet. *Patent completed.*

1803. J. TAYLOR. *Improvements in the manufacture of blocks for the construction of sewers and drains.* Dated Aug. 7, 1858.

Here blocks of clay or brick earth, &c., are expressed through moulding dies of the following form: the inner surface is concave, and the sides inclined to correspond with the section of the circle or curve it is intended to produce by a series of such blocks. The outer surface of such moulded block is formed with a longitudinal rib. *Patent completed.*

1804. J. WALKER. *Improvements in machinery or apparatus for moulding or shaping metals.* Dated August 7, 1858.

This relates to collapsible core bars, such as are used for the interior surfaces of pipes. The main shell of a core bar of this kind consists of a thin cast-iron pipe cut through longitudinally from end to end. Each lip or edge of this slot is formed with a longitudinal thickened portion interiorly, to form the bearing edge surfaces for the action of a series of flat, double, incline, or wedge pieces of metal, by the action of which the necessary expansion of the core bar cylinder is produced. *Patent completed.*

1805. J. H. JOHNSON. *Improvements in apparatus for working railway brakes.* (A communication.) Dated August 7, 1858.

Here the brake blocks are connected to brake rods disposed longitudinally beneath the carriage framing, and worked by T-headed levers with the T-piece downwards the two opposite ends of the lower arms of the T-piece being connected by links with the brake rods, whilst the upright arm of the lever is connected with a main actuating rod which extends from end to end of each carriage. These actuating rods are coupled in a peculiar manner, and may be actuated from either end of the train. *Patent completed.*

1806. A. V. NEWTON. *Improvements in pianofortes.* (A communication.) Dated August 7, 1858.

This relates to a former patent, dated 1st November, 1855, and consists in so arranging certain parts as to leave the sound chamber free from obstruction, to improve the tone, and cheapen the construction of the instrument. *Patent abandoned.*

1807. J. G. PICKING and T. P. PURSSOLOVE. *An improved pressure gauge for steam, gas, or other fluids.* Dated August 9, 1858.

The inventors place a number of tubes side by side in a vertical position, and connect them together at the bottom and top alternately, so as to form a continuous pipe. Into this pipe they pour mercury until it rises in each leg to half the vertical height thereof. They fill up the remaining space in each one with water. They attach one end of this pipe to the boiler or other vessel, and to the other end of the pipe attach a graduated scale to register the pressure by the rise and fall of the mercury in the last leg. Upon the pressure being turned on it will be found that as the mercury in the first leg is depressed and forced into the next in communication, so will the mercury in every alternate leg be depressed, owing to the intervention of the water or other fluid. *Patent abandoned.*

1808. J. J. MURPHY. *Improvements in the construction of floating bodies, and in the means of supporting floating structures.* Dated August 9, 1858.

This consists of one or more inverted air-tight vessels, somewhat like a gas holder, of such a height or depth as shall allow of a permanent air space being maintained, and by which the action of the waves shall be permitted freely to communicate and operate within the said inverted vessel, and thus counteract the rolling and oscillating motion of bodies immersed in a sea-way. *Patent abandoned.*

1809. T. INGRAM. *Improvements in means or apparatus for operating railway brakes.* Dated August 9, 1858.

This invention relates to a former patent dated 20th August, 1857, and is not described apart from the drawings. *Patent completed.*

1810. H. CLAYTON. *Improvements in machinery for manufacturing bricks and tiles, and other articles of brick earth, clay, or other plastic material.* Dated August 9, 1858.

To give the alternating motions and periods of rest to the rollers applied to expressing orifices, a cam is applied to the driving shaft. This cam is arranged to move the pulleys which drive the bands, so that they may alternately gear with, or be carried round by, the upright shaft on which they are placed, the one pulley allowing the shaft to turn within it when the other pulley is held by, and carried round with the shaft. The two pulleys by two bands give motion to two screw shafts, each of which gives motion to two screw wheels, which are fixed on the axis of the rollers applied to the moulding orifices of the machine. To sustain and guide the end of the bar to which the cutter wires are strained, a bridge is fixed across the cutting frame, the upper surface of which is formed to a curve corresponding with that described by the bar. On the end of the bar a roller or truck is applied, which runs on the surface of the bridge. The wires are tightened by screw nuts, which receive within them the stems or short rods to which the ends of the wires are attached. These short rods slide through the bar in square or angular holes, which prevent their turning in the holes, and the screw threads are cut at the four angles of the short arms or stems. *Patent completed.*

1811. W. SMITH. *An improved compound for coating or insulating electric telegraph wires, and for coating other surfaces.* Dated August 9, 1858.

The compound consists of about $\frac{3}{4}$ths lbs. by weight of gutta percha, $\frac{1}{4}$th of Stockholm tar, and $\frac{1}{4}$th of resin, and is prepared by first mixing in a vessel by preference heated by steam the tar and resin and then adding the gutta percha. *Patent completed.*

1812. T. G. MESSENGER. *Improvements in the manufacture of garden engines, which are also applicable to fire or other engines.* Dated August 9, 1858.

The patentee claims, 1, the placing or arranging of the cylinder or cylinders horizontally (thereby allowing for the employment of a longer lever or handle), and also the placing or arranging of the lever or levers perpendicularly; 2, the employment of a combined jet and spreader. *Patent completed.*

1813. A. H. WILLIAMS. *Improvements in fastenings for porte-monnaies, pocket-books, and other like articles.* Dated August 9, 1858.

This consists in fitting to the tongue or flap of the cased perforated plate, or in making apertures or holes in the tongue, and in causing a stud or button pressed upon by a spring held in the side of the case to enter one or other of the perforations in the plate. *Patent abandoned.*

1814. W. E. NEWTON. *An improved method of arranging and applying magnets to counteract or compensate for the effects of local attraction on the mariner's compass.* (A communication.) Dated August 9, 1858.

This consists in the arrangement of one or more magnets in a horizontal position below or above the needle of the compass, with opposite poles horizontally in line with the vertical centre or axis on which the needle turns, and on opposite sides thereof, by which arrangement the opposite poles of the magnet or magnets are caused to act upon the needle to force it into the same direction. It also consists in applying the so arranged magnet or magnets so as to make it or them adjustable on a centre coinciding as nearly as practicable with the vertical axis on which the needle turns, so that their poles may be made to point in

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any direction necessary to compensate for the local attraction, and may have their direction varied to meet any variation in the point or points of local attraction that may be produced by different cargoes, &c. Also in providing for the adjustment of the so arranged and applied magnets in a direction parallel with the axis or vertical centre on which the needle works, for increasing or diminishing the intensity of their action according to the intensity of the local attraction. *Patent completed.*

1815. W. E. NEWTON. *Improvements in machinery for drawing and twisting wool or other fibrous material.* (A communication.) Dated August 9, 1858.

This consists in a combination of tubes and drawing rollers, and a means of operating such rollers, by which the processes of drawing and twisting can be performed simultaneously, or either of these processes separately, and by which, when the two processes are combined, great convenience is afforded for varying the relative degrees of draft and twist to suit various lengths and qualities of fibre. Also in making the whole of that part of a drawing and twisting or spinning frame which carries the back drawing rollers, and the rollers or their equivalents on which the roving to be drawn and twisted or spun is contained, adjustable vertically, so as to enable the distance between the back and front drawing rollers on both sides of a double frame to be regulated according to the length of staple, and yet preserve the proper relation between the back drawing rollers and the roller or its equivalent which contains the roving. *Patent completed.*

1816. W. SPENCE. *The precipitation of purple colouring matter by chloride of calcium.* (A communication.) Dated August 9, 1858.

Here metallic oxides are used, and particularly lime in the state of a salt. The colour is extracted according to the process patented by the present patentee 1st May, 1851. To extract and separate the violet colouring principle freed from the pale red colouring matter which accompanies it, there is added to the ammoniacal coloured liquor a suitable quantity of chloride of calcium, which gives rise to a double decomposition; 1, an insoluble precipitate which contains the violet matter; and, 2, a solution more or less coloured, in which is found all the pale red matter. The precipitate is gathered on a filter, washed with hot or cold water, then dried with care, and presents the external characteristics of a light indigo. For use in dyeing it is sufficient to dilute it with water and sufficient acid to saturate the lime which is found in it. The acids which may be used are principally sulphuric and oxalic. *Patent completed.*

1817. T. PICKFORD. *Improvements in the preparation and manufacture of manure.* Dated August 10, 1858.

This consists in treating fish and marine and other animals or animal matter, seed, weed, &c., with diluted sulphuric or other acid, in pans or tanks lined with lead, and steam injected, so that it is boiled under pressure. Blood, Sombrero phosphates, or crust guano, ammoniacal liquors, bone, or gas sulphates of ammonia, gypsum, and other ingredients are used. Animal charcoal and other disinfectants are used. *Patent abandoned.*

1818. A. BARCHOU. *Improvements in the mode of fastening the soles and heels of boots and shoes.* (A communication.) Dated August 10, 1858.

This consists in joining the upper leather of boots and shoes to the exterior and interior soles by a threaded nail or spindle. *Patent completed.*

1819. M. HENRY. *Improvements in the manufacture or production of saltpetre, and the preparation of materials for the purpose.* (A communication.) Dated August 10, 1858.

Here nitrate of soda is treated with caustic potassa direct. *Patent abandoned.*

1820. R. H. COLLYER. *An improved coating composition to protect vessels from marine animal and vegetable substances.* Dated August 10, 1858.

This consists in the application of the metals zinc, tin, and lead, or their oxides, singly or in combination, added to any adhesive substance. *Patent completed.*

1821. F. HAECK. *Improvements in the construction of cocks, taps, or valves.* Dated August 10, 1858.

The barrel of the tap, &c., is formed with a conical or spherical seat covered by a layer of india-rubber, &c., and the closing of the passage therethrough is effected by suitable closing means, and the inner end of this closing means is formed with a disc which fits a cylindrical portion of the barrel within which it is capable of traversing. This disc is perforated near its edge with a series of holes, which together are of the area of the passage through the seat. The other end of this closing means is formed with a stem by which it is operated for closing or opening, and the stem may be formed with a screw to turn in a female screw formed in a fixed part of the tap. The parts of the tap may be made of porcelain, or metal. *Patent completed.*

1822. M. MOSES. *Improvements applicable to umbrella and parasol sticks.* Dated August 10, 1858.

The object here is to give a greater command over the umbrella or parasol. It consists in applying to the central stick a stop-piece or rest, against which the hand employed to grasp the stick will bear, and so relieve the strain on the muscles of the arm or hand. *Patent completed.*

1823. J. H. WHITEHEAD. *Improvements in the manufacture of woollen bags.* Dated August 10, 1858.

Here woollen yarn is employed for weaving tubular fabrics of the diameters desired, and to close the end of each bag, the same is done either in the loom, by throwing in shoots of woollen weft, so as to weave the warps into one fabric, or the tubular fabrics are sewed across by the hand. The bags are then to be milled, by which the ends of each bag will become felted together. *Patent abandoned.*

1824. J. T. PITMAN. *An improved mode of operating apparatus for lifting and pressing.* (A communication.) Dated Aug. 10, 1858.

This consists in the employment of mechanical agents, so that when little or no power is required the pressure may be effected, and the apparatus may be brought to the lifting point with great rapidity by one device; and when more power is needed than is consistent with such rapidity, the increased power is obtained by another device. The main agent is the screw fitted to play into a female screw running the entire length of a revolving cylinder or nut. *Patent completed.*

1825. S. F. COTTAM. *Improvements in machinery for doubling cotton and other yarns or threads.* Dated August 11, 1858.

This consists in so constructing doubling frames that as soon as the yarn or thread breaks the top roller ceases to revolve. *Patent completed.*

1826. R. C. GIST. *Improvements in knitting machines.* (A communication.) Dated August 11, 1858.

The object here is to knit plain tubes or cylinders continuously, and it is designed to operate with the number of threads simultaneously. It consists of a revolving cylinder carrying the needles, sinkers, and fabric, and a stationary cylinder sustaining the cams by which the needles and sinkers are worked. The yarns are laid by the carriers just before the needles attain their highest elevation; they are then carried in loops between the needles by the sinkers, and are caught under the barbs of the descending needles, which are closed by the bevelled teeth of the presser wheels. The needles pass through the old loops with the loops last formed beneath their barbs, and are elevated by another cam, and the operation is repeated with as many threads as there are cams. The number of yarns thus laid in at each revolution is limited only by the size of the machine. The knitted fabric is guided by an expanding plate, and is wound on a roller by suitable gearing. *Patent completed.*

1827 J. B. JOYCE, J. CURE, J. BOYCE, and J. CLOUGH. *Improvements in machinery or apparatus for combing wool and other fibrous materials.* Dated Aug. 11, 1858.

These consist in the use of a cam, &c., for bringing the swift towards the cam. This cam has a continuous rotary motion, and brings the swift up to the feed rollers of the machine, detaining it there while the combs which are placed on the swift are filled. The cam then pushes the swift on the slides to the travelling comb, and detains it there while the combs which are on the swift are emptied. This cam is worked by power; also, the swift is worked by the same means while at the feed rollers, but not while it is at the travelling comb, being reversed by hand. *Patent abandoned.*

1828. J. G. APPOLD. *Improvements in the manufacture of wire ropes or cables.* Dated August 11, 1858.

This consists in protecting telegraph cables by two sets of wire strands laid round the internal core in opposite directions. *Patent abandoned.*

1829. R. A. BROOMAN. *Improvements in time-keepers.* (A communication.) Dated August 11, 1858.

This relates to the regulation of time-keepers put in motion by weights or springs, and consists in the employment of pendulums, each pendulum being formed of two horizontal, or nearly horizontal, arms, carrying discs, each arm being formed of a metal or other material of different expansibility to the other, and the two being so combined that, as their lengths are caused to vary by variations of temperature, the angles which they form with each other, or with a vertical line, shall also vary so that the distance of their common centre of gravity below the point of suspension may be constant, and, therefore, the times of oscillation of the pendulum be constant. The discs may be furnished with indicators to indicate the variations in the dilatations of the arms, and the corresponding variations in the angles made by them. *Patent abandoned.*

1830. E. TAMBERLICK. *Improvements in apparatus used for exhibiting advertisements.* Dated August 11, 1858.

This consists in the employment of a hollow octagonal iron column made of framework and glazed on all its faces, and on the glass advertisements are written. Within the column lamps are placed, which render the advertisements legible at night. *Patent abandoned.*

1831. W. MECKEL. *Improvements in textile fabrics.* Dated August 12, 1858.

This has reference to woollen and union stuffs, and consists in producing a woven pattern upon the face of the fabric resembling the ordinary quilting, and forming the groundwork of the fabric. The inventor causes an additional weft to be employed during the weaving, for raising or doubling the surface in such parts of the material as are necessary for producing the desired effect. *Patent abandoned.*

1832. W. KNOWLES. *Improvements in certain parts of machinery used in preparing and spinning cotton and other fibrous materials.* Dated August 12, 1858.

This consists in a mode of weighting the top rollers of machines used in preparing and spinning cotton, &c., by the application of rotary weights bearing upon the pivots, or upon the spaces between the bosses of the top rollers; also, in the application of intermediate rollers between the top rollers and the weighted rollers. *Patent completed.*

1833. J. SCOTT and A. MARTINUCCI. *An improved steam-engine.* Dated August 12, 1858.

This consists in dispensing with the ordinary steam cylinders, and their valves and pumps. The engine consists of a solid cylindrical piece of metal, having recesses bored into it for inserting the valves, and for admitting steam. The centre of the cylinder is bored out to receive a solid ram, and the lower end of one side and the top end of the opposite side of the bore has a steam space cut therein, corresponding with similar steam spaces in the ram, so as to receive a reciprocating movement by the action of the steam, first on one side and then on the other, and so on continuously, without requiring condensation, and which may be prevented by raising the temperature of the metal composing the body of the engine. The boilers, steam pipes, and connections may be similar to those in ordinary use. *Patent abandoned.*

1834. G. HOUGHTON. *An improvement or improvements in saddles.* Dated August 12, 1858.

The patentee claims giving elasticity to the seats of saddles by springs made of plates or strips of metal, the said springs having certain forms represented in the drawings, and being so applied as to keep the webs or other material constituting the seat of the saddle in a state of tension, whether the said springs be applied to the anterior or posterior part of the saddle. *Patent completed.*

1835. J. H. M MAISSIAT. *Improvements in wheels.* Dated August 12, 1858.

Instead of the rigid radii or spokes of the wheels, the patentee interposes between the axle and the ground any elastic material that is susceptible of changing its form in a notable degree by elasticity. *Patent completed.*

1836. G. METZLER and J. WADDELL. *Improvements in the construction and formation of valve musical instruments.* Dated August 12, 1858.

Here the patentees have adopted an arrangement of tubing. They have also adopted an arrangement of the valves, in which the note-and-half tubing attached to the third valve is made a part of the "pitch" tubing of the instrument, the valve being made so as to allow the current of air to pass through this note-and-half tubing in all the open notes. The position of the bells of their instrument is similar to cornets, trumpets, trombones, &c., so that the instruments are placed or held across, or parallel to the body of the performer, thereby bringing the weight nearer the performer. *Patent completed.*

1837. J. FOGG. *Improvements in pressure guages.* Dated August 12, 1858.

Instead of allowing the fluid, the pressure or weight of which is to be indicated, to come into direct contact with the mercury, &c., the patentee interposes a moveable metal piston between such pressure or weight and the fluid used for indicating, the areas or superficies of the ends or other parts of such plug being made of such proportion to one another as it may be desired to decrease or increase the length or height of the indicating column below or above its natural height. There are various modifications included. *Patent completed.*

1838. R. BAXENDALE. *Improvements in brushes, mops, or apparatus for washing and cleaning.* Dated August 12, 1858.

The inventor makes the head of the brush hollow, and attaches to it a tube, through which liquid passes, the flow being regulated by a valve. *Patent abandoned.*

1839. A. J. PATERSON. *An improvement in propelling ships and vessels.* Dated August 12, 1858.

This refers to a former patent dated 2nd May, 1857, which consists in building the ship, fore and aft, with one or more cones or frustrums of cones, instead of the ordinary bows or stern. The patentee mounts screw blades upon a conical frame corresponding to the shape of the bows or stern, and causes this frame and screws to revolve round the fixed cones. Now, the present invention consists in causing the blades to revolve round the conical bow or stern, instead of the conical bow or stern revolving with the screw blades. *Patent completed.*

1840. R. JOBSON. *Improvements in apparatus used when making moulds for casting shells and other articles.* Dated August 12, 1858.

This invention is described and illustrated on another page of this Number. *Patent completed.*

1841. E. SMITH. *An improvement in puddling iron.* Dated August 12, 1858.

This consists in introducing streams of air between the sides and ends of a puddling furnace and the protecting materials (sometimes called "fettling") with which the furnace is lined, by which the plates, sides, and ends, as well as the lining materials are preserved. *Patent abandoned.*

1842. R. JOBSON. *Improvements in apparatus for supplying water to axletree boxes and other journal bearings to lubricate the same.* Dated August 12, 1858.

This consists in combining a water cistern and an axletree box, or the bearing of a journal, with the water passages or pipes so that the water may circulate from the axletree or journal to the water vessel, and from the water vessel to the axletree or journal. The water vessel may form part of the box or bearing, or be separate and at a distance therefrom. *Patent completed.*

1843. H. SMITH and T. W. ASHBY. *Improvements applicable to haymaking machines, whereby such machines are rendered useful for other agricultural purposes.* Dated August 12, 1858.

This relates, 1, to a mode of mounting the tine cylinders or barrels of haymaking machines, and of arranging the gearing for actuating the same, the chief object being to obtain the reverse rotary motion of the tine cylinders (when desired) in a simple and convenient manner. 2, to the application to the teeth or tines of haymaking machines of moveable bars provided with sharp cutting edges, and also short teeth or tines for extending the use of the implement and enabling it to cut off the tops of thistles or weeds, and also of breaking up light clods of earth or manure. The invention is not described in detail apart from the drawings. *Patent completed.*

1844. R. JOBSON. *Improvements in apparatus for crushing and sifting.* Dated August 12, 1858.

This invention will be described and illustrated in our next Number. *Patent completed*

1845. W. B. NORTCLIFFE. *An improvement in dyeing woollen, worsted, cotton, silk, linen, and other textile fabrics and fibrous substances.* Dated August 12, 1858.

This consists in the use of nitrate of copper in combination with the extracts of logwood and fustic, with or without terra japonica, as a first process, and in the use of chromate of potash as a finishing process. *Patent completed.*

1846. L. AUTRA. *Improved apparatuses for exhibiting advertisements.* Dated August 13, 1858.

This consists in fitting up the fronts of houses with, or in placing against walls, frames containing glass, each frame being set at an angle, so as to obtain an extended surface within a comparatively small space, and in writing thereon the announcement desired to be published. *Patent abandoned.*

1847. F. J. MANCEAUX. *Improvements in stocks for fire-arms.* Dated August 13, 1858.

This invention was described and illustrated at page 188 No. 12, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, APRIL 8, 1859.

THE LONDON MECHANICS' INSTITUTION.

THE remarks made in our last number on the founding of this Institution have elicited many communications from men who love truth and justice, but neither has Lord Brougham, nor have those gentlemen who now manage the Institution's affairs, and who servilely sanction the noble lord's misrepresentation, offered any rejoinder to them. Mr. Hodgskin, who was associated with Mr. Robertson in the founding of it, and who still lives to vindicate the truth, writes as follows :—

"TO THE EDITORS OF THE 'MECHANICS' MAGAZINE.'

"16 Claremont Row, Islington, N.
April 2, 1859.

"GENTLEMEN,—Allow me to return you my thanks for your article last week on the London Mechanics' Institution, in which you do justice to the parties especially concerned in originating and founding the Institution. If this have now a money value, and can unlock the purses of the nobility and the gentry to bestow on Lord Brougham what would be a fortune to a person, not richly endowed by the State like the noble Lord—if it call forth the laudation of the noble Earls, Right Rev. Bishops, and Right Hon. Gentlemen, (though I remember the time when numerous members of these classes scowled on the individuals who really tried to promote intellectual improvement and independence, as contradistinguished from mental drilling into peculiar habits of thought, and when Right Rev. Gentlemen preached against Mechanics' Institutes,)—if it be a meritorious step in social progress, now calling forth public approbation—and I see to subscribe to an Institute is now proposed as a means of enfranchisement — then nothing can be clearer than the propriety and justice of informing the public who were the actual originators and founders of the London Mechanics' Institution. I rejoice much to see a due appreciation of such institutions in high quarters, and I also rejoice to see them now forming a large portion of the intellectual life of this noble community; for the more they are honoured and praised, the greater will be the recompense of those who, neither wedded to past prejudices nor seeking meretricious popularity, most contributed to originate and promote them. Let me, therefore, remind you that prior to the London Mechanics' Institute being established, the WORKMEN of Glasgow had proposed to establish such an Institute for themselves, and you will find the evidence of the fact in the early columns of your Magazine. They, therefore, deserve the praise of first endeavouring to establish such an institution in their own behalf. But their exertions in no degree detract from the merit of those who started the idea of founding a great institute in London by an appeal to the mechanics' and the public, and carried it into execution with a success not to be surpassed by any similar attempt in modern times. You, gentlemen, have, in your notice of this movement, done justice to the late Mr. Robertson, to Dr. Birkbeck, and to myself; and there are many others, some gone and some yet left, who deserve much praise for having contributed to what is now acknowledged to be a good work.

"I must now say that with reference to Lord Brougham, you have, I think, misunderstood the empathic *we* in his letter to which you refer. I wrote a note to his Lordship a short time ago, asking him if he had seen the false statement in the *Times* on this subject, to which I directed attention in other journals when it occurred. The answer which Lord Brougham gave to my question will, I think, prove both that the *Times*—I do not say the unknown writer in that journal, for it is totally distinct from its contributors—knew that Lord Brougham was not the founder of the London Mechanics' Institute, and that by his late letter from Cannes, read at the meeting, he does not mean to make any such claim. I have no hesitation in sending you an extract from his Lordship's answer for publication—though I have not asked his permission—because it concerns a public matter and his personal honour :—

"'Lord Brougham presents his compliments to Mr. Hodgskin, and in answer to his letter which he received last night, he has to state that he cannot say whether he saw the paper published four or five weeks ago, in which, according to Mr. H., some one has done Lord B. the *unmerited* honour of mentioning him as the founder of the London Mechanics' Institute. He has been often so represented, and he has *always contradicted* it, and he will cause to be copied and sent to Mr. H. a speech on the subject which he made in 1835, and which has been repeatedly published. He has continually declared Dr. Birkbeck to be the founder, and has added that he had coadjutors, of whom Lord B. has represented himself to be one, as he well might.'

"The extract promised by his Lordship was from Vol. III, page 582, of Lord Brougham's speeches, and as it stated only at greater length the substance of the above extract I shall not quote it. I may, however, add that his Lordship informed me that he made a like statement in a tract which he published in 1845. The whole reading world therefore knew several years ago that Lord Brougham disclaimed the honour which the *Times* attributed to him a few months since to obtain relief from a pecuniary difficulty incurred for the London Mechanics' Institute. The noble lord himself having present to his mind these circumstances, and knowing that were he to make such a claim it would be at once questioned, did not mean—as you imply—that he, in conjunction with Dr. Birkbeck, founded the Institute.—I had written thus much and more before the letter of the noble lord, as published in the *Times* this morning, fell under my notice, and in this version of his epistle from Cannes I find to my satisfaction that the *we* is converted into *he*, so that the true reading is 'he (Dr. Birkbeck) both founded and endowed the Institute.' How far this is correct you have already explained. I have only to add, that so far as Lord Brougham is concerned his personal disclaimer of the honour which the *Times* thrust upon him is complete.

"I remain, Gentlemen, your obedient servant,
"THOMAS HODGSKIN."

We are glad to find, for Lord Brougham's sake, that the disclaimer made in respect to himself was complete, and that the apparent intrusion of a claim on his own account in the end of the sentence quoted from his letter last week was but a misprint. But this, of course, leaves the injustice done by him to the memory of Mr. Robertson as flagrant and as indefensible as ever.

And let us now express a plain sentiment or two with respect to this London Mechanics' Institution. The intention of its real founder, and that of his friend Mr. Hodgskin, was that it should really be what its name implies—viz., an institute for mechanics. But is it that now? Has it been that since the first year of its foundation? If it had been, would its officers have been cringing, and petitioning, and begging, hat in hand, for years past, from princes and noblemen for the means of keeping it in existence? Nay, worse than that, would they have been miserably lending themselves, not only to these questionable proceedings, but also to the propagation of a statement which five minutes' perusal of an accessible book (if that were necessary) would have shown them to be utterly false? We put these questions confidently, and would wish to see them answered. It grieves us to have to express ourselves in these terms on this subject. But it is our clear duty to do it. We cannot turn from the task with the facts of the case present to our mind.

Last week we showed that Mr. Robertson was, and that Dr. Birkbeck was not, the founder of the Institution. This week we have the testimony of Mr. Hodgskin, who knew all about it from the first, to that effect. But we have more than that. We have the distinct disclaimer of Dr. Birkbeck himself on the subject. In his Inaugural Address, delivered on the 20th of February, 1824, at the opening of the Institution, the Doctor spoke as follows :—

"For myself, who, although *not the originator of this Institution*, took the earliest counsel with its earliest effectual projectors, I can boldly declare, that the scientific cultivation of the mind of the mechanic was, and still continues to be, *my only object*. For my friends, Mr. Robertson and Mr. Hodgskin, your original temporary secretaries, who first gave currency to the plan, and were the powerful means of organizing our first public movements, I can with equal confidence answer. But what need of any voucher here for them? They are always before you. The MECHANICS' MAGAZINE, the most valuable gift which the hand of Science ever yet offered to the artizan, of which they are the intelligent editors, carries along with it incontestible evidence of the inflexible resolution with which they can pursue their sole objects—your amelioration and your instruction. For several individuals who took an active part in the public proceedings, and for the committee to whom you have intrusted the management of your concerns, I can, without hesitation, make a similar avowal."

Does Lord Brougham, do the present officers of the Institution, need further proof of the justice of our course, or of the injustice of their own?

But we claim for Mr. Robertson more than the honour of founding the Institution. We contend that to him is due the further honour of endeavouring to secure for it a proper basis, of resisting the measures which have reduced it to beggary, and of prophesying its present disgrace when he found such resistance hopeless. It is only necessary to turn to the first two volumes of this Magazine for the most satisfactory proofs that he laboured hard, and, despite bitter hostility, to preserve its purity as a *Mechanics'* Institute, and to avoid that very debt which has ruined it. In a supplement to the second volume of the Magazine, written expressly upon this subject, he speaks with a degree of grief and anger which he only could be expected to feel. He says :—

The Anniversary which the Managers and their friends consider a fit subject for convivial celebration, brings to the Editor's mind only cause of sorrow for principles abandoned, laws and promises broken, and great interests lamentably sacrificed. The Institution was founded for the benefit of the journeymen Mechanics of London chiefly, who showed, by the numbers in which they flocked to its first meetings, that they were fully sensible of the important benefits which it promised to procure for them; but so slowly and imperfectly have the plans laid down been followed, and so little has the year produced, suited to the wants and taste of the journeyman mechanic, that the number of this class now enrolled as members has dwindled to a few hundreds, of whom a large proportion are new intrants, who, if we may judge from the past, have entered only to acquire that experience of empty professions which has disappointed and driven away their predecessors. The number of members altogether is small, and certainly not more than *one half* are of that class of persons for whose special benefit the Institution was founded. The Institution was established, too, on the condition that the mechanics themselves should have, in the proportion of two-thirds, the preponderance in the management of its affairs; but that condition, as we have seen, has been shamefully violated. It was provided, also, that the Institution should rest on the principle of self-support and exertion. The mechanics of London would have disdained to seek advantage from it on any other. But, though the rate of contribution to the London Mechanics' Institution is higher than to any similar Institution in the kingdom, it cannot (it is believed) be said, that one penny has yet been paid for lecturers or teachers. The Managers have proceeded on a system of begging for gratuitous instruction, wholly inconsistent with that spirit of independence which breathed in the first resolutions of the Society, and in our humble opinion, most injurious to the real interests of the working classes. Who can doubt that it is partly owing to an honourable repugnance to instruction on such terms, that so few mechanics are now to be found in the list of members?

Have we not here the vital defects of all so-called Mechanics' Institutes laid bare? Are they frequented mainly by mechanics? Certainly not. If they were, would they be in the languid and almost eleemosynary condition in which too many of them now are? Most emphatically we say no. Very many, if not the great bulk, of the Institutions thus designated are in the main mere places of amusement—dancing-schools, singing-rooms, amateur theatres, and so forth, carried on for the amusement of mere lads and girls, who do not, in the majority of cases, belong to mechanics at all. We are not now speaking against such places of amusement. They may be very useful things in their way. But to disgrace the name

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of mechanics by placing it upon such places is to insult the class. We have no desire to flatter mechanics; we should not know how to do it if we had. But we do say that they, as a class, respect themselves far too much to beg for anything—least of all for the means of acquiring knowledge; and in the name of the mechanics of this country we call upon the promoters of Institutions everywhere either to make them self-sustaining—no matter how humble that may render them—or else to wipe the name "Mechanics' Institution" off them altogether.

GUNPOWDER MANUFACTORIES.

THE fearful explosion at the Hounslow Gunpowder Mills will necessarily for a while draw men's attention to the consideration of the causes of such disasters, and the more philosophic and profitable means of their prevention. We have had enough of these accidents to convince us that gunpowder is a chemical combination of an extremely treacherous nature. Although not so uncertain as gun-cotton and fulminating silver it is, from the difficulty of defining to what lengths it may be trusted, of the same coquettish family. Gun-cotton, it has been proved in the making of rockets, may be rammed by a succession of gentle taps, or by the whole force of hydraulic pressure some nine thousand nine hundred and ninety-nine times with perfect impunity, and then a child shall drop a mere rod upon it and cause the loss of many lives. Fulminating silver may be stirred with impunity two or three times a-day in a wooden bowl with a wooden stick for a period of some ten or fifteen years, and yet this simple act shall at some other time scatter into space a large factory, spread dismay throughout Bond-street and Piccadilly, and strike the ingenious inventor of wire-cartridges a corpse. With gunpowder, copper as a metal has, from the time of Roger Bacon, been supposed to be friendly, and men have not doubted that the former would patiently submit to be knocked about by the latter with the greatest unconcern; yet after such a fact has been almost universally accepted as beyond dispute, experiments in France and Austria incontestably prove that under special circumstances copper is as liable to produce its ignition as iron. Indeed, at the accident at Hatton, about a year ago, a spark was seen to escape from the copper tool used by one of the men. And now we have iron rollers substituted at the Hounslow Powder Mills in lieu of stone, as iron is considered to ensure an additional safety from accidents.

When we visited the works on Thursday we found the pressing-house, or rather the site where it had stood, bearing every evidence that it was upon this spot that the explosion first took place, the greatest corroboration being in the fact that the hydraulic press in the centre of the building yet remained almost uninjured. Not only that the accident originated here, but that the press itself was the cause of it, we feel fully convinced. The four uprights of the press were still standing, somewhat, however, out of the perpendicular. The bottom was nearly perfect, but the whole of the top had been blown away. This would be just the effect which might have been anticipated from an explosion taking place within the press. It acted in some wise as a huge piece of ordnance, scattering destruction around, but leaving itself intact.

Now, does not extreme pressure necessarily involve friction of particles, and does not friction of particles, under certain circumstances, and in countless instances produce ignition? If the reply is in the affirmative, what is there in the nature of sulphur, or charcoal, or saltpetre to exempt them from a well-ascertained law? We believe we are not alone in pointing with suspicion to this machinery. Very well-grounded fears respecting its danger have been openly expressed by the best informed men upon the works; and if we are not misinformed, so strong was this feeling during the period of its construction that the foreman of the works, after respectfully protesting against its adoption, resigned his appointment rather than run the risk he saw in its use.

Fear does not, however, appear to exercise much sway over the men who work in these dangerous trades. Eight men were killed on the Wednesday and more than eighty had, directly or indirectly, offered to supply their places before even their mangled remains were consigned to the grave. Surely, then, the inducement must be great; the pay must be liberal, and the hours short. If two shillings and twopence a-day be an equivalent for the risk, this the "black men"—the men who must go with a "blow"—receive regularly and faithfully. And here a most important consideration presents itself. Have we any right to tempt honest men, even for fifty times that amount, to risk their lives in such an avocation? Surely we have convicts enough doing nothing—or less than nothing—who might be employed in such pursuits, and who might then be paid for their time; for no one would grudge even the greatest malefactor 2s. 2d. a-day when it was known that his body was liable to be rent into fragments and scattered to the four quarters of the globe at a moment's notice. The question whether Hounslow is *now* a proper locality for the carrying on of so dangerous a trade must shortly force itself upon the attention of the Legislature; and we shall not be surprised to hear that meetings are called and attended by the principal landowners and others for some five miles round to take into consideration a matter which so seriously affects the interests of their property, and the consequences resulting from fright and alarm which so many of their relatives and tenants are now suffering and may suffer for years.

PATENTS FOR INVENTIONS COMMUNICATED FROM ABROAD.

WE have occasionally met with persons who are not a little astonished at the frequency with which the names of certain individuals appear in the official lists of patentees; and who consider that those individuals must certainly possess prodigious inventive powers. Such persons further suppose that the patentee invariably has a personal interest in, if he be not the proprietor of, the patent for which he applies. As one of the Editors of this Magazine, Mr. R. A. Brooman, is the patentee of some scores of inventions annually, we have ourselves experienced the disadvantages of the mistakes which persons make in this respect. As it is our invariable practice never to have a property in inventions, under any circumstances—in order that we may be perfectly unbiassed in the opinions which we form professionally upon the numerous inventions that are daily brought before us—we think it desirable to explain how it is that one of us so frequently appears before the public as a patentee.

The cause of this is simply that, in the course of our practice as patent-agents—a practice which has been pursued in this office for nearly forty years—we are brought into communication with numerous foreign inventors resident in various parts of the world; and, beside these, we are, of course, in communication also with many English inventors resident abroad. Now, in order that these two classes of inventors—foreigners, and subjects of Her Majesty residing in foreign parts—may obtain patents in Great Britain for their inventions, they must either execute declarations, &c., in English abroad, or come to England themselves, or employ a reliable agent to secure their patents for them. The latter is the course most usually preferred, as might be expected; and it is solely in the capacity of confidential agent to such inventors that Mr. Brooman applies for so many patents annually. It will be observed that wherever his name appears, the title of the invention is followed by the words "A communication," which imply that the invention is not his own, but that of a client residing abroad. The patent is, it is true, the property of the patentee when granted, but it is his only with the understanding that as soon as it is obtained it shall be duly and formally assigned to the true proprietor, as is invariably done. These remarks apply, of course, not to our own case only, but to all cases in which inventions are communicated from an inventor residing abroad to another person.

From this statement it will be seen that we have no more real interest in patents in which the name of Mr. Brooman appears than we have in those patents which, as patent-agents, we obtain daily for British inventors. Nor have we, as we have already intimated, an interest in any invention or inventions whatever. We are, therefore, at all times perfectly free to form opinions, and pronounce decisions, upon any and every invention which may be brought before us. To all of them we apply the large experience of many years—this we may surely say without ostentation; to none of them do we apply any kind of interest or prejudice whatever.

We have thought it desirable to make these remarks thus prominently in order to prevent misapprehension on the part of our friends, clients, and subscribers.

THE CIVIL SERVICE SUPERANNUATION BILL.

THE withdrawal of the compulsory retirement clause of the Civil Service Superannuation Bill at the eleventh hour—for although the reports in the morning papers differ, it seems to be withdrawn—deprives that measure of a most important feature. We complained some little time since that there were many ancient officers in receipt of salaries—and some of very large salaries—on the list of civil servants who had not performed a day's duty for years. These men, who have not scrupled to draw unjustly the public monies, are to be permitted to continue their dishonest practices, whilst their under-paid subordinates are to be compelled to submit still further to the wrongs under which they have hitherto suffered.

This ought not to be so; the question of compulsory retirement at sixty-five years of age had been fully discussed, and there was no doubt about the justice of the proposition. Why, then, was the clause eliminated from the Bill? From no other cause than that the influence of a few pertinacious friends of the old fogies, who happened to have seats in Parliament, baffled the somewhat simple-minded Sir Stafford Northcote and the more wily Mr. Wilson. In the new House of Commons we trust the compulsory provision may obtain more favour.

THE ENFIELD RIFLE.

THERE have been numerous letters in the *Times* this week respecting the statements of Dr. Russell, mentioned in our gossip of last week. Mr. J. D. Goodman, the chairman of the Birmingham small arms' trade, says:—

"Your correspondent's own statement sufficiently explains the matter. It is clear that the officers by whom the examination was made had no proper gauge."

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Again he says:

"It is clear the ammunition was at fault. The barrels did not become smaller, but they became foul. The correct size of the bore is ·577 inch. Before a barrel leaves the barrel-maker's hands, it is tested by a plug of this size. As the same barrel passes through the hands of the various workmen in the subsequent stages of making up the gun, the ·577 plug is again and again applied, not by workmen only, but by viewers repeatedly. The plugs used are constantly compared with delicately-adjusted standards, so that error is impossible. I don't know how many guns there are now in store, but if there are 50,000, I will pledge the reputation of the gunmakers of Birmingham that not one single barrel, if uninjured, shall reject the ·577 plugs."

The next writer is a correspondent signing himself "H," whose theory is:—

"That the bore of the rifles in question was of the proper size when they left the hands of the manufacturers, but they have been so injured by use as to prevent the bullets from being rammed down. If the above conclusions are correct," he adds, "it is evident that, unless the barrels are left much thicker, or some method devised for making them of cast steel, instead of soft iron, the Enfield rifles can never be relied upon to stand the hard usage they must necessarily receive in the hands of soldiers on actual service."

The next is Mr. W. Greener, who volunteers an explanation which is purely fantastical, and, therefore, very characteristic of its author. His suggestion is, that if you fire an Enfield rifle several times with a tight ring of iron around the barrel, the bore will become contracted within the ring, and the ring will become loose. Then we have:—

"The bayonet socket at Allahabad is this ring. Ten or fifteen rounds have produced an imperceptible contraction of the barrel by its yielding in the weakest point—viz., 'the three grooves which are now narrowed,' and the bore less, and hence the defect. . . . An additional cause will be found in the enormous vibration to which the bayonet blade is subjected by the adjacent concussion travelling down to the socket with a 'lever's' power, exercising a force on the comparative weaker tube equal to the effect produced. The remedy for this is better metal or more of it."

Thus this oracle.

Next we have Sir John Scott Lillie, who rails at the "wiseacres of the War Department," and recommends improved cartridges and breech-loading arms as a cure for the Enfield rifle.

Finally we have a letter from Mr. Samuel Aspinwall Goddard (who with another gentleman invented two very important parts of the Armstrong gun). Mr. Goddard believes the barrels all to be of a proper gauge, but to be liable to rapid fouling. He then tells us that during the war in the Crimea he submitted an invention for cleaning rifle barrels on the field. It was tried at Enfield, and, as he supposed, with complete success. On the very day that he was at Enfield copies of the reports were received there, made by the four Brigadiers in the Crimea, by order, on the subject of the clogging of the rifles, thus showing the extreme importance attached to it.

"The mode of cleaning suggested by me," he says, "was very simple, and thoroughly effective. It occupied no appreciable time, it could be adopted without interfering with any other arrangements and with no inconvenience to the soldier, and it did not require that any other means which had been adopted, or which might be adopted, should be dispensed with. It was inexpensive and certain, and not only was the barrel completely cleaned, but was found not to clog afterwards under about 50 rounds. I believe the trial was favourably reported upon, but some time after I was informed that 'other means had been taken for effecting the object.' What those means were I never knew, nor whether any of my suggestions had been acted upon."

THE CULTIVATION OF FLAX.

The appearance of a pamphlet just issued by the National Flax Company* has recalled our attention to a movement which appears to us to deserve the support of the public, both on patriotic and on commercial grounds. The object of the Company is to prepare flax and other fibrous substances for manufacturing purposes; and also to promote, by certain well-defined measures, the more general growth of the home plant, in order thereby to avoid those fluctuations in the supply which are so injurious to manufactures and commerce. We have not space just now to enter at any length into this subject; we will content ourselves for the present with adding a sentence or two from the Company's prospectus and pamphlet. "Rightly estimating the evils existing in this branch of productive industry," says the prospectus, "the Company propose in the first instance to immediately relieve the grower from this incubus upon his labour by establishing in various available localities throughout the United Kingdom proper rettories, which shall supersede the old plan of preparing flax for the spinner, whereby the processes of steeping, drying, and scutching, are rendered so tedious, uncertain, and costly; in a word, both landholders and manufacturers will, by the patented processes of this Company, be saved a vast outlay of capital and an unnecessary expenditure of time, while the injury to the texture and colour of the fibre, inevitable on the modes of drying, whether by means of stoves, heated rooms, or atmospheric exposure, now practised both at home and on the Continent, being obviated, the commercial and trade value of the article through every phase of its manufacture will be intrinsically enhanced." "By the machinery of Mr. Cator," says the pamphlet, "the flax, after being lifted out of the water, is passed at once in a continuous course through pressing rollers, and round cylinders heated by steam (being pressed against these cylinders by small carrying rollers), into fluted rollers, whence it is conveyed by hand all ready dried and broken, to be scutched. Thus the operation between the water and scutching is performed in less than a quarter of an hour. One machine is capable of drying sufficient flax to produce half a ton of fibre and a quarter of a ton of tow in ten hours. The advantages to be gained are evident, viz.:—The saving of time, labour, and material (say in value from £5 to £10 per ton of fibre), the certainty and simplicity of the process, entire independence of the weather, ability to work throughout the year without interruption, reduction of the present complex system into one easily understood, and an addition of quality to the fibre without diminution of strength." The control of this Company is in very good hands. We shall probably give a description of the machinery adopted by it on an early occasion.

* Explanatory Details, Opinions of the London Press, and Commercial Arguments in favour of the System proposed to be adopted for the Encouragement of the Cultivation and Preparation of Flax, under the plans and patented processes of George Albermarle Cator, Esq., March 1859. London: Published by the Company, 193 Gresham House, Old Broad-street, E.C.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

March 22, 1859.

MR. FAIRBAIRN ON GUNPOWDER.

Dr. Joule having taken the chair, a paper was read by the President, W. Fairbairn, F.R.S., &c., entitled "An experimental inquiry into the effect of severe pressure upon the properties of Gunpowder." During the late war, the Author received from the Government authorities at Woolwich different samples of Waltham Abbey gunpowder, for the purpose of submitting them to severe compression, in order to ascertain the effect of close contact between the particles upon its explosive properties. At the Government works there is no machinery of sufficient strength to give a pressure of more than 5,000lbs. to 6,000lbs. per square inch, and as it was considered advisable to test the quality of the powder under the influence of greatly increased pressure, the Author was requested to compress it in an apparatus of his own, calculated to effect its condensation under a force of more than 60,000lbs. per square inch. By carrying the pressure in this way far beyond the ordinary limits, it was expected that the precise influence of compression on the properties of the powder would be more clearly and accurately exhibited.

The samples of powder were placed in a wrought iron box, and compressed by a lever acting upon them by a solid piston with a force varying from 38,000lbs. to 67,000lbs. per square inch in the different specimens. When taken from the apparatus, the powder was found to have been consolidated into cylinders of 1¼ inches in diameter with smooth polished surfaces, every trace of its granular character having disappeared.

From the Report of Mr. Abel, the Chemist of the War Department, we learn that the specific gravity of the specimens was increased by the pressure, but not to so great an extent as might have been expected.

The specimens having been granulated were then burned, and it was found, on comparing the results with those of similar experiments on ordinary press-cake, that the amount of residue left by the compressed powders, after ignition, was greater in proportion as the pressure was increased. This increase of residue is probably to be attributed to the more gradual combustion and the diminished intensity of heat generated by compressed powder.

Experiments were then instituted to determine the amount of charcoal left unconsumed in the residue. They showed conclusively that the condensation of the powder had caused a more perfect chemical action in combustion, as the per-centage of carbon was considerably diminished in the compressed powders. Nitric acid was very carefully searched for in the residues of the compressed powders, but none could be detected, although in ordinary gunpowder a portion of the acid of the saltpetre always escapes decomposition.

An important objection to the application of increased pressure in the manufacture of gunpowder, notwithstanding the more intimate mechanical mixture of its constituents, is that the quantity of the residue left after combustion is increased, and a larger proportion of powder escapes ignition altogether when a charge is fired from a gun. If, however, larger quantities were submitted to compression, it is probable that the closer contact of the particles might be found to act beneficially, and a powder be produced of an improved and stronger quality, resulting from a judicious application of increased pressure and a more perfect system of granulation.

Dr. Roscoe expressed his opinion that we as yet know very little about the chemistry of gunpowder, and drew the attention of the Society to the interesting and important "Memoirs on the Analysis of the Products and Cumbustion of Gunpowder," lately published by Professor Bunsen. He found that the decomposition which occurs in an explosion, is by no means as simple as was formerly supposed. Besides the usual products of carbonic acid, carbonic oxide, nitrogen, and sulphide of potassium, Bunsen showed the presence of hydrogen, oxides of nitrogen, cyanide of potassium, sulpho-cyanide of potassium, sulphate and carbonate of potash, and various other salts, the relative quantities of which were all determined.

Several of the members suggested that the experiments, which were highly important, should be repeated, Government granting the funds which were requisite to prepare the compressed gunpowder in the same state of granulation and as it is in the samples with which it is to be compared.

The Sale of Gas.—Lord Redesdale has just introduced a Bill to regulate the measures used in the sale of gas. To prevent disputes and litigation it enacts that all contracts for sales of gas made and to be made by meters registering within two per cent. variation from the cubic foot containing 62 32 lb. avoirdupois weight of distilled water or rain water, weighed in air at the temperature of 62 deg. of Fahrenheit's scale, the barometer being at 30 inches, and by any meters registering within two per cent. variation from multiples or decimal parts of such cubic foot, shall be valid in law. Models of measures are to be made and verified under the direction of the Treasury. Power is given to justices and inspectors to enter houses and inspect gas measures and meters. The progress of the bill will probably be stopped by the proximate prorogation of the present condemned Parliament.

Mr. W. Lander, of Bristol, engraver, has patented the following improvements in engraving and printing for the purpose of ornamenting earthenware. According to his invention, he first engraves his subject in the usual manner on the surface of a copper plate. From this original plate he produces as many metal copies by the galvanic or electrotype process as there are colours to be printed. He then erases a part of the work previously engraved on the several plates, so that the portion of the engraving present on each plate shall be absent from the surface of all the rest. This done, the several portions remaining are then finished with the graver or otherwise, the work on each plate being completed sufficiently for printing. When the plates are required to be printed, each will be restricted to one particular colour, and when the successive impressions are made by the several plates on one sheet of paper, or other suitable material, the subject will then be completed for transferring to the ware. To ensure a true register in combining the parts of the subject on the several plates, he employs a metal frame for securing the plates and paper from the possibility of shifting from their proper positions during the printing of the rolling press.

The St. Germans viaduct of the Cornwall Railway is completed. The Government Inspector will commence his survey next week.

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SOCIETY OF ARTS.

ON THE PRACTICAL BEARING OF THE THEORY OF ELECTRICITY IN SUBMARINE TELEGRAPHY, THE ELECTRICAL DIFFICULTIES IN LONG CIRCUITS, AND THE CONDITIONS REQUISITE IN A CABLE TO INSURE RAPID AND CERTAIN COMMUNICATION.

By S. Alfred Varley, Assoc. Inst. C.E.

[The paper read by Mr. S. Alfred Varley at this Society on the 30th ult., of which a brief abstract was given in our last number, deserves to be reported in these columns at greater length, because it was an attempt to withdraw electric telegraph engineers and others from "a laborious perseverance in almost empyrical experiments," and to induce them to seek guiding principles, to which canstant reference may be made while practical operations are pursued. The following is the paper (from which the introduction only is omitted) in the author's own words.]

The generally recognised theory of electricity, as I understand it, supposes all bodies in their normal condition to have two powers or forces resident in them directly opposite in their character, being exactly balanced; in bodies in their natural state these forces are completely neutralised and rendered inactive, producing the ordinary condition of matter.

To these powers the name of electricities has been given, and although we are still as ignorant at the present day as the ancients themselves with regard to what electricity actually is, yet the fact of the existence of the electric telegraph is a proof of the progress which has been made in a knowledge of the laws, at least, which govern electric phenomena.

In the year 1838, Dr. Faraday clearly developed the principles of induction and conduction, since which time no further progress has been made in the fundamental truths of the science, though much has been done to confirm their correctness and to develop their consequences.

In the Philosophical Transactions for 1838, will be found Dr. Faraday's views on the subject of induction and conduction; and these, to my mind, so clearly explain all electric phenomena, that it will be as well at once to refer to them before proceeding further. After giving reasons for his belief in the identity of induction and conduction, he says, "All these considerations impress my mind strongly with the conviction that insulation and ordinary conduction cannot be properly separated when we are examining into their nature, that is, into the general law or laws under which their phenomena are produced. They appear to me to consist in an action of contiguous particles dependent on the forces developed in electrical excitement; these forces bring the particles into a state of tension or polarity, which constitutes both induction and insulation, and, being in this state, the continuous particles have a power or capability of communicating their forces one to the other, by which they are lowered, and discharge occurs. Every body appears to discharge, but the possession of this capability in a greater or smaller degree in different bodies, makes them better or worse conductors, worse or better insulators, and both induction and conduction appear to be the same in their principle and action, except that in the latter an effect common to both is raised to the highest degree; whereas in the former it occurs in the best cases in only an almost insensible quantity."

In part the 2nd of the Philosophical Transactions of the same date will be found a summary of Dr. Faraday's views, which I will also quote:—

"1st. The theory assumes that all the particles, whether of insulating or conducting matter, are, as wholes, conductors.

"2nd. That, not being polar in their normal state, they can become so by the influence of neighbouring charged particles, the polar state being developed at the instant, exactly as in an insulated conducting mass consisting of many particles.

"3rd. That the particles when polarised are in a forced state, and tend to return to their normal or natural condition.

"4th. That being, as wholes, conductors they can readily be charged either bodily or polarly.

"5th. That particles which, being contiguous, are in the line of inductive action, can communicate or transfer their polar forces one to another more or less readily.

"6th. That those doing so less readily require the polar forces to be raised to a higher degree before this transference or communication takes place.

"7th. That the ready communication of forces between contiguous particles constitutes conduction, and the difficult communication insulation; conductors and insulators being bodies whose particles naturally possess the property of communicating their forces easily, or with difficulty, and bodies having these differences as they have differences of any other natural property.

"8th. That ordinary induction is the effect resulting from the action of matter charged with excited or free electricity upon insulating matter, tending to produce in it an equal amount of the contrary state.

"9th. That it can do this only by polarising the particles contiguous to it, which perform the same office to the next, and these again to those beyond; and that thus the action is propagated from the excited body to the next conducting mass, and these render the contrary force evident in consequence of the effect of communication which supervenes in the conducting mass upon the polarisation of the particles of that body.

"10th. That, therefore, induction can only take place through insulators; that induction is insulation, it being the necessary state of the particles, and the mode in which the influence of electrical forces is transferred or transmitted across such insulating media."

To determine for myself the law which induction obeys, in conjunction with my brother, Mr. C. John Varley, I have tried some experiments.

The principle upon which these were based was that of the dual character of electricity, and the fact established by Dr. Faraday, that all statical charge is sustained solely and entirely by induction.

In bodies in their normal condition, the opposite forces or electricities being balanced and united, no attraction for neighbouring particles exists, but when these forces are separated, as in the case of a Leyden jar, the attraction which a given quantity of electricity exerts for the similar amount of negative on the opposite coating, will be less in proportion to some law as the thickness of the intervening dielectric is increased.

It was, therefore, assumed that the amount of free attraction under these circumstances, or more correctly the amount of induction which would be thrown upon neighbouring bodies, would increase inversely as the attraction between the opposite coatings diminished.

The apparatus made use of was constituted in the following way:—A glass pillar, varnished, for better insulation, was mounted upon a board. On the top of this a brass plate was attached, and upon this plate the dielectric to be examined was laid. Over the dielectric another brass plate was then placed. A Leyden arrangement was thus constructed, the upper and lower brass plates representing the inner and outer coatings of an ordinary Leyden jar. A brass ball, suspended from a balance which had an adjusting arrangement, so that it could be raised or lowered, hung over the upper metal plate at a short distance from it.

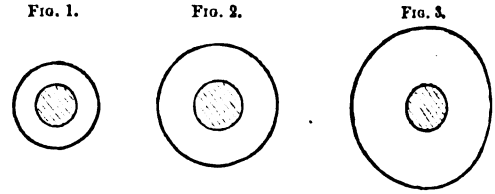
The *modus operandi* was as follows:—The upper brass plate was connected to the earth, and a series of sparks, through the medium of a sliding rod kept at a fixed distance from the prime conductors of a frictional machine, thrown into the lower brass plate of the Leyden arrangements, or the prime conductor was kept fully charged, and a carrier ball attached to a long glass rod was made use of to measure out definite quantities of electricity.

The room in which the experiments were performed was heated with a stove, and the dryness of the atmosphere indicated by a hygrometer, so that the insulation might be as perfect as possible. When a certain number of sparks had been thrown into the lower brass plate, the upper brass plate was disconnected from the earth, and the lower one attached to the balance, and if the tension of the charge was sufficient, the brass ball suspended from the balance was attracted down, and discharge ensued. The experiment was repeated again and again, and the number of sparks requisite to just attract the ball down, noted. Glass plates were the dielectric employed, and the experiment was tried first with one plate, then with two, and then with three plates of glass between the upper and lower brass plates, the brass ball suspended from the balance being kept always at a certain fixed distance from the upper brass plate.

The results obtained from a numerous series of experiments were that when two plates of glass were placed between the brass plates, only half the number of sparks which were required to raise the tension of charge sufficiently to cause discharge when one plate of glass separated the brass plates was requisite, and when three plates of glass divided the upper and lower brass plates, then a third of the number of sparks raised the charge to the same degree of tension, showing that through flat plates of glass, induction decreases in the inverse proportion to the thickness of the dielectric, that is to say, if the induction through one be 12, through 2 it will be 6, through 3—4, and so on.

In the case of a gutta percha covered wire, it was anticipated that as when the thickness of the gutta percha is increased, the outer surface increases at the same time, the decrease of induction consequent on the increased thickness of the insulating material would not be inversely proportionate to the depths of the gutta percha, but would follow some other law. To put this to the test, a series of Leyden arrangements were constructed in the following way:—three pieces of tube, of half an inch internal diameter, and 2 feet 6 inches long, were placed in the centre of tubes of 2 feet long, the internal diameters of which were 1 inch, 1½ inches, and 2 inches, and the space between the inner and outer tubes filled with melted resin. (Figs. 1, 2, 3.)

Fig. 1. Fig. 2. Fig. 3.



By this means three Leyden arrangements, with a uniform internal surface, but whose insulating material varied in thickness in the proportion of 1, 2, and 3, were constructed, and the same process as that already described with the flat plates was repeated. The results obtained are shown in the annexed table:

Diameter of Inner Tube	Thickness of Insulation.	Diameter of Outer Tube.	Inductive Force.
10	5	20	22
10	10	30	15·5
10	15	40	11·5

These results were very constant, but as resin was the only dielectric employed, the experiment requires repeating with other dielectrics, for there is reason to believe that with glass at least the decrease in induction consequent on an increased thickness of the dielectric would be somewhat greater than that indicated in the above table.

The reasons for this belief are the following:—When a galvanic battery is connected with the inner and outer coatings of a Leyden arrangement, induction will take place through the dielectric, and if the surfaces of the two coatings are equal, then the force will be equally divided over them; that is to say, if the battery force be 100, the tension of the charge on the one coating will be 50, and that on the other will be 50 also = 100. Let the surface of the outer coating be supposed to be infinite in extent, then the tension of the charge on the inner coating will approach infinitely near to 100, and the tension of the charge on the outer coating will be almost nil. An example of this we have when the earth represents one of the coatings of a Leyden arrangement; and this is the case in the prime conductor of a frictional machine, and also in the suspended wire of a telegraphic circuit; in these two examples the prime conductor of the machine and the wire of the telegraphic circuit represent the one coating, the air the dielectric, and the earth the other coating.

Now, consider a case where the outer surface is double that of the inner one, the tension of the charge on the inner coating will then be double that of the *outer*; an example of this we have in the above table, where the inner surface is 10, the thickness of the insulation 5, which may here be regarded as unity, and the outer surface 20—the battery force being 100. Divide this into three parts, and we get 33⅓. Give two parts for the tension of the charge on the inner coating, and one part for the tension of the charge on the outer coating, then we shall have for the tension of the inner surface, 66⅔; for the outer surface, 33⅓ = 100 when united.

Now, consider the third example in the above table. Inner surface 10, thickness of insulation 15, outer surface 40, or quadruple that of the inner surface. In this case the tension of charge on the inner surface will be four times that of the charge on the outer surface. In other words, the tension of the charge on the smaller surface will be 80, and that of the outer surface 20, the united tensions equalling 100; but the thickness of the insulation is 15, or three times that of the first example; and it has been shown that induction decreases in the inverse proportion to the thickness of the insulating material; we shall, therefore, have to divide by 3, and this will give 26·6 for the tension of the chargo on the inner surface.

In the first example it has been shown that if the force be 100, the

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tension of the charge on the inner surface will be 66¾, which, to avoid fractions, we may regard as 67. In the actual experiment the inductive force measured was 22; 67, therefore, represents 22, and as 67 is to 22 so should 26·6 be to the amount of force which would be expected to be obtained in the last example; this, when calculated by a simple Rule of Three sum, gives 8·8 for the amount of inductive force. In the actual experiment the force obtained was 11·5, a result, therefore, sufficiently near to warrant further investigation, to ascertain whether the law which would seem to be indicated is correct, and whether it holds good with any other dielectric, such as glass, in which case the cause of the discrepancy, when resin is the dielectric employed, should be sought after.

I now proceed to conduction.

The law which governs the conduction of electrity has been very accurately ascertained, and would seem to follow the same law as induction, that is to say, if the sectional area be uniform throughout, the resistance which a conductor will oppose to the passage of a current will be directly relative to its length; or, the length of the conductor being determined, the resistance will be relative to its sectional area. In other words, a wire one mile long will oppose half the resistance of that which will be opposed by a similar wire two miles long, two wires, each two miles long placed side by side, which is the same thing as one of twice the sectional area, will oppose exactly the same resistance as a single wire one mile long.

The next thing to be considered is the part which the quantity and intensity of electric currents play in electric phenomena. The amount of force developed by an electric current, whether it be the deflection of a needle, the attraction of an armature in an electro-magnet, or the decomposition of water, is always relative to the dynamic quantity flowing. This fact has been well established, and the difference between quantity and intensity accurately defined; yet still, in practice, there is a want of a clear comprehension of the relationship of those terms.

Let a battery—say of ten pairs of elements, with ten inches of surface in each cell—be joined through a circuit perfectly insulated, and opposing very great resistance to the passage of the current; and the amount of force, or in other words, the dynamic quantity of electricity flowing, be weighed off by a magnetometer, and noted down. If now this battery be disconnected, and another of the same number of elements, but with twice the surface, be connected in its place, practically no more will be found to be flowing through the circuit than in the former case, the resistance which the wire opposes measuring out the quantity passing somewhat in the same way as the height of the column, and not the quantity of water, in a cistern, regulates the rate at which it flows from an orifice inserted in it.

Let the series be increased, and more will be urged through; and, if the number of cells be sufficiently numerous for practical purposes, the same dynamic quantity as a single cell would generate through a circuit of no resistance, will be found to be flowing.

In theory this point can only be approached, for the resistance of the wire can never be completely overcome. In theory, also, when the number of elements is not increased, the larger the surface the greater will be the dynamic quantity flowing, for the tension of the current is lowered in proportion to the amount of electricity flowing out of the battery; and, when drawing from a larger reservoir, which batteries of greater surface may be compared to, this same amount will not lower so much the general tension; consequently, there will be more intensity to urge the current through. But to return to practice. If the number of cells has been sufficiently extended so as to generate the same dynamic quantity as a single cell does through a circuit of nominally no resistance, a further addition to the series will not be attended with any beneficial effect, for there is already power enough to urge through all the electricity the battery is capable of generating; and the force developed is directly relative to the dynamic quantity flowing. Tension is only the medium by means of which this dynamic quantity is forced through the circuit.

It will be as well, perhaps, to define more precisely what is wished to be understood by the term resistance. When it is said that one circuit opposes twice the resistance of another, it is meant that the same tension of current will force half the dynamic quantity only through this circuit that it would through one opposing half the resistance; it follows that a given length of wire opposes the same resistance to half the dynamic quantity of electricity that half this length of wire does to double the dynamic quantity, and hence all circuits oppose to an infinitely small quantity of electricity an infinitely small amount of resistance.

The way in which quantity and intensity affect practical telegraphing has next to be considered, and whether there be any advantage in employing comparatively large over smaller dynamic quantities of electricity. It may be generally stated that when the insulation is very perfect there is no great difficulty in working with minimum quantities; but when the insulation is imperfect, larger dynamic quantities hold out a better prospect of working through. When a current is flowing through a circuit which offers, practically speaking, no resistance, let the cells of the battery be ever so numerous, it will possess no intensity worth noticing, for, as there is no resistance opposed to the force resident in the battery, the intensity is not brought into play. It is something like a powerful engine raising a light weight, the force is latent, but not brought into action. Let the battery, however, be connected through a circuit opposing considerable resistance; its intensity will then be developed.

Let the diagram (Fig. 4) represent a circuit which fulfils these conditions, one end of the wire dipping into the earth in the usual way, and the other connected with the copper pole of a battery composed of a numerous series of elements possessing very little surface and, consequently, capable of generating only a small dynamic quantity of electricity, and let the circuit be completed by connecting the zinc pole to the earth. The current will flow from the copper pole through the wire, thence to the earth, and back to the battery; and its working intensity will be dependent on the resistance which the circuit opposes, and can be measured in the following manner:—

Let another battery, but with a much smaller number of elements, be connected side by side with the larger battery to this wire, the zinc pole being connected to the earth and the copper to the wire, and introduce galvanometers in the circuit, between the large battery and the wire and between the small battery and the wire, so as to indicate the direction in which the currents are flowing. Both batteries will desire to send a current through the circuit in the same way, but should the small battery oppose much less resistance to the passage of a current through itself than is opposed by the long wire, then the greater quantity of electricity generated by the large battery will pass that way in preference to through the wire, and paralyze the action of the smaller battery; but if cell after cell be added to this little battery, when its intensity becomes greater than the resistance of the wire, a current will flow from it also in the same direction as that from the large battery through the wire, and the number of cells requisite just to do this will be an exact measure of the working intensity of the current.

Let the case now be considered where the insulation is not perfect; if there be sufficient leakage to let the small dynamic quantity, which the battery can only generate, escape on the road, no appreciable amount will reach the further end, the tension of the current will be lowered, and a less number of cells in the little battery will now be found to balance it. Adding to the number of these small pairs of elements will not give any appreciable assistance, but let the surface in each of the cells of the larger battery be increased so that a greater quantity may be generated than can escape through the leaks, represented in the diagram by the dotted lines, an appreciable amount will then reach the further extremity, and the telegraph instrument be rendered active. In such a case as this, adding quantity will raise the working intensity of the current, whilst increasing the intensity of the battery alone will scarcely affect it.

In some experiments tried by my brother, Mr. Cromwell Varley, and myself, on long leaky circuits, increasing the surface of the batteries alone, without adding to the series, raised the deflection on the galvanometer from 22° to 53°; and the last intelligible words uttered by the Atlantic cable, "Daniells are now in circuit," is a further testimony of the correctness of what has just been advanced.

The correctness of considering the inductive phenomena which manifest themselves in subterranean and submarine circuits, as a new fact suddenly brought to light, has been called in question in the early portion of this paper; a few words on its history will therefore not be out of place, before considering the way in which it affects telegraphing.

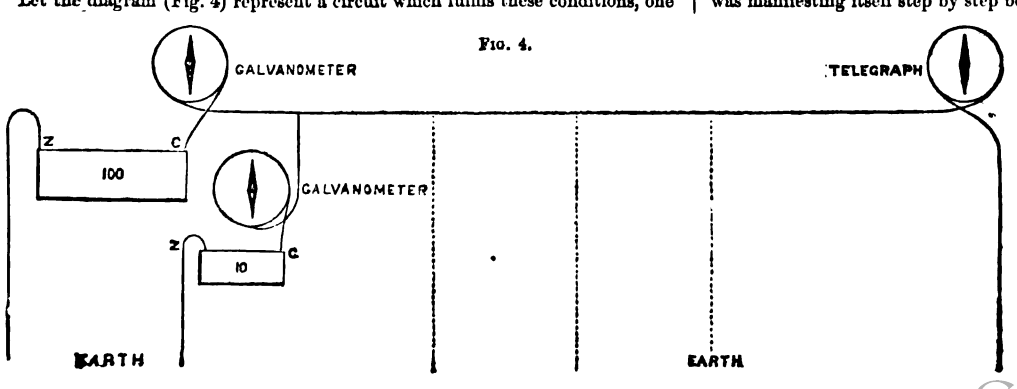
In 1838, Dr. Faraday pointed out the conditions which would cause the retardation of an electric impulse in its passage through a conductor. In 1848, the electric telegraph was in actual operation. The method adopted at that time for the insulation of the wires passing through towns, was to enclose a number of cotton-covered wires in a leaden tube, and then fill the tube with a mixture of resin and Stockholm tar. Reasoning on Dr. Faraday's observations, my brother, Cromwell Varley, was led to think that such circuits possessed conditions favourable for induction to manifest itself; he therefore searched for it, and succeeded in obtaining indications of induction. In 1849, gutta percha had been introduced, and as the insulation in gutta percha covered wires was much more perfect than in the cotton-covered ones enclosed in leaden pipes, induction manifested itself much more strikingly, and my brother made use of from that time as a more searching test of the perfection of the insulation than the deflection of a galvanometer, the capability of the wire to retain for a certain period the induced charge, and he stood alone for some time in making use of this test, others not having faith in it at that period, and in the same year he obtained indications of induction in an overground circuit. In the latter end of the year 1851, my brother was enabled to experiment upon a length of ten miles of gutta percha covered wire. At these experiments I assisted, and the conclusion he arrived at was, that if gutta percha covered wires were employed for circuits of any length, as was at that time proposed, induction would manifest itself so powerfully as to offer serious obstacles to telegraphing with the apparatus then in use, the truth of which prediction was subsequently verified. In Prussia, however, as early as 1850, Mr. W. Siemens had employed gutta percha covered wires for circuits of considerable lengths, and encountered the inductive phenomena, an account and explanation of which he published during that year. This fact was not known on this side of the channel until after gutta percha covered wires throughout the whole lengths of the circuit were also employed in this country, and that was in the year 1854.

To Dr. Faraday, however, is due the whole credit in this matter, and I have only alluded to its telegraphic history, as I cannot help feeling it as a sort of reproach to practical electricians that it should go forth that induction, which was manifesting itself step by step before their eyes, came suddenly and unexpectedly upon them. The following extract from Dr. Faraday's researches of 1838 is so instructive, and teaches such a valuable lesson, that I cannot refrain from quoting it. Alluding to Professor Wheatstone's well-known experiment, he says:—

"If the two ends of the wire were immediately connected with two large insulated metallic surfaces exposed to the air, so that the primary act of induction, after making contact for discharge, might be in part removed from the internal portion of the wire at the first instant, and disposed for the moment on its surface, jointly with the air and surrounding conductors; then, I venture to anticipate, the middle spark would be more retarded than before, and if these two plates were the inner and outer coatings of a large jar, or Leyden battery, then the retardations of that spark would be still greater."

(To be continued.)

Fig. 4.



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Literature.

A Manual of Applied Mechanics. By WM. JAS. MACQUORN RANKINE, LL.D., C.E., F.R.S.S., L. and E., President of the Institution of Engineers in Scotland, and Regius Professor of Civil Engineering and Mechanics to the University of Glasgow. London and Glasgow: Richard Griffin and Co., Publishers to the University of Glasgow. 1858.

[THIRD NOTICE.*]

WE now proceed to justify the opinion we have ventured to offer of this work by reference to the particular treatment of some of the subjects contained in it. And first of all the most glaring instance of the unfitness of this work to be placed in the hands of a learner as a text-book, or into the hands of a practical engineer as a *vade-mecum*, is to be found in the author's laying down the theory of couples as the basis of the mathematical portion of his work. This arrangement has the single merit of novelty or originality, while it has the disadvantage of attempting to familiarize the tyro at the outset of his career with conceptions which, even after considerable experience of the modes of combining single forces, he has usually great difficulty in forming.

When a student has once obtained an adequate idea of a force, and of the mode of estimating its effects as regards magnitude, direction, &c., it has, of late years at all events, been the approved course among writers to proceed to the discussion of the effects of a combination of single forces applied to a body at one point. The proposition well known as that of the parallelogram of forces has thus been usually laid down as the basis of mechanical inquiry. The fundamental propositions of the theory of couples have on this system been brought before the learner as a natural and necessary consequence of the laws of combination of single forces. In this way the learner has been led to discover, as it were, for himself that a couple can produce no motion of translation, but only one of rotation; and the conception of the effects of couples has thus been made easy and distinct to his mind. On Professor Rankine's method his faith is at once subjected to a rude trial, and his power of conception most severely taxed. Thus (page 21, article 27) he is expected at once to admit as a fundamental truth that "the tendency of a couple is to turn the body to which it is applied in the plane of the couple—that is, the plane which contains the lines of action of the two forces." We defy a learner to form any distinct conception of the tendency here laid down. About *what point* is the tendency of a couple to produce motion? In the ordinary mode of treating this subject the student can discover this from the very fundamental proposition which introduces him to his first notion of a couple. Our author leaves this point indefinite, nor does he by any subsequent definition supply this desideratum.

Again, our author draws very severely on the faith and powers of conception of his readers when he states, as an axiom, that in order that two couples, similar in direction and of equal force and leverage, may be exactly alike or *equivalent* in their tendency to turn the body, "it is necessary and sufficient that their planes should be either identical or parallel." As a necessary consequence of this imperfect treatment in establishing the lemma that "*two couples of equal force acting in the same direction with the same axis are equivalent to* a couple whose moment is the sum of their moments," the author is obliged to assume that the arm of couples may be turned anyhow in the plane in which they are applied.

Nothing, again, can be to our mind so unsatisfactory as the author's proof of the theorem that, "*if the moments of two couples acting in the same direction and with the same axis are equal, those couples are equivalent.*" This is made to depend on an algebraical juggle—no doubt very ingenious and clever—rather than on a sound mechanical investigation. In fact, throughout this elementary portion of his work, the learned Professor has entirely lost sight of one great object which an elementary writer ought always to have in view, viz., making each successive proposition a means of familiarizing his readers with the elementary conceptions of his subject, and adding something to their breadth.

We have again to quarrel with our author for departing from the received nomenclature and definition in treating this part of his subject. Those of our readers who are familiar with the mathematical investigations of mechanics are well aware that the axis of a couple is generally defined to be a straight line perpendicular to the plane of a couple, and proportional to its moment in magnitude. This definition of "an axis" has many advantages in simplifying the statement of propositions. Professor Rankine's definition is simply—"The axis of a couple is any line perpendicular to its plane." We shall not pursue the author further into his theory of couples; to the absurdity of the mode of treatment we have pointed out, the cope-stone is placed by demonstrating the parallelogram of forces by the theory of couples. We are, therefore, obliged to arrive at the conclusion that the author's mode of "setting forth those first principles which are common to all branches of mechanics," is for all purposes of instruction a failure.

In his fourth chapter the Professor makes a great parade of a principle which he dignifies by the name of "Parallel Projections in Statics." It is simply this: that "if two figures are so related that for each point in one there is a corresponding point in the other, and to each pair of equal and parallel lines in the one there corresponds a pair of equal and parallel lines in the other, those figures are said to be parallel projections;" and hence the author infers that if when forces, &c, have been geometrically represented, certain propositions have been established with regard to them; the truth of these or similar propositions may be deduced with regard to other forces, &c., whose geometrical representations are parallel projections of the former. To this we can offer no objection; but it does not seem to us so great a matter after all, as to deserve to be made the foundation of many new principles, *e. g.*: "Principle of Transformation of Frames," "Transformation of Structures in Masonry," &c., the practical application of which, moreover, the author leaves very much to the reader's own ingenuity.

A very prominent feature of the work before us is the complete treatment of the theory of "Stress." In a purely theoretical work this would find a fitting place, and the mathematical reader could not peruse it without deriving much profit; but we think our readers will be much astonished to learn that the fundamental principles of fluids, viz., that in a fluid at rest the pressure at any point varies directly as the depth below the free surface, and that fluids press equally in all directions, are deduced from three differential equations derived from the theory of stresses; and no other explanation or illustration of these most important principles are vouchsafed. Thus, facts of which a tyro may obtain a very adequate idea without the slightest knowledge of the principles of the Differential Calculus, are made by Professor Rankine to rest entirely on the higher mathematics. How could our author have more painfully or ludicrously have contravened his own position with respect to practical scientific instruction, viz., "that so far as possible mathematical intricacy ought to be avoided," and that "in treating of the practical application of scientific principles, an algebraical formula should only be employed when its shortness and *simplicity* are such as to render it a clearer expression of a proposition or rule than common language would be, and when there is no difficulty in keeping the thing represented by such symbol constantly before his mind."

This fluid-investigation (in a treatise, be it remembered, called a "Manual of Applied Mechanics") is so rich, that we cannot forbear inserting it. At page 100, art. 110, theorem 11, the author lays it down that "In a perfect fluid the pressure at a given point is normal and of equal intensity in all directions," of which the following is the proof:—

"*Fluid* is a term opposed to *solid*, and comprehending the liquid and gaseous conditions of bodies, which have been defined in article 4. The property common to the liquid and gaseous conditions is that of *not tending to preserve a definite shape*, and the possession of this property by a body in perfection throughout all its parts, constitutes that body a *perfect fluid*. The parts of a body resisting alteration of shape must exert tangential stress; a perfect fluid does not resist alteration of shape, therefore the parts of a perfect fluid cannot exert tangential stress; therefore the stress exerted amongst and by them at every point and in every direction is normal; therefore, at a given point, it is of equal intensity in every direction. Q. E. D."

Pretty well this for a learner!

Again, at p. 116, for equilibrium of fluids, the following is given:—

"In adapting equations (2) of art. 116 [too long to be inserted here], to this case, it is convenient to take x to denote vertical co-ordinates, and to make it *positive downwards*. Then bearing in mind that p is now a thrust, being positive (and not a pull when positive and a thrust when negative, as in the general problem), we obtain the following equations:—

$$\left.\begin{aligned} \frac{dp}{dx} &= w \\ \frac{dp}{dy} = 0, \quad \frac{dp}{dr} &= 0 \end{aligned}\right\} \quad \ldots\ldots (2).$$

The first of these equations expresses the fact that in a balanced fluid, *the pressure increases with the vertical depth at a rate expressed by the weight of the fluid per unit of volume;* and the second and third express the fact that *in a balance fluid, the pressure has no variation in any horizontal direction:* in other words *that the pressure is equal at all points in the same level surface.*"

We think we have said enough to establish our position that Professor Rankine's work is not what it professes to be, "A Manual of Applied Mechanics," but much more what he himself states a work intended for "practical scientific instruction" ought not to be. We cannot commend it to the reader unless he be already an accomplished mathematician, thoroughly acquainted with the principles of mechanical science, not to be deterred by a crabbed and forbidding nomenclature, but anxious to pursue the principles into the highest *theoretical* development they have yet attained. To such a reader the work before us will present much that he will find useful and interesting. He must be a bold man, indeed, who will venture to recommend the treatise to the learner or the practical man whose mathematical knowledge is small, or who will dare to affirm that the author has done anything by its publication towards bridging the gulf which now unfortunately separates the theoretical from the practical.

Tents and Tent-life, from the Earliest Ages to the Present Time. To which is added the Practice of Encamping an Army in Ancient and Modern Times. By GODFREY RHODES, (late) Captain of Her Majesty's 94th Regiment. Illustrated by several engravings. London: Smith, Elder, and Co., Cornhill. 1858.

OUR late articles on the improved tents of Major Rhodes have brought us acquainted with this exceedingly entertaining volume. The length to which those articles extended renders it undesirable for us to occupy much further space on the subject now. We would wish, however, to have it understood that, although the volume was suggested in connection with the invention of the gallant author, it has by no means suffered on that account; on the contrary, it has evidently been prepared with faithful labour and research, and is a most valuable contribution to the literature of the time. It will be found, we repeat, an exceedingly entertaining volume and that by all classes of readers.

Chambers's Encyclopædia; a Dictionary of Universal Knowledge for the People. No. 1. W. and R. Chambers, London and Edinburgh. 1859.

WE hail the appearance of the first number of this work with unaffected pleasure. The type and paper are both excellent, and the quantity of

* The preparation of this article has been delayed by the illness of the writer.

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matter for the 1½d. is abundant. This publication will be a great boon to large numbers of our countrymen, especially to the working classes, and we would urge such of them as we address to commence to obtain and study it as it is published week by week, or month by month. At the same time we entreat the publishers to secure soundness, at any cost, in their scientific articles. Are they quite sure that "aberration of light" is philosophically defined by the words, "an apparent alteration in the place of a star?"

Routledge's Illustrated Natural History. By the Rev. J. G. Wood, M.A., F.L.S., &c. Part I—April. London: Routledge, Warnes, and Routledge, Farringdon-street.

There is so much exquisite mechanism at work in the animal life of the creation, that no thoughtful student of mechanics and machinery should fail to enrich and stimulate his mind by the study of Natural History. We therefore receive with much satisfaction this first part of Messrs. Routledge's new work. The author is well known as a most exact and able writer on the subject, and the publishers have manifestly resolved to second his ability by type, paper, and illustrations of a very superior kind. They are likewise very liberal in the quantity of matter which they give. This first number contains considerably more than twice as much letter press as the monthly number of Mr. Thackeray's novel, the "Virginians," at the same price. It is very gratifying to find high-class science produced for less than one-half the cost of high-class fiction.

The Problem of Squaring the Circle Solved; or the true Circumference and Area of the Circle discovered. By James Smith. London: Longman, Brown, and Co. 1859.

On the first page of this tract we are distinctly told what we felt confident we should find on some page or other, viz., that the author "never went through a regular course of mathematics." This intelligent gentleman endeavours to effect his object by making circles and squares of cardboard, copper, &c., and weighing them, and so forth! What a pity it is he did not first take the pains to acquaint himself with the theories and the *facts* which he proposed to overthrow. We do not blame Mr. Smith for either writing or publishing his paper, but we cannot recommend it to our readers except as a matter of amusement.

How to Lower Ships' Boats. By C. Clifford. *Fifth Thousand.* London: Charles Wilson, 157 Leadenhall-street. 1858.

We recommend this pamphlet to persons who are, or ought to be, interested in the highly-important subject of saving life at sea. It well deserves study, and will repay perusal in many more respects than one.

The British Workman for January, February, March, and April, 1859. Partridge and Co.

The Band of Hope Review for January, February, March, and April, 1859. Partridge and Co.

We cheerfully devote a few lines to a notice of these unpretending but most useful publications, which circulate so largely among labourers, mechanics of inferior grades, and the families of these classes. The January number of the *British Workman* contains an excellent sketch of the life of George Stephenson, condensed from Mr. Smiles' work. The tone and tendency of these numbers are most praiseworthy throughout.

LIST OF NEW BOOKS.

New Dictionary of Quotations from Greek, Latin, &c., 7s. 6d.

Parent's Cabinet of Amusement and Instruction, new edit., Vol. V., 1s.

Photographic Fac-similes of Antique Gems of the late Prince Poniatowski, £10 10s.

Jean's (H. W.) Navigation and Naut. Astron., Part II., 4s.

Hatterseley's (J.) Potato Disease and its Remedy, 6d.

Wordsworth's (C.) New Joint-stock Company, Law of, 1856-7-8, 7th edit., 8vo., 4s., sewed.

Parliamentary Proceedings.

The Patents for Inventions (Munitions of War) Bill passed through committee, in the House of Lords, on Tuesday, the 5th instant.

On Wednesday April 6, in the House of Commons, Sir J. Pakington entered into explanations respecting the reports of various committees on naval and dockyard expenditure, naval machinery, and the expenses of shipbuilding (the last by the Surveyor of Navy), all of which were laid on the table of the House—excepting that on Dockyard Economy. He recommended a committee of the House on the subject when the new Parliament assembled.

Lord Clarence Paget explained that his wish was simply to return to the method of preparing the Navy Estimates which was in vogue prior to 1819.

A short and inconclusive discussion followed on tenders for naval machinery, on Admiralty anchors, and on Captain Kynaston's patent hooks for lowering boats.

Sir C. Wood and Sir J. Pakington then skirmished at great length, the subject in dispute being the state of the navy when Sir Charles retired from office.

A DEFENCE OF FARADAY.

Gentlemen,—You have republished (in No. 12, for March 18) from the *Athenæum* some of the critical remarks of its mathematical reviewer on Faraday's additional observations on the Conservation of Force, in which remarks, coupled with those of a former review, there is evinced a disposition to undervalue without sufficient cause the mind and the ideas of a most eminent philosopher, even when propounding his views on a subject which he is specially qualified to discuss, namely, the *philosophy* of force, as a theme distinct from its mathematics or quantitative relations. This depreciatory attack is unfair, because, touching the experimental and logical relations of force, it is *not* founded on deep views of the realities of things, as consisting of either facts or inferences, in which department of knowledge and inductive reasoning Faraday is as much at home, to say the least, and is as competent to discuss any questions therein, as any mathematician can ever hope to be. The reviewer is, no doubt, his master in regard to deductive reasoning from abstract ideas of quantity, and I believe I may add, that no one—not excepting even Sir William Hamilton—has penetrated so deeply into the intricacies of syllogism as himself; but as to that logic which is yet to be written and systematised—if indeed it be susceptible of system—that logic which gives point and device to the efforts of the experimentalist, and is alike characteristic of practical sagacity and of profound philosophy,—in that logic of induction, the reviewer, instead of being his critic, ought rather to stand before him in the humble attitude of one of his own college pupils, if haply indeed he could learn a little of what nature only fully imparts. This attack is unfair, again, because it rests on the shallow ground that Faraday does not talk with the shibboleth of *modern* mathematicians, but presents his views, independent of the particular physical and theoretical form, in which they are accustomed for scientifically convenient purposes to invest their conceptions of force, but prefers rather to speak of it in a general sense. As well may the advocates of the emissive and undulatory hypotheses of light join to deride the philosopher who should choose to investigate the phenomena (as Brewster has been accustomed to do) independent of both the technical language and theoretical ideas of either of their respective schemes.

Now, the doctrine of the conservation of force is an inductive principle, like that of gravitation, but still more general, and to which gravitation itself, in its *physics*, must be made amenable; and it results from a comprehensive survey of the phenomena of nature, but directed more to the complicated relations connected with the constitution of bodies, than to the more simple movements of the celestial bodies in space, which the reviewer is able more easily to grasp, instructed therein, as he is, by a century of labours of the most eminent mathematicians who ever lived. But Faraday's labours belong not to routine attainments; they evince profound and original research; and of all philosophers, none have so much reason to be impressed with a sense of this doctrine being a true induction from molecular phenomena as himself. And mathematicians who are not philosophers travel beyond their domain, and diminish the prestige which it is more fashionable than reasonable to attach to their vocation, by cavilling at the inductive and philosophical conclusions at which such a man arrives. Let them, at least, meet him on his own ground—not indeed of original research, for that would be asking a little too much—but of general inductive reasoning. And instead of taking the high and sheltering position of self-assumed superior but inapposite attainments, let them review the subject with a disposition to acquire both general knowledge and more comprehensive views of things, although by so doing they should be obliged to revise some hypothetical opinions concerning the physics of gravitation in which they have hitherto indolently acquiesced. New applications of ideas and suggested improvements proceed so generally from the outside of the professional circle, that it has almost been adopted as a popular aphorism. But how is it that this principle of the conservation of force seems to come upon some mathematicians with the surprise, as it were, of a new truth? It is, I believe, because that it is now perceived to be no barren speculative idea, but a fruitful inductive proposition, capable of many important applications both in physical and practical investigations; and so, because of this extension, mathematicians more conversant with force in its sensible and measureable manifestations, in matter in the mass, became coy in regard to it as respects molecular phenomena. But when it was contended, and not by one of themselves to whose authority they could defer, that supplemental to an oversight of their own, gravitation must also be made amenable to this principle,—that its law, although a true mathematical expression of its action, is not obedient thereto in respect to the physical aspect of gravitation as an ultimate phenomenon,—that as a consequence, either associated phenomena must be sought for, which, with itself, must be included in some higher generalisation, or else that some explanatory considerations based on the principle of radiation must be accepted—no wonder they should be startled as though by a novelty and a heresy, and be disposed to disparage both the philosopher and his philosophy.

Wherefore it is that the reviewer would fain substitute for the general philosophical principle of the conservation of force, the particular mathematical truth, or theorem, concerning the conservation of momentum. By confusing, or inveterately associating—it matters not on which horn the fallacy is impaled—the mathematical expression of the equality of action with the physical expression of integral existence, he would have us to understand that all that is sound in one kind of conservation is to be found in the other. But why may they not co-exist? He says that "two equal and opposite momenta count as nothing in the [his] principle of *conservation*, not only when they shock each other and produce *rest*, but before;" that, in fact, momentum is being conserved even whilst being destroyed! Here is both a solecism in language and a paralogism in argument, although what is meant is correct enough. It is anomalous to talk of the conservation of momentum—simply of momentum, instead of the equality of action—and it is even contradictory, when motion, its most prominent element, is admitted to be absolutely destroyed in the production of rest; and it is beside the mark, when the question in dispute is a physical one, to give a mathematical answer about what no one controverts. That "the sum total of all the forces in the universe is equal to—*nothing*," is, of course, true in a mathematical sense, touching the mathematician's sole theme, the action of force; but by using the word "nothing," he would appear to point to a philosophical sense in opposition to that conservation which he repudiates, of force both collectively and individually being *something*, ever existent, and constant in amount. And, indeed, he makes this statement in connection with "the law of conservation *of force* strictly so called." Does he dally and palter, then, between the physical and the mathematical sense? Undoubtedly equal and opposite forces are equal to *zero;* but it is only in our mathematician's world that such zero is equal to "nothing." In the world of realities, such zero is perfectly compatible with continued existence, accompanied with integrity of power, admitting neither of increase nor of diminution whilst manifesting itself in different forms; otherwise, our members of Parliament, for instance, would be in a poor plight, if when votes are equal and opposite, they personally are to be deemed equal to—"*nothing*." Nullification is not annihilation. Forces live to fight again another day, even though they should put each other *hors de combat*.

It is not the algebraical zero that is in question; that zero concerns action, and no one demurs to the mathematical account of the matter, which, indeed, is a corollary from the third law of motion. It is the arithmetical zero, or cipher, in the arithmetic of whole numbers, to which the principle of the conservation of *force*, in apposition to that of equality of action, stands related; *that* zero concerns existence and constancy of endowment or the integrity of the unit, and is absolute, meaning truly now—"*nothing*." Now, the reviewer, great as are his talents, must not, through the algebraical pre-occupancy of his mind, practice an imposition either upon himself or upon us, by confounding the nature of the two zeros, or whilst talking of the one, covertly mean the other. Force, as to its existence and integrity, neither proceeds from nor returns to the absolute zero. It is a unit, ever on the sole positive side of the arithmetical zero, but the action of forces may be in units on opposite sides of the algebraical zero. Conservation, then, of both kinds are compatible and co-exist; and it is conservation in the physical aspect which Faraday and the philosophers who agree with him uphold; and yet, without controverting the mathematical conservation of the equality of reciprocal action, and of the motion of the centre of gravity. And this physical conservation (in respect to gravitation when confined to its own form of force, and omitting the addendum of its constancy unaffected by distance) the reviewer will in reality no more deny than Faraday himself, seeing that it stands as the *sine quâ non* of that mathematical conservation of momentum, as he calls it, which, with something like a love for an idle paradox, he would substitute for it.

Gentlemen, you will think it right, I am sure, that future historians should have the means of knowing that even at the time of an unjust depreciation of his mind, talents, and ideas, there were not wanting defenders of the fair fame of Faraday. This vindication will be by no means complete without another letter, but I scarcely hope you can afford more space for a somewhat recondite subject. For the same reason alone, I wish it to be understood, I refrain from replying to the articles by "A Mechanic." I am, &c.,

BENJ. CHEVERTON.

[We feel in a certain sense bound to give place to the above letter, because it is the only defence of Professor Faraday's views of Conservation of Force which has been sent us, and for other reasons. Having undergone the misfortune (as Mr. Cheverton would probably deem it) of a mathematical training, we are perhaps incapable of forming a correct and adequate opinion upon this question. However that may be, we confess that we are quite incapable of replying, with any satisfaction to ourselves, to the above letter—for we do not understand it. We have a tolerably clear conception of Professor Faraday's views, and an equally clear apprehension of those points on which we believe him to be in error; but the views, or at any rate the letter, of his defender passes our understanding. We are most willing—nay, we are really anxious—that we shall keep back nothing which the illustrious Professor would himself deem serviceable either to him or to the truth; but in the absence of all knowledge on that point we really do not see of what avail another letter like the above can be. We say this with the utmost respect for the long experience which our correspondent is known to have had in matters of science.—Eds. M. M.]

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SIR WILLIAM ARMSTRONG'S WATER PRESSURE MACHINERY.

FIG. 7.

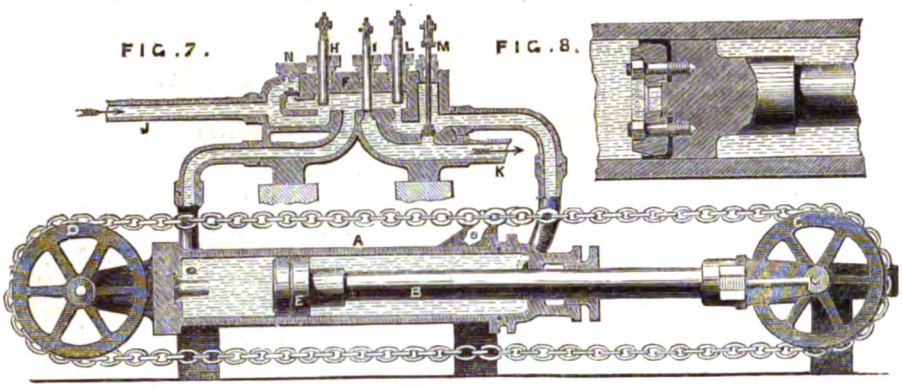


FIG. 8.

FIG. 9.

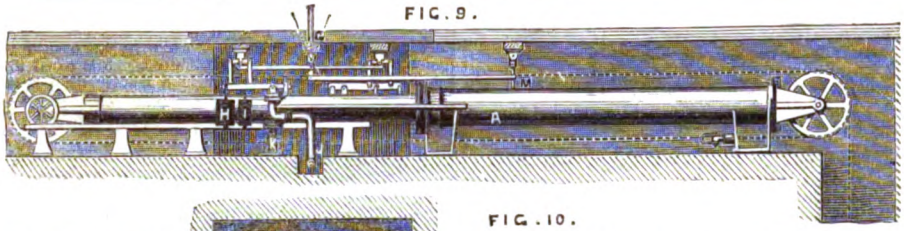
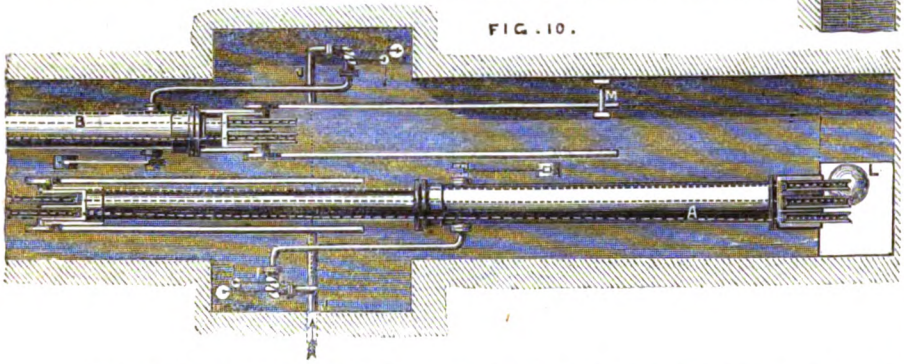


FIG. 10.



IMPROVED WATER-PRESSURE MACHINERY.

By Sir W. G. ARMSTRONG, C.E., F.R.S., Engineer to the War Department for Rifled Ordnance.

(*Continued from page* 220.)

To meet variation of load it was formerly the practice to combine three of the pressure cylinders so as to act either separately or collectively upon the lifting chain; but the writer has more recently introduced a method by which a variation of power is obtained with a single bored cylinder fitted with a combined piston and ram. Fig. 7 is a longitudinal section of the cylinder and valves of a double power hydraulic crane; and Fig. 8 is a section of the piston enlarged. *A* is the cylinder fitted with the piston *E* and ram *B*; the water from the accumulator enters the valve-chest *F*, through the pressure pipe *J*, and the inlet-valve *H*. For the lower power the water is admitted to both sides of the piston *E*, by opening the valve *L*, as shown in the drawing, in which case the power exerted and the water expended are each proportionate to the area of the ram *B*. For the higher power the valve *L* is closed and the valve *M* opened, so that the front side of the piston *E* is thrown open to the exhaust *K*, and the result both as regards power and expenditure, is then proportionate to the full area of the cylinder *A*. It is seldom necessary to have more than a double power; but where a lower or third power is required, a smaller ram may be inserted within the other, but in this case it is necessary to make fast the larger ram while the smaller one is at work. For lowering the load the valves *H* and *M* are closed and the outlet valve *I* opened, allowing the water to escape from the cylinder *A* into the exhaust pipe *K*; at the same time the valve *L* is also opened to allow the water to follow up the piston in the inward stroke.

In hydraulic cranes the power is applied not only for lifting the load, but also for swinging the jib, which latter object is effected by means of a rack or chain acting on the base of the moveable part of the crane, and connected either with a cylinder and piston, or with two single-acting cylinders applied to produce the same effect by alternate action. Figs. 4 and 5 (page 220), show the arrangement of the two cylinders *N* and *O*, for turning the crane, fitted with rams acting, by a chain passing round the base of the crane-post *F*. The motion is controlled by means of a slide-valve worked by a handle situated beside the handle *G*, so that while the water is admitted to one cylinder the other is open to the exhaust. The travel of the rams is limited by means of a tappet rod connected with the handle of the slide-valve, whereby the crane is prevented from being turned round too far.

The absence of any sensible elasticity in water renders the motions resulting from its pressure capable of the most perfect control by means of the valves which regulate the inlet and outlet passages; but this very property which gives so much certainty of action tends to cause shocks and strains to the machinery by suddenly resisting the momentum acquired by the moving parts. Taking for example the case of a hydraulic crane swinging round with a load suspended from the jib, the motion being produced by the water entering into one cylinder and escaping from the other, it is obvious that if the water passages be suddenly closed, the ram of the latter, impelled forwards by the momentum of the loaded jib, but met by an unyielding body of water deprived of outlet, would be brought to rest so abruptly as to cause, in all probability, a fracture of the machine. So also in lowering a heavy weight, if the escape passage be too suddenly closed, a similar risk of injury would arise from the sudden stoppage of the weight, if a remedy were not provided. But these liabilities are effectually removed, in the case of a single-acting cylinder, by employing a relief valve in connection with the water passages, consisting of a small clack valve, opening upwards against the effective pressure, so as to permit the pent-up water in the cylinder to be forced back into the pressure pipe whenever it becomes subject to a compressive force exceeding the pressure given by the accumulator. In the case of a double-acting cylinder, fitted with a piston and slide valve, or where two single-acting cylinders with rams working alternately are controlled by a slide-valve, as in the instance of the cylinders *N* and *O*, Fig. 5 (page 220), for turning the crane, relief valves are employed in connection with the slide valve, consisting of four small leather flap valves arranged as shown in Fig. 6 (page 220). The passages *PP* communicate with the pressure pipe *J*, and the passages *EE* with the exhaust *K*. When the slide valve is moved in the direction of the arrow, the pressure is first cut off from the port *R* by the lap of the valve, the port *S* being still open to the exhaust *K*; at the same instant the flap valve *T* opens upwards and allows a small quantity of water to pass from the exhaust *K* into the port *R* to follow up the ram until brought to rest. When the slide valve arrives at the centre position, as shown in the drawing, the port *S* is closed to the exhaust; and the pressure in the port *S* being increased by the further motion of the ram before it is completely stopped, the second flap valve *U* is raised and a small quantity of water forced back into the passage *P* communicating with the pressure pipe *J*. When the slide valve is moved in the opposite direction, the two remaining relief valves are called into action in the same manner. By these means all jerks and concussions are avoided, and perfect control over the machine is combined with great softness of action.

The method which the writer has most generally adopted for opening and closing lock gates by means of hydraulic pressure, consists in applying to each gate a pair of cylinders with rams and multiplying sheaves similar to those constituting the hoisting apparatus in hydraulic cranes. One of these cylinders opens the gate and the other closes it, the whole of the machinery being placed in chambers beneath the ground, as shown in Figs. 9 and 10. The water is admitted from the pressure pipe *J* to the cylinder *A*, through the inlet valve *H*, by means of the handle *G*; the same motion of the handle also opens the outlet valve of the other cylinder *B*. The opposite motion of the handle *G* opens the outlet valve *I*, allowing the water to escape from the cylinder *A* into the exhaust pipe *K*, and at the same time admits the pressure to the cylinder *B*. A stop *M*, connected with the handle *G*, prevents the ram from travelling too far in the out-stroke, by closing the inlet valve; and the return stroke of the ram is effected by means of the weight *L*. This arrangement is in use at the Sunderland Docks, the London Docks, the Victoria Docks, and the West India Docks, and is now being applied to the new 100 feet entrance to the Liverpool Docks

(To be concluded in our next.)

DIVIDING METALS BY ROTATION.

A communication has been made to the Society of Civil Engineers of Paris, relative to a new method of obtaining metals in a finely-divided state by means of rotation—in fact, in a manner similar to that which has been used for the production of small shot. In the present instance the machinery employed consists of a disc of fire-clay mounted on a vertical axis, and made to revolve at the rate of 2,000 turns a minute. The metal is allowed to fall in a state of fusion upon this disc, and is thrown off in the form of powder, which is cold before it reaches the ground or receptacle. The powder of lead thus obtained is proposed to be used in the production of masticot, or yellow oxide of lead; for this purpose the powder is damped, and then heated to a moderate degree, when the surface of each atom at once becomes covered with the protoxyde, which is removed by washing, and the process repeated. By the addition of acid, white lead may in like manner be produced. An experiment was made with the apparatus upon iron, but that metal retained its heat too long to permit the division to take place, during the time the molten metal remained in the air; it was suggested, however, that fine iron might be produced for special purposes by submitting it to the action of the machine, in order to disengage from it sulphur, phosphorus, and other foreign matters before moulding. The President of the Society objected that the rotating action of the foreign bodies contained in the iron could only be effected at the cost of the combustion of a portion of the iron itself, as occurred in casting, and also, as he stated, happened in the case of Mr. Bessemer's apparatus.

At the last meeting of the Mersey Dock board, Mr. Bold called attention to the subject of placing the time-ball at the Observatory in a better position. The expense of removing the ball to the top of Victoria tower was estimated at £100, and the erection of a new ball at the top of the Albert warehouses at £150. Mr. Mondel said the subject had not been lost sight of. Wires were, at present, being laid across the basins for carrying on the communication from end to end of the docks. It is not intended to carry the wires across the west side of the entrances at present, except with a view of communicating with the necessary offices. The submarine cable, for a telegraph to Holyhead, is to be supplied by Messrs. Glass, Elliott, and Co., the well-known makers.

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JOBSON'S APPARATUS FOR CRUSHING AND SIFTING.

Mr. Robert Jobson, ironfounder, of Wordsley, Stafford, has invented an apparatus for crushing and sifting, in which a hopper and crushing rollers are fixed within a rotating sieve in such manner that the crushed matters coming from the crushing rollers descend on to the part of the sieve which is below them; and in order that any matters which may have passed through between the crushing rollers, and yet not be sufficiently crushed to pass through the sieves, may be again raised into the hopper, there is a shelf or shelves fixed longitudinally to the interior of the sieve, by which such matters are raised up into a position to fall into the hopper, and thence pass again through between the crushing rollers. When desired, the crushing rollers are so arranged that they can be heated.

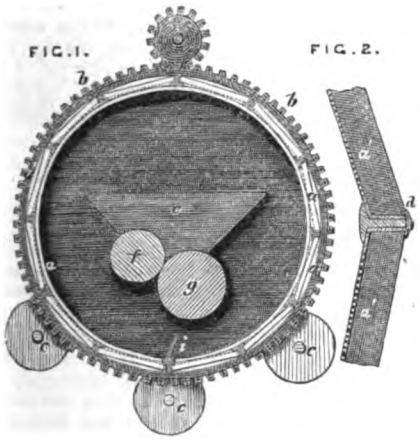


Fig. 1 is a transverse section of the machine, and Fig 2 shows the manner in which the sieves are fixed and retained in the spaces between the longitudinal bars of the cylinder. The cylindrical frame *a*, *a*, is composed of two rings, made by preference with flanches; these rings are connected together by longitudinal bars of T iron, and at one or both ends of the framed cylinder is fixed a toothed ring *b*, by which, when the framed cylinder *a*, *a* is supported by rollers *c*, *c*, *c*, at each end, motion is communicated to the cylinder *a*, *a* by a pinion or pinions, on an axis driven by any suitable power. The rings of the framed cylinder rest on the rollers *c*, *c*, *c*, and the flanches on such rings prevent the cylinder from getting out of position. The cylinder *a*, *a* is supported by two end-frames, which carry the axes of the rollers *c*, *c*, *c*. The sifting surfaces *a'*, *a'* are fixed in the spaces between the longitudinal bars of the cylinder by means of turn buckles *d*, or other convenient means. Within the cylinder *a*, *a*, is suspended a hopper *e*, *e*, which is carried by the end-framings, as shown. Below the hopper are two crushing rollers *f* and *g*. The axes or necks of the roller *g* have their bearings carried by the end-framing, and the roller *g* is driven by steam or other suitable power, and when desired the roller *g* may be made suitable to be heated by steam or other means. The axes or necks of the roller *f* have their bearings in two weighted levers by which the roller *f* is kept pressed to the roller *g*; by these means the materials to be crushed and sifted being placed in the hopper, the same pass between the rollers *f* and *g*, and become crushed by the rotation of the cylinder *a*, *a*. Such crushed materials become sifted, and such portions thereof as do not pass through the sieve surfaces are raised up by the inclined shelf *i*; more than one such shelf may be used.

The above machine has been patented by Mr. Jobson.

GOVERNMENT RIFLES.

Gentlemen,—As we learn that the Enfield Rifles have in numerous instances proved utterly useless in the field in India, I shall be glad if any of your readers can tell us how the oval bore Lancasters, supplied by the Ordnance, have answered? Perhaps Mr. Lancaster himself would favour us with any authentic reports which may have been issued respecting his peculiar bore small arms.—Yours obediently, J. Bartery, Cheltenham, 4th April, 1859.

CUNNINGHAM'S NON-RECOIL CARRIAGE FOR NAVAL GUNS.

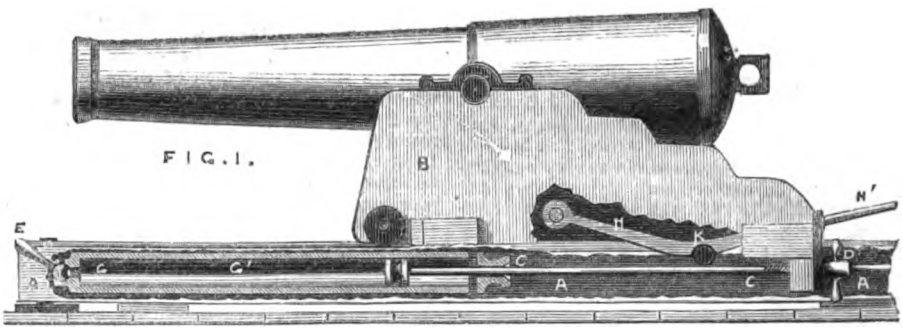
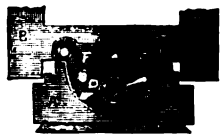


Fig. 1, *side elevation, partly in section. AA, the slide. BB, the carriage. GG', a tube fixed in slide. CC, piston rod attached to piston in tube, and connected with cannon by the screw lever at D. E is a valve by which the outer end of tube can be opened or closed. HH', is a gab lever to retain the gun from running out if worked in the ordinary manner, but this would not be required on the Non-Recoil Principle. Fig.* 2 *is an end view.*

FIG. 2.



N.B.—The tube G is here shown exaggerated in size for the purpose of perspicuity.

[The following communication has been received from H. D. P. Cunningham, Esq., R.N., the inventor of the system of self-reefing sails which is now largely in use in the ships of all nations.]

Bury, near Gosport, 2nd April, 1859.

With reference to the probability of Sir William Armstrong's gun being used for ship's purposes, it is *à propos* to the subject to refer your readers to my plan for receiving the recoil force of a gun on the elastic medium of the atmosphere, as described in Number 1354 of the Mechanics' Magazine, 21st July, 1849, which I there term my atmosphere gun carriage, as I then contemplated working ordinary guns by the power which I economise by my arrangement.

The necessity of running the carriage in and out for the purpose of loading the gun no longer exists in a breech-loader. It is desirable, therefore, to have the carriage of a gun of this description on the *non-recoil* principle, as by this arrangement the time occupied in running out the carriage by the side tackles is saved, and hence the gun worked with greater speed and fewer men. A very serious objection, however, exists to a carriage on the non-recoil plan, and that is the great shock which it gives to the ship's side, and indeed to the whole fabric. A remedy for this is to receive the shock of recoil on some elastic medium which will yield sufficiently to blunt or deaden the effect of the shock. Now this is provided for in my plan.

Using a carriage on the slide principle, I place in the slide a tube of sufficient length, within which are fitted a piston and rod. The outer end of the tube is furnished with a valve, and the inner end has orifices for the admission of air. The carriage is connected with the piston rod by a screw capable of ready disconnection, and also re-adjustment. When the gun is fired, and caused to recoil, the piston is of course carried with it down the tube against the pressure of the atmosphere (the valve at the outer end being closed), and thus a retarding force is exercised which, increasing with the distance travelled, finally overcomes the force of recoil, and the reacting result is that the gun is driven out again. By opening the valve at the outer end, the vacuous action ceases, and the carriage can be used as an ordinary one. This valve also regulates the amount of resistance, as by admitting a certain amount of air, the purity of the vacuum is affected, and hence the amount of atmospheric pressure diminished. This valve can also be made to act the part of a train tackle, to prevent the gun running out if required to be kept in; in this case, the gun having been run in with the valve open, the tube is filled with air. On the shutting of the valve, this column of air offers a resistance to the passage of the piston down the tube; hence the carriage cannot run out in that state. There are also other purposes that can be secured by the action of thi tube.

I have never received a copy of the report of the select committee at Woolwich, before which I was ordered to appear with my plan, but I remember that the President laboured under the impression that it was on the principle of *compressed air*, and that the result would be ignition of the carriage, an opinion which I earnestly combatted, but I am afraid without success. I avail myself of this opportunity to point out that the air is *not compressive*, the tube being open at the inner, or baroscopic end, and the weight of the atmosphere only is the resisting force exercised in controlling the recoil of the gun. I repeat that I believe my plan of receiving the shock of recoil on the elastic medium of a vacuum in the very simple manner provided by me, is admirably adapted for guns worked on the non-recoil principle, which, I presume, will be the case should Sir William Armstrong's gun become in use for naval artillery.

It was in working out the design of a breech-loading cannon that I was led to devise the plan I have here described for perfecting a carriage on the non-recoil principle; and it was in course of considering the subject of breech-loading guns that a most formidable objection to the use of this description of ordnance for ships' purposes presented itself, and which I consider most important. This objection consists in the danger of the fire in the gun blowing in-board on opening the breech when fighting or working weather guns, or guns on the windward side of the ship; an objection which also applies to casemated batteries, although not so important as with reference to ships. So long as cartridges made of inflammable material are used I do not see how this objection can be prevented. Whatever arrangements may be made for opening the breech, if any fire exists in the gun when the breech is opened in-board the fire must blow; and the result of having a large quantity of fire thus scattered about the decks in action may be easily appreciated by naval men. Whether cartridges can be made of inflammable materials, so as to retain that state after the firing of the gun, is a subject for the consideration of chemists. My idea is, that any textile fabric subjected to the penetrating effects of the explosion of gunpowder, however in its original state it may have been rendered inflammable, will imbibe so much of the igneous particles of the gunpowder as to inflame when brought into contact with the air. I believe this to be a most important consideration in connection with the Armstrong gun, and an objection that must be overcome before this weapon can be used with safety on board of ships.

I enclose you a plan of my atmospheric gun-carriage. I remain, your's obediently,

H. D. P. Cunningham.

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IMPROVEMENTS IN FISHING TACKLE.

WE have had occasion more than once recently to call attention to a movement amongst the fishing-tackle makers that has for its object the improvement of a business which was becoming fixed and stationary, or rather to adopt the notion that in these days "to stand still is to go back," was retrogressive. Mr. Little, of Crooked-lane, took the lead in this forward inclination, and in 1851, at the Grand Exhibition, showed us very many improvements in the ordinary fly, trolling, and spinning rod. Then followed men from Worcester and elsewhere, who would catch the public if they did not catch any fish, with artificial baits that were purposely made not to break the second commandment, so unlike were they to anything on the waters, or out of them. Crooked-lane then aroused itself, and several minor novelties, if not improvements, were consequent; and then the dream of the seven sleepers came over all, and the trade dozed again. This season, however, one of the craft, Mr. Wright, of 376 Strand, has started from his slumbers with a whole creel full of artful dodges—the word is now used in Parliament—having for their object the capture and destruction of the finny tribe. Amongst these is a new bait, which cannot be termed artificial, as it is composed of the veritable gudgeon or dace itself, stuffed in its own skin, and varnished with a hard transparent cement; this latter and its eyes, if we except the hooks with which it is armed, are the only unreal things about it. We pity the salmon, the trout, the pike, or the perch, ensnared by so crafty a bait. These victims may find in it something to add to the already overwhelming charge of the treachery of man; and man himself, in a philosophic mood, may see in it an instrument to determine the long-mooted question, whether the sense of smell is active in fish, and influences the selection of their food. Another novelty is in a garf, or sanding hook, which is incapable of doing any mischief to its owner when not in use. Another is a reel for deep-sea fishing. A fourth, a disgorger with a handle for pike, and other large-mouthed fish. A fifth is an acorn-shaped ferrule-stopper, giving a hold and purchase to the fingers for their removal, more particularly in cold weather, and indeed several other affairs, apparently trivial in themselves, but important to those whose holiday life takes its charm and colour from the sports of the stream.

A PLAN FOR IRON DWELLING-HOUSES.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—I beg to submit the following thoughts about incombustible dwellings for your consideration:—

No one needs to be told that the use of easily combustible materials—such as wood—in the construction of houses is a great evil: the only question to be asked is, How is it to be avoided? The "fire-proof" mode of building would, doubtless, be generally adopted but for the increased expense. Iron has been proposed as an economical material, and, as immense strength is given to very thin plates of this metal by simple corrugation, it may be well worth inquiring whether something more than the public is at present aware of may not be done by its employment. We will suppose the walls to be built of the usual double-plating, with some non-conducting substance, as felt, cork, or wood, sawdust, &c., interposed; and then the question arises, Of what use are incombustible *walls*, if the house may be at any moment gutted by fire?

Suppose, then, that a jointing of iron tubes, consisting simply of "plate," no thicker than experiment shall show to be necessary in reference to the span, were to be substituted for wood; over these a flat plating might be laid, and the thing is done. The edges of the plates might be tinned, which, on the grand scale, is a very simple operation, and so secured with a little solder, containing, for cheapness sake, as much lead as will "give" to the soldering-iron (if, indeed, the oxy-hydrogen blowpipe be out of the question, which I think a needless supposition, and the use of which instrument would of course dispense with the more expensive metal *tin* altogether); and thus we can imagine a habitable room, with the incombustible character of which we are in search. It is possible that, instead of joints, as described above, a simple succession of corrugated plates might be cheaper, and equally effective; but the power which corrugation gives of applying *light* metal plates to sustain heavy weights, is one which, I think, will in the long run, turn the scale in favour of iron dwelling-houses, at least for the poor, and in places where *use* is the object in view. I can see no reason why a roof of galvanized corrugated iron, eschewing all timber, slates nails, &c., should not be a very safe and economical substitute for that we hear now constantly spoken of as the great bugbear, the monster difficulty in building.

I am, Gentlemen, only an engineer; but I can assure you that I represent a very numerous body of non-professional readers, to whom a little information on the subject would be very acceptable. Could not you, or some one of your many valuable correspondents, give us a comparative estimate of the probable cost of such a roof for a cottage, or small house, as I have described, as compared with one of timber and slates of the usual kind? The general impression appears to be, that the introduction of iron into house-building would interfere with a vast number of trades and professions now flourishing, just because the ordinary materials are employed; and that this is the reason they hear so little about it.

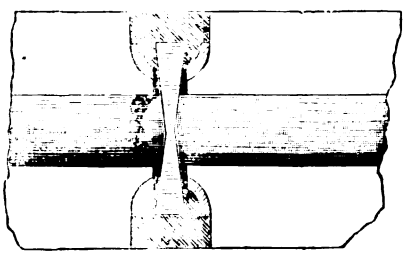
I know not how this may be; but I think I could scarcely start a better subject for inquiry and solution in your excellent journal, than that which I thus venture to bring before you.

I remain, Gentlemen, your constant reader,

PLATO.

CAPTAIN NORTON'S FUZE.

CAPTAIN NORTON writes:—"I shall be much obliged if you will be so kind as to give a place in your next Magazine to the enclosed drawing of a section of my concussion-fuze, representing the rivet having the molten lead poured into the metal cups at each end of the connecting fuzible band of sheet zinc. In your number for the 12th of June last, you kindly gave a drawing of a section of my fuze, showing the metal cup placed



on one end of the connecting band. The present drawing will, together with the former, make all intelligible. Before the molten lead is poured into the cups, a cuirass of steel is placed over the cup, and the lead is poured in through a funnel saucer-shaped in form, like the steel cutter on the upper end of a bullet mould; when the lead is cool, a gentle blow on the end of the cuirass cuts the lead level with the surface of the fuze-case."

THE ATLANTIC CABLE.

GENTLEMEN,—I am at a loss to conceive on what grounds the *Times* of this day repeats the opinion expressed in a former article that, "when a fresh wire is laid the old cable will possess an undoubted value for the return current," thereby setting up a wire of (I believe) less than ¼-inch diameter in comparison with that wire, the earth, which has a diameter equal to its length, and which, therefore, offers no resistance to the passage of the return current. I can only presume that the writer has run away with the idea that by placing two wires side by side—one of which, for the advance current, is a pretty good one—he will obtain exemption from the so-called earth currents which have been the scapegoat for the failure of the electricians in sending signals along the present Atlantic cable. To those common minds who have not yet made acquaintance with those mysterious currents it may appear possible that the signals on the telegraphic instrument alluded to in the *Times'* article of the 3rd Feb. last, 83rd line, may have been only the result of that electric condition set up by the intense electricity employed by her first operators and the use of which cannot be too strongly reprobated. Those "constant and perplexing vagaries" called the earth currents may appear to such minds as simply the discharge of a cable which had had too much electricity of an intense kind sent into it. If such be the fact, it is difficult to understand in what way the present cable can be of any use in the manner indicated. That it will be made to work I am confident, but it will be by means far different from those pointed out by the writer, who will, perhaps, should this meet his eye, enlighten your readers on the points referred to, as the paper to which he has contributed his ideas would possibly not have permitted me to question its writer's judgment.

Your's, respectfully,

17th March, 1859. S. B.

DESTRUCTIVE ENGINES OF WAR.

WE have received the following letter from Mr. Macintosh, the inventor of those formidable means of warfare which have been the subject of remark in these columns:—

GENTLEMEN,—In reference to your remarks on Dr. Lardner's letter in your last impression, touching a question of surpassing importance to us as a nation, and pointing out that the introduction of chemical agents into her Majesty's service would greatly augment our powers of destruction, permit me to make a few remarks, to which I trust you will kindly give insertion. In 1852, with a view of introducing into the service compounds of kakodyle as an agent of warfare, I filled small diaphragm shells (having a bursting charge) with the chloride, cyanide, and oxide of kakodyle. These shells, on bursting, ignite spontaneously, setting fire to everything combustible. The result of this combustion is the evolution of clouds of white arsenic, so that the atmosphere round becomes poisonous. I have also filled shells with cyanogen gas, in combination with arsenic and with hydro-cyanic acid. By the explosion of such shells the surrounding air would be instantly impregnated with vapour of the most fearful poisons known. To the reader, it may appear difficult to conceive a collection of more formidable properties, or of a more fitting agent of destruction, were it not for the following drawbacks to its practical application, viz.:—1. The great difficulty and danger of preparing and stowing it. 2. Its efficiency would entirely depend on the shells bursting in confined places, where nere is little draught of air, as the diffusive properties would rapidly neutralise its useful effect. 3. t will not burn on water, being specifically heavier, having a density of 1·462. 4. In case of leakage it would be formidable, as well to friends as foes.

To obviate these difficulties, I substitute for kakodyle, coal tar naphtha, bisulphuret of carbon, and phosphorus, which can be had in any quantity, and applied without danger.

These shells on bursting ignite spontaneously, setting fire to everything combustible, and rendering the air pernicious to life. J. MACINTOSH.

April 6th.

THE METROPOLITAN BOARD OF WORKS.

GENTLEMEN,—Some months ago the rate-payers of London were greatly startled at the wonderful business-like movement, all in a moment, of the Board of Works announcing the names of several leading engineers to send in for their approval plans and models to raise all the sewage on the Lambeth side of the river. Well, of course one would have thought from such a flourish of trumpets the thing would have been done off hand;

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what do we find, however? Instead of that the Main Drainage Committee then appointed to carry out the works forthwith, are actually thrown overboard and the whole board substituted in its place. Now, gentlemen, if they would only do the work they ought to do as fast as they do and undo themselves, there would yet be hope; but as things proceed at present, if ever a reform was wanted in anything in this world it is in this body. If the parishes who send such refractory members would only advise them to stay at home, something might be done; positively it would be better for us all that such men were paid to lie in bed. Unfortunately I am a large rate-payer, and must pay whatever demand they make, but even then it would be a little consolation to see our representatives conducting themselves as sober men of business. I am, Gentlemen,

An Ill-used Rate-payer.

GUNNERY.

An esteemed correspondent sends us the following suggestive remarks:—"There are facts connected with this interesting subject which I think are very little known, and this is my excuse for troubling you with these observations. Doubling the weight of a gun, keeping the same diameter of bore and firing it with the same charge of powder as the one of half its weight, will give seventy five per cent less recoil, and a projectile force of about twenty-five per cent. more Not allowing any recoil with the same increased weight makes a still greater augmented effect. These advantages would be surely of great moment in the employment of guns for maritime purposes, and especially when breech-loading guns are used; as guns without recoil on a substantial breech-loading principle could be fired four times for once as compared with guns on the old principle; so that with half the number of guns employed, there would be no more weight on board, but immense increased operative effect would be produced.—J. M.

ASSOCIATION OF FOREMEN ENGINEERS.

At the meeting on Saturday, April 2nd, Mr. Joseph Newton in the chair, Mr. Theyte read a paper on the "Best Means of producing Heavy Castings in Iron." The subject was one which the great practical experience of the writer of the paper enabled him to deal with in the most lucid and satisfactory manner. He explained, in language divested of technicalities, the best methods of making patterns, moulds, and castings, whether for hydraulic rams, cylinders, or any other articles requiring strength and density. The paper was illustrated by diagrams carefully prepared, and was listened to throughout with much attention and interest. A vote of thanks was, at its conclusion, unanimously given to Mr. Theyte.

It was announced by the chairman that Mr. John Briggs would, at the ensuing May meeting, read a paper on the "Concussion of Water."

NORTH OF ENGLAND *v.* WELSH COAL.

The reports of Messrs. Miller and Taplin to the Board of Admiralty on the evaporative power and economic value of Hartley coal, and on the properties of Welsh steam coal, are now before us. From the average results obtained in their experiments, and from their general observations, they come to the following conclusions:—

First. That when the smoke from the north-country coal is consumed, its evaporative value is nearly equal to that of Welsh coal, while its rapidity of combustion is greater, and therefore that it is capable of generating a larger quantity of steam in a given time.

Second. That from the harder nature of the north-country coal, it is less liable to be broken up from motion than Welsh coal, and from the large heaps which had been exposed at the pits' mouths for nearly twelve months, which we saw at some of the collieries, without exhibiting any symptoms of falling into small particles, thereby showing that atmospheric changes had but little effect upon it; and therefore, for these reasons, it is better adapted for store or conveyance to distant parts of the world than Welsh coal, which from daily experience is found not only to be greatly reduced in size by motion, but to be reduced to dust when exposed to the changes of atmosphere in stores, &c. These comparisons are only made upon the supposition that the smoke from north-country coal may be reduced to the same minimum as that which may arise from Welsh coal, or be entirely prevented by Mr. Williams' or some effective apparatus for this purpose.

Third. That it is possible to consume the smoke arising from north-country coal by the use of Mr. Williams' apparatus, and by the modification of it as introduced by the association to some of the collieries in this part of the country and elsewhere.

Messrs. Miller and Taplin are, we may state, assistants to the Chief Engineers and Inspectors of Steam Machinery in Portsmouth and Woolwich Dockyards respectively.

CAPTAIN KYNASTON'S LIFE-BOAT HOOKS.

Captain Tarleton, C.B., of H.M.S "Euryalus," in a letter from Alexandria, states that a seaman of that ship owes his life to the "Patent Slip-hooks." The day before the frigate arrived at Alexandria, when running eight knots, with studding-sails set, a seaman fell overboard. While the ship was in the act of rounding-to, and still held her way, Captain Tarleton ordered one of his quarter-boats (a 28 feet cutter), which was fitted with the "patent hooks," to be at once lowered with her crew. Although the boat happened to be the weather boat, and therefore most exposed to the wind and sea, Captain Tarleton adds, she was admirably disconnected, and the man picked up. The Pacha of Egypt had expressed his desire to see the working of the "hooks" on board his yacht when the weather moderated.

Law Case.

NORTHERN CIRCUIT.—LIVERPOOL, April 2, 1859.

Before Mr. Justice Byles and a Special Jury.

MACNEE AND OTHERS *v.* NIMMO.

Mr. Monk, Q.C., Mr. Hindmarch, and Mr. Ovens appeared for the plaintiffs; Mr. James Wilde, Q.C., Mr. Manisty, Q.C., and Mr. Ffooks for the defendant.

This was an action directed by the Lords Justices to try whether certain printed cotton fabric called "zebras," were an infrigement of the plaintiffs' patent. It appeared that there was an original fabric woven with coloured threads called "zebras," and that the plaintiffs, in order to imitate them, had invented a species of fabric woven with uncoloured threads, which were afterwards printed, and to make the resemblance nearer, there were in the plaintiffs' goods certain loose or "flushed" threads purposely woven at the back bearing an appearance very similar to the original zebras. These goods were the subject of the plaintiffs' patent. The defendant's goods were similar in some respects to the plaintiffs'. The difference, it was contended, existed in there being a pattern or raised figure woven on the face of them and the threads at the back, though loose or "flushed," as the plaintiffs' were, being also like the face woven into a pattern; the flushing being only so much as was necessary to produce that pattern. For these goods the defendant had taken out a patent; the question was whether the goods were substantially similar to the plaintiffs.

The trial lasted for some hours, and ended in a verdict for the defendant.

THE ARMSTRONG GUN.

In one part of the *Morning Post* we read that at Woolwich—"Sir W. Armstrong's gun, after a succession of trials, has been removed from the garrison to the Royal Arsenal, where it has been carefully stored, with strict orders that no person, whether connected with the establishment or otherwise, shall be allowed to view it without a special order for that purpose." In another we are told that "Discoveries in these days gravitate to the best market. Months ago, the whole secret of the Armstrong gun was sold by two malcontents to the governments of France and Austria." Moreover, a minute description of the Armstrong gun, a few weeks ago, went the round of the papers. Does not the Royal Arsenal at Woolwich resemble a stable, and is not the secret of the Armstrong gun like a horse, and the precaution of preventing any unauthorised person from viewing that invention, very much like the providence of closing the entrance of the quadruped's abode, at a period subsequent to the felonious abduction of the noble animal?—*Punch.*

FRENCH PATENT LAW.

A Paris correspondent, under date 30th March, writes:—The Corps Législatif is busy with the new patent law which has been so long anxiously looked for. The Bill under consideration includes many important amendments of the law of 1844, but retains some of its vexatious provisions; *e.g.*, the clause forbidding the importation of articles patented in France, except when the minister of public works shall grant a permit for the introduction of models of *machines*, and articles manufactured abroad and destined for public exhibitions or trials authorised by government. This article is now stringently enforced, the importation of all models except of machines being strictly prohibited—a serious obstacle to the working of patents for foreign inventions, the sale of which would be greatly facilitated by the patentees being allowed to exhibit their inventions in a complete form. Power is to be given to the government to regulate by an imperial decree the conditions of keeping inventions secret, and of "expropriation" for public purposes, the mode of publishing specifications and registering transfers, the attributions of a committee of consultation on questions relating to patents, &c., which includes the object proposed to be attained by the Bill now before Parliament. Meanwhile the Société d'Encouragement has published a specification in imitation of those issued by the English Commissioners, with the view of urging the government here to adopt a similar plan. A paper read by M. Laboulaye points out the utter uselessness of the present mode of publication:—"At long intervals, two or three years after the time when the patents might be published, appears a ponderous and costly quarto, containing a multitude of patents more or less mutilated (sometimes the only indication is, such an invention *is described in the patent*), without any order, and on all sorts of subjects—any one interested in one or two questions who might wish to consult five or six patents, naturally refrains from losing his time in searching through these volumes, and avoids purchasing them, thus this costly publication is in reality almost completely to no purpose. It has now become customary when any one wants to examine an important patent, which has as such been protected in England, to send for a copy of the English specification, which costs 1s. and two penny stamps; such is now the simplest means of examining a *French* patent."

BONELLI'S ELECTRIC LAW.

At the meeting of the 7th ult. of the Académie des Sciences, M. de Senazcourt informed the members that M. Froment has completed important improvements in the electric loom invented by Chevalier Bonelli, director of the Sardinian telegraph, which figured at the Paris Exhibition of 1855, and a commission was named to examine it and make a report to the Academy. M. Chevreuil stated that he had been to see it at work, accompanied by the President of the Chamber of Commerce and other gentlemen, and had been astonished at the results obtained. The invention consists chiefly in replacing the Jacquard cards by a thin sheet of tin on which the design to be reproduced on the fabric is figured with varnish or isolating ink The beat up of the batten brings a metallic comb formed of small separate teeth into contact with the design, when some of the teeth touch the varnish of the design, and others touch the metal; and those teeth in contact with the metal alone give passage to the electric fluid supplied by a Bunsen pile, and convey it to the small electro-magnets with which they are connected by means of a thin copper wire. These electro-magnets act upon an equal number of small iron rods to keep them out of the way of the wires of Jacquard, while those teeth which come in contact with the varnish of the pattern are allowed to project against the wires of the Jacquard, to act upon them in the same manner as the cards now used. As a proof of the case with which new patterns can be applied, when the Emperor and Empress were lately visiting the *Ateliers* to inspect the loom, M. Froment, without interrupting the work, replaced the design in course of execution by a band of tin, on which he had written the words Napoleon III., which were seen to follow on the fabric, the flowers composing the first design.

A very cheap and simple apparatus for showing the phenomena of polarized light has recently been arranged by Mr. Bestall, of 82 Brook-street, Kennington-road, Lambeth; the chief merit and novelty consisting in the facilities thus afforded to young people and persons in the humbler ranks of life, for familiarizing themselves with the operation of scientific laws, from the study of which they have hitherto been debarred by the high price of the philosophical instrument manufactured for the purpose.

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NOTICES.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

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Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

THE demand for Mr. E. J. REED'S paper—

ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY, IN RESPECT OF DIMENSIONS, FORM, MEANS OF PROPULSION, AND POWER OF ATTACK AND DEFENCE,"

has been so great that the Journal of the Society of Arts, the MECHANICS' MAGAZINE, and all other Scientific Journals in which it appeared in December last, are now out of print. The demand still continuing, it has been deemed desirable to reprint it in a separate form. An 8vo. edition of it, in large type, and on fine paper, has, therefore, been prepared, and may now be had at the Office of this Magazine, price 1s.

CORRESPONDENT'S QUERY.

GENTLEMEN,—Could any of your numerous scientific readers inform me of any rule by which to find the amount of stability of cast-iron pipes to resist compression.

I am, yours,

March, 28, 1859. A SUBSCRIBER FOR YEARS PAST.

Our Weekly Gossip.

The Government Bill for granting patents for inventions in India, which passed the Legislative Council in July last, has received the Royal assent. The Bill in its original form was published in full in the MECHANICS' MAGAZINE for July 19, 1858; but it has since been somewhat altered in Committee. The complete measure, in its amended form, shall be published on an early occasion in our columns.

The Council of the Society of Arts have arranged for two Conversazioni during the present Session; the first, on Saturday, the 7th May, at the Society's house, the card for which will admit the Member only; the second, on Saturday, the 28th May, at the South Kensington Museum, the card for which will admit the member and two ladies, or one gentleman.

The Council of the Society of Arts have received numerous offers of support towards establishing the proposed Exhibition of 1861 upon a much more popular and extended basis than on the last occasion (1851)—sufficient to enable them to undertake, with confidence, the task of finding four-fifths of what they consider the necessary guarantee. If Her Majesty's Commissioners of 1851 will sign for £50,000, out of £250,000, and allow it to be announced that, provided this guarantee is completed by a given day, they will hold the Exhibition of 1861 on their own ground at South Kensington, the Council of the Society of Arts could be prepared to take upon itself the labour and responsibility of completing the necessary sum. "With railway facilities increased fifty per cent.; with a population not only much changed and much advanced, but increased twenty per cent., and with the consequent increase of capital to that extent, there cannot," the Council consider, "be any doubt that, with a little timely energy and co-operation, the proposed Exhibition of 1861 will become a great and splendid success."

The official reports of two highly interesting and instructive papers read this session at the Royal Institution are now before us. The first is on the newly-discovered ape, the gorilla, by Professor Owen; the second is on some grounds of dissatisfaction with modern gothic architecture, by Mr. E. B. Denison. The latter lecture has been written since its delivery from the notes used on the occasion, and is of much greater length than the usual abstracts of the Institution. It is in Mr. Denison's best—and therefore not his usual—style, and will well repay perusal.

Mr. T. E. Hignett has exhibited to the members of the Liverpool Polytechnic Society, a model of a raft to be used in case of shipwreck as a means of transport in shallow waters. It is the invention of Captain Burnett, and consists of rows of casks laid end to end, each row being secured between four spars running longitudinally, and fastened by ropes, the different sections being afterwards joined together by additional lashings, according to the size of raft which may be required, or that the materials may suffice to make.

A limited liability company is proposed for the erection of blast furnaces at Seaham Harbour. It is proposed to erect the furnaces to the south of the town, and the site for the works will consist of about 12 acres. Two furnaces are to be erected in the first instance, and two others are to follow if possible. The capital contemplated is £40,000.

The use of the Leeds Town-hall has been granted for the approaching meeting, in that town, of the Institution of Mechanical Engineers. There are to be three meetings and an evening conversazione.

M. Lauro Cecconi, a band-master residing in England, has just patented a method of constructing cornets, trumpets, horns, &c., with six pistons or cylinders for producing the tones and semi-tones, and for improving the intonation. These pistons or cylinders are so arranged that sliding tubes and crooks are dispensed with. He also employs various forms of simplified mechanism for operating the valves which regulate the notes in order that a simpler and lighter action may be obtained. His improvements have, we are informed, given to piston-instruments new and extraordinary powers of expression. Mr. Carte, the military musical instrument maker of Charing Cross, is manufacturing the new instruments, we believe.

Mr. J. H. Lindsey, of Grocers-hall-court, has introduced a method of applying loose plates to the covers of books for fixing the binding, and allowing one binding to be used for a series of books when required. The improvement will be valuable for some purposes.

As a curiosity for non-mathematical readers we give the following title of a paper read at the Manchester Philosophical Society by the Rev. T. P. Kirkman, M.A., F.R.S., viz., "On the *j*-nodal *k*-partitions of the *r*-gon."

An improvement in the method of producing copies of busts, statues, groups, and round ornaments by the galvanoplastic process has just been made public. The principle of the invention is the use of conductors so arranged as to spread the electrical current over a large surface. The modes of applying differ according to circumstances. One plan is as follows:—A piece of copper, or of charcoal, is made to represent in miniature the form in outline of the object to be reproduced; this miniature conductor is attached to the negative pole, and then introduced into the interior of the mould, which, of course, is in connection with the same pole; the whole is then plunged together in the bath. The metal is conducted by the various points of this miniature-conductor towards all the various hollows which correspond with its prominences. This, however, was but a rude form of the methods adopted. The inventor, M. Lenoir, afterwards substituted for the miniature above described, a light frame or mass formed of metallic wire or of any other conducting material, which he introduced in the same manner into the hollow of the mould: by this means he obtained a large number of conductors, which approached every portion of the interior of the mould, and formed what he calls a mass of nerves for conducting the electricity into the most intricate portions of the hollow mould. These wires also render the decomposition of the solution unusually active—so much so that the gas liberated rises constantly to the surface in large beads. The deposit, however, is made with perfect regularity and uniformity.

The *Mariposa Gazette* (California) gives an account of a new separator in use at Bear Alley, the property of Col. Fremont. This machine is described as working about a ton of mineral per hour, separating from it the whole of the gold free of mercury, sulphur, and the sulphurets. The quartz is reduced to a fine dry powder between stones, and in this condition is thrown upon a metal gauze, beneath which a strong current of air is created by means of bellows. The current is regulated so as to permit the descent of the gold, and to stop all the atoms of less specific gravity, which are immediately ejected so as not to encumber the action of the separator. Mr. Gilbert, the inventor, believes that the effect of air as a separating fluid is much superior to water, as the latter carries off some of the finely-divided gold. The reduction of the quartz and the separation of the gold without water or mercury is, we need hardly state, a great desideratum, and we shall be curious to see a machine separating the gold from its earthy companions by the same means that are used to separate corn and other grains from their accompanying impurities.

An interesting paper on the plans adopted for working and ventilating collieries in the Newcastle district, by Mr. Alexander Ross, of Gateshead, has been read before the Bristol School of Mines. Mr. Ross stated that two distinct shafts are now generally employed. In collieries of moderate extent, the downcast pit only is used for winding coals, but in more extensive works both shafts are used for this purpose. The shafts are generally placed in the centre of the estate to be worked, as this gives the largest area of coal which can be worked by one pair of shafts. The "pillar-and-stall" system of working coal is generally pursued. The size of the pillars of coal left in the ordinary workings is determined by the depth of the seam from the surface, the nature and texture of the coal, and the condition of the floor and roof, &c. At a depth of 60 fathoms from the surface, the ordinary pillars may be made 30 yards by 12; at a depth of 180 fathoms, 30 yards by 16 or 18; or in extreme cases, as the Monkwearmouth and Seaton collieries, where the seams are at a depth of 250 or 300 fathoms from the surface, 60 by 40 or 60 by 60. The paper, after entering into other details, added that furnace ventilation is nearly universal.

The Council of the "Bath and West of England Society for the Encouragement of Agriculture, Arts, Manufactures, and Commerce," (of which Society the Prince Consort has lately become a member,) taking courage from their prosperous condition, and the increased demand in the West of England for education and scientific instruction, have opened a new department of "Arts and Manufactures," for exhibition and sale. A special fund has been raised for a moveable building, to be used next year at Dorchester; a plan has been furnished by Mr. Nicholson, Agricultural Engineer, of Newark; and important local support has been obtained. Encouraging promises of articles for exhibition and sale have been received from London, the Midlands, and the North of England. The arrangements appear to be quite satisfactory to exhibitors. Pottery, glass, metal-work, wood-work, and textile fabrics will be there in attractive forms. It is said there will be a goodly show of water-colour drawings and sketches by West of England artists, and, in addition, a collection including works of Turner and others. The exhibition will open on the 30th May, and last for the week; unfortunately it is the week of the Derby. The entries close on the 16th April. The Committee of Council on Education have made a special exception in favour of this society, in order to allow the selection of decorative works of art from South Kensington Museum to be exhibited at the North Devon meeting, at Barnstaple—a meeting having for its object the promotion of the above-mentioned exhibition.

We are accustomed in this age to the utilization of much that was formerly considered waste material, but we scarcely expected to find any one patenting a process for the utilization of the metallic constituents of grindstone sand, or the detritus of the stones employed in grinding iron and steel manufactures. This, however, has been done. These sands, which are said to contain on an average from fifty to seventy per cent. of iron, steel, or a mixture of both, according to the source from which they are procured, are first freed from their earthy matter and oxides by washing, or by any known voltaic or magnetical separating process. The product of this operation, which consists entirely of finely-divided metal, is submitted to pressure in masses of convenient dimensions, which are afterwards dried. In this state the compressed metal is passed to the furnace, and heated till slightly softened, when the cohesion of the particles is completed by hammering in ingot moulds. These ingots are then returned to the furnace in superposed layers, according to the form and dimensions of the bars required, and are finely welded and hammered for use.

At the ordinary meeting of the Manchester Literary and Philosophical Society Mr. Binney made the following statement:—"In the public prints, frequent allusions are made to micro-photography. In the *Manchester Guardian* of the 11th March instant, is the following paragraph: 'Photographic Curiosities.—M. Amadio of Throgmorton-street, whose portrait of Charles Dickens no larger than a pin's point was lately noticed, has produced by photography a view of Westminster-bridge, the Houses of Parliament, and Westminster Abbey within a space not larger than the eye of a worsted needle. The same gentleman has published a portrait of a youth which is only just larger than a needle's point, but when magnified is as perfect as any conceivable likeness.' No doubt most of the members of this society have seen the beautiful specimens of micro-photographic art produced by one of our fellow-members, Mr. J. B. Dancer, F.R.A.S., during the last five years. So early as the year 1840 Mr. Dancer began his investigations on the subject, and soon produced satisfactory results on silver plates. In may, 1853, when Dr. Joule, F.R.S., and some other friends erected a tablet to the memory of our late distinguished member, Mr. William Sturgeon, the electrician, Mr. Dancer was so kind as to present me with a photograph of the tablet not larger than a pin's head. His discovery was not allowed to rest, for hundreds

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of his beautiful specimens were sent all over the world. Within the last year or two several parties have coolly claimed Mr. Dancer's discovery, and when it is represented in a local print as something wonderful in M. Amadio having produced what Mr. Dancer did six years ago, it is only due to our fellow-member and townsman to set the public right as to who was the discoverer of micro-photography."

What has the MECHANICS' MAGAZINE to do with morality?—asked a certain gentleman a week or two since, when we happened, in mentioning an improved make of steel for crinoline, to put in a word against the abuses of that material. And we doubt not that when the present lines are read, some will wonder what we have to do with poetry. Well, we cannot avoid such questionings. No professional editors in existence adhere—we are prepared to contend—more closely than we to professional topics, and we do not intend departing from our custom in this respect. But surely we may, without offence, claim a little license—just sufficient to enable us to give a word of recognition now and then to such matters of morality, and even of poetry, as mere mechanism may bring directly under our eye. At any rate, in the exercise of that literary despotism which is the blessed prerogative of editors, we will do it, defying consequences. Why should we not? Here, for example, has fallen into our hands, by a strangely circuitous channel, a number of poems—or, to speak correctly, of verses—in honour of Sir William Armstrong, his excellent lady, and his wonderful gun,—all written by his workpeople. Why should we not give to these bards a word or two of favour, and to their songs a wider publicity than handbills and local journals can bestow upon them? We do not get an Armstrong gun every day. Of course we can only give a verse or two from each. These productions are four in number, and although they certainly embody far more feeling than fancy, they are not without a certain kind of merit. Two of them were sung by their authors at a feast given by Sir William and his partners, in the Elswick Works, Newcastle, to their workpeople. Of these, the first is by W. Ross, a fitter, and is entitled "The Armstrong Gun." The chorus of this meritorious piece is:—

> The Armstrong gun, the Armstrong gun—
> What a wonderful thing is the Armstrong gun;
> Sir William's invention astonish'd them a',
> Wi' his bolt for a shot instead o' a ba'.

This poet is mainly descriptive, and writes not a little in detail. Witness the following verses:—

> For to see our lish smiths in the smiddy sae thrang,
> Wi' their dark shinin' faces and good arms sae strang;
> Roun' the fire's glowin' heat how they bus'l and run,
> Weldin', hammerin', constructin' the new rifle gun.
>
> Our turners sae skilled, wi' lathes, silver clear,
> Revolvin', and turnin', wi' straps and their gear;
> The guns from their hands receive form and shape,
> The grooves are all cut—complete in their make.
>
> Nae spungin' or rammin' or servin' the vent—
> Sic things are no needed to serve its intent;
> In a neat little chamber, breach end o' the bore,
> Place the powder and shot, and awa' let it roar.
>
> Then there's fusees they're ca'd—sic wonders I tell—
> They 'splode the bolt shells when it pleases themsel';
> It's short range or lang range, it's a' the same thing,
> Just set them—they're true to the secret spring.
>
> The gunboats hae now lost their glory and pride,
> For our gun sends its bolts slap bang through their side;
> Neither iron nor oak can resist it ava,
> When it vomits them forth from its terrible jaw.

The next piece is by Mr. J. Sutherland, and is entitled "Sir W. G. Armstrong's Rifled Gun: a Terror to the World." The chorus is:—

> So success to Sir William, and long may he thrive;
> May his days be as glad as the bee in his hive.
> With his greatness of mind, he's had the patience of Job;
> He's now made a gun that can conquer the globe.

This bard is less descriptive than the other, confining his account of the gun's construction to the four following lines, which are, every line of them, perfectly correct—which poetry is *not* at all times:—

> This gun is a queer'un, it loads at the breech,
> They put a shell in, gives the screw a bit twitch;
> Then slap throo the groove away agoes the shell,
> What damage it dis there's ne man can tell.

He continues:—

> To improve his inventions he never will cease—
> This gun of Sir William's is sure to keep peace;
> It's an honour to Newcastle, the laurels he's won—
> With his hydraulic cranes and his wonderful gun.
>
> Some of the Admirals said the gun wadent de;
> It might de for land, but it wadent for sea.
> So they tried the gun with a bonny steel shell,
> Upon their strong battery—man, hoo it did tell!
> It went through the iron, the beam and the deck;
> It myed their great battery nowt but a wreck.
> And noo that aw've very near finished maw song,
> Here's a health to Sir William and Lady Armstrong.

But these authors, it will be observed, indulge in the very imaginative statement that the new gun has sent its projectile through the iron-plated batteries. We can pardon them that flight of fancy. The next effusion (signed "R. Sced,") is of a more military tone and spirit, and, to the tune of the "British Grenadiers' March," sings the praises of "Our Elswick Engineer":—

> Some talk of Colin Campbell and some of Pellisier,
> Of Raglan and Canrobert, and some of old Napier;
> But of all those valiant heroes there's none that can compare
> With the great Sir William Armstrong, our Elswick Engineer.
>
> What now are Minié Rifles, or the great Lancaster Gun,
> They sink to children's trifles, before the great A 1;
> Of all the warlike weapons that ever did appear,
> The strongest arm's by Armstrong, our Elswick Engineer.
>
> No more we'll skulk in trenches, or hide behind stone walls,
> But from the open plain, boys, beyond the reach of balls,
> We'll show'r destruction on our foes in distance far or near.
> Each shot and shell its tale will tell of our Elswick Engineer.
>
> In vain they fight, in vain they fly, nor need we them pursue,
> But keep them within range by the turning of a screw;
> On decks o'war our British Tars, will sweep the ocean clear,
> In freedom's cause, with loud hurrahs, for our Elswick Engineer.

The last of these productions of art is by Mr. Joseph Wilson, and is in honour of "Armstrong, the Pride of the North." We can only afford space for two verses from this, the most ambitious piece of all:—

> Hurrah for the pride of the North!
> Who's name hath appeared like a star
> Displaying its light o'er the earth,
> In glorious might from afar;
> Let us call him the pride
> Of the bright coaly tide,
> For through him, we may now defy war.
>
> Well may old England extol
> The eminent men it contains,
> To its list we another enrol,
> And to him we direct our strains;
> Let us then rejoice,
> And in praise raise our voice,
> To Armstrong, and wide be his fame.

We will only add to these poetic outbursts one sentence from a speech made at the feast by Mr. Rowell, Sir William's foreman of smiths. His observation may seem prosaic, but it was doubtless very earnestly made. He said, "They had met to celebrate the top-stone of Sir William's greatness; they had that evening surrounded the festive board at Sir William's own expense."

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated December 16, 1858.

2880. R. Wilson and R. Wilson, jun., of Manchester. Certain improvements in the preparation of leather in combination with india-rubber and other materials, for the manufacturing of hose pipes and other purposes where leather is required to be impervious to water, steam, or frost.

Dated February 19, 1859.

460. T. Earle, of Clapham, Contractor. Improved apparatus for conveying signals to railway trains in motion.

462. W. Basford, of Burslem, Brick Manufacturer. Improvements in the method of, and means for, drying bricks and tiles preparatory to their being burnt, and also in the construction of kilns or ovens for burning such bricks, tiles, pipes, pottery, or earthenware, and in the mode of charging or placing these said articles therein to be burnt or fired, and also in certain appliances for regulating the heat therein.

Dated February 25, 1859.

516. G. Peover, of Wilmington-sq., Mathematical Instrument Maker. An improved optical instrument, being an improvement upon the kaleidoscope.

Dated March 8, 1859.

600. J. King, of Moss Mill, near Rochdale, Cotton Spinner, and A. Wilcock, of the same place, Mechanic. Improvements in certain parts of machines used in preparing, spinning, and doubling cotton and other fibrous materials.

602. W. Halliday, of Wakefield, Gentleman. Improvements in apparatus for preventing smoke and economising fuel.

604. C. Mills, of Camden Town. Improvements in the action of pianofortes.

606. E. Deane, of Arthur-st., London Bridge, Gas Engineer. Improvements in apparatus for the transmission of gas and other fluids.

608. B. M. Belling, of Bayswater, Dentist. Improved apparatus for hardening india-rubber for the bases of teeth.

Dated March 9, 1859.

610. J. A. Williams, of Baydon, Wilts, Farmer. Improvements in machinery or apparatus for cultivating land by steam power.

612. J. R. Nicholson, of Redditch, Doctor of Medicine. New or improved machinery to be used in the manufacture of needles, a part or parts of which said machinery may also be used for pointing pins and other like articles.

614. G. C. Pearce, of Cyfarthfa, Glamorgan, Engineer. An improvement in cornets, trumpets, trombones, and other like wind instruments.

618. W. E. Newton, of Chancery-lane. Improvements in billiard tables. A communication from A. Bassford, of New York.

Dated March 10, 1859.

620. J. C. Martin, of Barnes, Naval Architect. An improvement in the manufacture of cannon and small fire-arms, and of projectiles to be used with the same.

622. R. F. Woodward, of Birmingham, Manufacturer. An improvement or improvements in the manufacture of certain kinds of scale beams and fittings used therewith.

Dated March 11, 1859.

624. J. H. Burton, of Enfield Lock. An improvement in breech loading fire-arms.

630. A. V. Newton, of Chancery-lane. An improved construction of steam-engine, applicable also to the raising of water. A communication from S. Hube.

Dated March 12, 1859.

632. W. E, Newton, of Chancery-lane. An improvement in endless chain propellers for boats and other vessels. A communication from A. Wolcott, of New York.

638. R. Allison, of Birmingham, Engineer. Improvements in apparatuses for boring and sinking.

Dated March 14, 1859.

640. R. Waller, of Baker-st., Portman-sq., Gentleman. Improvements in joining leather, flexible and textile materials, for the production of boots and shoes, and articles of the like description, and harness, strapping, bags, sails, tent-covers, portmanteaus, and such other articles, together with machinery and apparatus for that purpose.

642. A. Tylor, of Warwick-lane, Newgate-st. Improvements in apparatus for regulating the supply of water to water-closets and other vessels.

644. D. Joy, of Leeds, Engineer. Improvements in hydraulic engines and meters.

646. E. Smith, of Dudley-port, Stafford, Agent. Improvements in treating or preparing furnaces used in the manufacture of iron.

648. J. S. Dawes, of Smethwick, near Birmingham, Gentleman. A new or improved method, or combination of arrangements for the better securing and collecting of night-soil or town manure, and rendering it more valuable for agricultural purposes.

Dated March 15, 1859.

650. C. Desurmont, of Seclin, France, Gentleman, and C. Goudeau, of Alost, Belgium, Mechanical Engineer. Certain improvements in looms for weaving.

652. C. Ritchie, of the Strand, Engineer. Improvements in calculating machines.

654. B. Rider, of Red Cross-st., Boro', Leather Dresser. Improvements in hats, caps, and other coverings for the head, and in the apparatus used in the manufacture of such articles.

Dated March 16, 1859.

655. J. Dixon and R. Clayton, of Bradford, Engineers. Improvements in rolling iron and steel for manufacturing railway wheels and for other purposes.

657. W. Robertson, of Dundee, and J. G. Orchar, of the same place, Engineers. Improvements in weaving.

659. J. Parker, of Camberwell, Solicitor's Clerk. Improvements in lever-sails, and in submerged feathering-propellers.

661. F. Mordan, of Goswell-road, Manufacturer. A means of keeping a stopper connected with a bottle, jar, or such like receptacle when removed from the mouth thereof.

663. J. Fuller, of Reading, Turner. Improvements in churns.

665. J. Michel-Denys, of Charleroi, Belgium, Gentleman. Certain improvements in the construction of railway crossings.

669. G. Hamilton, of St. Martin's-le-Grand, and W. H. Nash, of Poplar, Engineer. Improvements in tumbler or lever locks, and in keys for such and other locks.

671. T. W. Miller, of H.M. Dockyard, Portsmouth. Improvements in blocking or securing ships and other vessels whilst being removed, examined, or repaired.

Dated March 17, 1859.

673. C. Garnett, of Cleckheaton, York, Machine Maker. Improvements in machinery for ginning cotton, and for cleaning cotton and certain other fibrous materials.

675. E. T. Hughes, of Chancery-lane. Improvements in machinery or apparatus for crushing sugar-canes and other materials. A communication from S. Thérèse.

677. T. Skelton, of Plaistow, Draughtsman. Improvements in steering apparatus.

679. P. Larochette, aîné, of Paris. Improvements in machinery for brewing.

681. A. Warner, of Threadneedle-street., and W. H. Tooth, of Southwark. Improvements in the manufacture of iron.

Dated March 18, 1859.

683. W. Cook, of Hull, Coppersmith. A smoke consumer.

685. Sir W. G. Armstrong, Knight, of Newcastle-on-Tyne, Civil Engineer. Improvements in the means of igniting explosive projectiles.

687. J. Molesworth, of Rochdale, Gentleman. An improvement in telegraphic communication. A communication from F. N. Gisborne and F. O. J. Smith.

689. J. Hinks and G. Wells, of Birmingham, Manufacturers. A new or improved pen-holder.

691. R. Mushet, of Coleford, Metallurgist. An improvement in the manufacture of cast steel.

693. C. Lambert, of Sunk Island, York, Farmer. Improvements in corn and seed drills.

Dated March 19, 1859.

695. T. Allen, of Waingate, Sheffield, Clothier. Improvements in petticoats.

697. E. L. Benzon, of Sheffield, Steel Manufacturer. An improvement in the casting of steel. A communication from E. Riepe, of Pau, France.

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699. H. Whitaker, of Newman-st. A new musical instrument, to be called "The Cherubine Minor."
701. W. Haigh, of Reddish, Paper Maker. An improved manufacture of paper, to be employed for the purpose of packing and other similar uses.
703. R. Mushet, of Coleford, Metallurgist. An improvement or improvements in the manufacture of cast steel.
705. A. V. Newton, of Chancery-lane. Improvements in propelling vessels. A communication from T. W. Phinney.

Dated March 21, 1859.

707. W. Haggett, of Sherborne, Dorset, Architect. An improved method of treating metals and other materials to increase their strength.
709. W. Hudson, of Burnley, Meahinist, and C. Catlow, of the same place, Overlooker. Certain improvements in looms for weaving.
711. G. Ferguson, of the Strand, Naturalist. The combination and application of certain materials for the destruction of insects and vermin.
713. S. Leoni, of St. Paul-st., Manufacturer. Improvements in the manufacture of useful and ornamental articles, surfaces, and works, parts of articles and parts of machinery or apparatus, from talc and other silicates of magnesia, and from the same combined with other substances.
715. G. Gregg, of Sheffield, Currier. Improvements in currying or manufacturing leather.
717. W. Rhodes, of Bradford, Whitesmith. Certain improvements in fire-proof safes.

Dated March 22, 1859.

719. J. Davis, of Frith-st., Soho, Professor of Music. Improvements in musical instruments.
721. W. A. Gilbee, of South-st., Finsbury. An improved apparatus for stretching and polishing silk thread. A communication from Lyonnet and Prenat.
723. F. Ashford, of Commercial-road-east. Improved means of fastening and securing treasure or bullion cases.
725. E. Maynard, of Washington. Improving breech-loading fire-arms.
729. Sir P. Fairbairn, of Leeds, Knight, and R. Newton, of Leeds, Commercial Traveller. Straightening and separating the fibres of silk waste, and laying them in parallel lengths preparatory to combing or dressing.
731. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in fire-arms and ordnance, and in projectiles and apparatuses to be employed therewith. A communication from C. Rochaz, of Paris.
733. A. Watkins, Brush Manufacturer, of Greek-st., Soho. Improvements in the manufacture of brushes.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

780. W. Mossman, of Pentonville, Stationer. Improvements in machinery applied to embossing or cutting presses, for the better and more expeditious manner of manufacturing ornamental cut out and embossed work, in paper, leather, parchment, cloth, foil, and other material. Dated March 29, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, April* 5, 1859.)

2678. F. H. Maberly. Candlesticks.
2680. F. Loss. Gas regulators.
2696. J. Ramsbottom. Water meters, &c.
2702. G. B. Sander. Jugs.
2704. S. Diggle. Weaving.
2706. L. A. Possoz. Alkalies.
2712. G. Hadfield. Carboys, barrels, &c.
2716. W. A. Henry. Boots and shoes.
2723. D. Evans and G. Jones. Pumps and water guages.
2729. J. Thow and T. M. Hall. Furnaces.
2731. G. Boccius. Furnaces.
2742. J. Samuel and J. Nicholson. Steam-engines.
2743. E. Viney. Portmanteaus, desks, &c.
2752. J. Lewis. Attaching sails to the yards.
2758. J. Tyssen. Motive power.
2770. H. Beven. Effecting arithmetical operations.
2773. L. W. Fletcher. Telegraph cables.
2779. J. B. A. Monnier. Railway brakes.
2790. J. and F. Muir. Colour printing.
2795. F. W. Fletcher. Bolts.
2830. E. L. Pensuete. Driving piles.
2874. C. F. Vasserot. Marine engines. A communication.
18. I. Wood. Corks. A communication.
86. R. and W. Hawthorn. Promoting combustion and preventing smoke.
284. R. Needham. Water-guage.
289. R. A. Brooman. Sewing machines. A communication.
446. T. Cattell. Treating gutta percha.
491. W. Ashton. Gas regulators.
546. J. T. Carter. Preparing fibrous materials.
577. C. R. Mead. Water gas meters.
592. W. Palmer. Carriage break and coupling.
613. J. Erwood and J. Skertchly. Glass, sand, and emery papers.
615. J. S. Russell. Building ships.
630. A. V. Newton. Steam-engine. A communication.
639. J. Macnab. Telegraphing apparatus.
642. A. Tylor. Regulating supply of water.
705. A. V. Newton. Propelling. A communication.
729. Sir P. Fairbairn and R. Newton. Silk waste.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed April 1, 1859.

2194. W. Brierley, sen.
2198. J. C. & E. W. Holman.
2206. J. Mills.
2207. A. Bessemer.
2209. W. Menelaus.
2211. J. H. Brown.
2213. J. H. Brown.
2219. G. Collier.
2223. W. Malam.
2225. C. Baylis.
2230. D. Naylor.
2248. A. E. Galliard.
2251. L. Hope.
2292. W. Clark.
2296. T. Archer, jun.
2303. T. Moore.
2307. G. F. Wilson.
2364. R. Kennedy and J. Armstrong.
2372. W. E. Newton.
2376. J. J. Welch and J. S. Margetson.
2386. S. R. Parkhurst.
2406. A. Heywood.
2409. W. Munro.
2436. W. Palmer.
2439. M. A. F. Mennons.
2879. W. Morgan.
2987. T. Bell.
68. E. Cobbold.
147. W. Newman.
219. H. Rawson.
250. J. Buckingham and G. Salt.
302. J. Buncher.
326. P. Adie.
352. E. Bagnicki.

Sealed April 5, 1859.

2137. A. F. Jarloureau.
2212. G. Hamilton and W. H. Nash
2217. J. Luis.
2226. D. Nicoll.
2229. J. C. Nouveau.
2234. J. Luis.
2243. C. W. Lancaster.
2252. W. Crofts.
2301. W. Bacon.
2337. R. A. Brooman.
2398. T. Almond.
333. R. Tinkler.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

770. B. Looker, jun.
786. J. Gray.
801. J. Samuel and J. Nicholson.
818. C. W. Ramié.
820. J. G. Martien.
827. J. Bernard.
833. F. G. Underhay.
838. E. Leigh.
902. W. Fuller.
908. A. V. Newton.
915. H. Y. D. Scott.
923. W. Tytherleigh.
989. F. W. Blacket.
1024. J. Rigby.

LIST OF SPECIFICATIONS, &c.

Published during the week ending April 1, 1859.

No.	Pr.	No.	Pr.	No.	Pr.	No	Pr.	No.	Pr.	No.	Pr.
	s d		s d		s d		s d		s d		s d
1925	0 3	1943	0 5	1955	0 7	1965	0 6	1974	0 3	1983	0 3
1927	0 8	1945	0 8	1956	0 5	1966	0 7	1976	0 10	1986	0 3
1931	0 7	1947	0 3	1957	0 3	1967	0 5	1977	0 6	1987	0 6
1932	0 3	1948	0 10	1958	0 7	1968	0 3	1978	0 5	2004	0 3
1935	0 7	1949	1 0	1959	0 3	1969	0 7	1979	0 3	2016	0 9
1937	0 3	1951	1 5	1960	0 7	1970	0 7	1980	0 9	...	...
1938	0 6	1953	0 3	1963	0 7	1971	0 6	1981	0 3	...	...
1941	0 6	1954	0 6	1964	0 5	1972	0 5	1982	0 3	...	...

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINES, &c., 1849, 1890.
BOILERS AND THEIR FURNACES, 1903.
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1849, 1869, 1892, 1894, 1902.
SHIPS AND BOATS, including their fittings, 1881, 1913, 1918.
CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 1817.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals. *None.*
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1850, 1851, 1856, 1857, 1864, 1876, 1886, 1899, 1904, 1905, 1906.
BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c. *None.*
LIGHTING, HEATING, AND VENTILATING. *None.*
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1855, 1865, 1872, 1873, 1917.
METALS, including apparatus for their manufacture, 1859, 1898.
CHEMISTRY AND PHOTOGRAPHY, 1896, 1910.
ELECTRICAL APPARATUS, 1848, 1866, 1889, 1900, 1916.
WARFARE, 1854, 1871, 1875, 1879, 1911.
LETTER PRESS PRINTING &c., 1852.
MISCELLANEOUS, 1853, 1858, 1861, 1862, 1863, 1867, 1868, 1870, 1874, 1877, 1878, 1880, 1882, 1883, 1884, 1885, 1888, 1891, 1893, 1895, 1897, 1901, 1907, 1908, 1909, 1912, 1914, 1915, 1919, 1920, 1921.

1848. C. L. LIGHT. *Improvements in electric telegraph ropes or cables.* Dated August 13, 1858.

This invention was described and illustrated at page 141, No. 9, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

1849. T. RICKETT. *Improvements in locomotive engines and other carriages to facilitate their transit.* Dated August 13, 1858.

This consists in giving to the engines through an elastic medium a more extended bearing surface. In place of each driving wheel, the patentee employs two or more small wheels, placed equidistant longitudinally from the central axis; and around these wheels he places an elastic hoop or hoops of proportionally large diameter, made of a thin plate or plates of steel, &c. Within this hoop the wheels roll, and the weight of the engine coming upon these hoops at two or more points beyond the centre of bearing, the hoop yields to the weight till the bearing points of the wheels approach or touch the ground, so that that portion of the hoop between the bearing points becomes nearly flat, and the load is sustained by a portion of ground approaching to the whole distance between the centres of the roller. *Patent completed.*

1850. J. PETRIE, jun. *Improvements in machinery or apparatus for stretching and drying woven fabrics.* Dated August 13, 1858.

This relates to a former patent, dated 30th June, 1858. The patentee causes a band or bands armed with hooks or teeth to travel over the rollers with the cloth, which bands are guided in their motion, and are drawn outward by weights, &c. *Patent completed.*

1851. T. WORTH and H. SPENCER. *Improvements in machinery or apparatus for preparing for spinning, and for spinning cotton and other fibrous materials, and in winding and warping yarns of the said materials, and in making wire cards for such preparing machinery.* Dated August 13, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1852. G. SCHAUB. *New or improved machinery to be used in the manufacture of certain kinds of printing types, and also in the manufacture of spaces and quadrats used in setting up printing types.* Dated August 13, 1858.

This relates to a previous patent granted to the inventor, dated the 16th of April, 1857. A circular table having a series of radial slots is mounted upon a vertical axis, and capable of motion in a horizontal plane. In the radial slots beds are placed, the said beds being impressed with the types to be manufactured. The heads of the types, made of copper, and coated at back with soft solder, are cut from the sheets in which they are made by a fly press, the lower die used in the press having a spring bottom by which the type head cut out is raised from the die. The separate type heads are placed in the beds on the table, the backs of the type heads being uppermost. The bodies of the types are cast on the heads by a mould, one-half of which is fixed over the table in the direction of a radius, and the other half of the mould is moveable. The table is turned until the bed filled with type heads is brought under the fixed part of the mould. The moveable half of the mould is connected to the fixed half, and the bed is made to bear up against the under side of the mould, and is fixed accurately in its place. The said bed constitutes the bottom of the mould. Fused type-metal being poured into the mould, the metal attaches itself to the type heads, and forms bodies thereto. The mould is opened and the types removed. The bed is depressed so that it can pass freely under the fixed part of the mould, and another filled bed be brought under it. *Patent abandoned.*

1853. J. H. JOHNSON. *Improvements in the treatment of crude india-rubber, gutta percha, or other vulcanized gums, and in the manufacture therefrom of what are usually called hard rubber articles.* (A communication.) Dated August 13, 1858.

This consists, 1, in passing the crude gum in masses of from 10 to 30 lbs. weight through toothed rollers having a slipping motion; 2, in the use of alternative pressure and vacuum in cleansing raw gums; 3, in grinding together about two parts by weight of the gum with one part of sulphur, preparatory to running the heat; 4, in running the heat from about 275° Fahr. at the commencement of the process to about 300°; 5, in certain means of equalising the temperature in the heating apparatus. *Patent completed.*

1854. T. G. PENDELLY and H. BROWN. *Improvements in apparatus for straightening gun barrels.* Dated August 13, 1858.

The inventors straighten gun barrels without defacing the outside of the barrel, or striking or bruising the inside of the same. *Patent abandoned.*

1855. J. CARTMEL. *Improvements in the manufacture of hats, caps, and other coverings for the head.* Dated August 14, 1858.

This consists in making the foundation or body and brim of a hat of a linen or cloth prepared with caoutchouc. The cloth is lined with a piece of linen, and the latter is caused to adhere to the former by using shellac, powdered and dissolved in water impregnated with ammonia, with any of the resinous gums possessing sufficient property of adhesion. *Patent completed.*

1856. M. A. F. MENNONS. *Improvements in the construction of Jacquard looms.* (A communication.) Dated August 14, 1858.

A complete specification of this invention was filed with the application. It consists in a construction of Jaquard looms, specially applicable to carpet manufacturers, and in certain cases to the production of shawl and "brochè" tissues. *Patent completed.*

1857. J. HOLT. *Improvements in looms.* Dated August 14, 1858.

This relates to mechanism for operating rotary shuttle boxes for producing the various changes of shuttles required in fancy weaving, and consists in constructing apparatus capable of being governed by a small Jaquard machine affixed to the loom end, and receiving motion therefrom. *Patent completed.*

1858. J. SMITH and S. A. CHASE. *Improved arrangements for obtaining and applying motive power.* Dated August 14, 1858.

This consists of certain complicated mechanical appli-

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ances "so arranged as to co-operate with the motive power of the atmosphere." *Patent completed.*

1859. A. SLATE. *Improvements in blast furnaces and in smelting iron ore.* Dated August 14, 1858.

This invention was described and illustrated at page 205, No. 13, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

1860. S. C. LISTER and J. WARBURTON. *Improvements in dyeing wool, hair, cotton, flax, and similar materials, also yarns and textile fabrics made from such materials, also in dyeing and tanning other substances and materials, also in washing wool, and in discharging the gum from silk.* Dated Aug. 14, 1858.

These consist in dyeing in vacuum. The material is placed in an air-tight vessel, through a door, which is then closed, and the air exhausted. The colouring matter is then admitted. *Patent completed.*

1861. C. O'NEILL. *Improvements in the manufacture of artificial gums from starch, farina, and other amylaceous substances, and in apparatus for such manufacture.* Dated Aug. 14, 1858.

This consists, 1, in subjecting starch, farina, &c., to the chemical action of muriatic gas or other acid gas or vapour, the substances acted upon being heated to a proper temperature either before or after the admission to them of the gas or vapour employed. 2. In the following apparatus for effecting the aforesaid purposes:—starch, farina, &c., is inclosed within a cylindrical chamber, into which the gas or vapour is admitted, and which is surrounded by another chamber heated by steam. The starch, farina, &c., is stirred about by revolving arms within the inner chamber. *Patent completed.*

1862. G., G. W. and J. BETJEMANN. *An improvement in book-slides.* Dated Aug. 14, 1858.

This consists in fitting vulcanized caoutchouc springs to the slides so that the side supports shall always return to the position from whence they have been drawn upon the extra book or books being taken from the slide. *Patent abandoned.*

1863. W. E. NEWTON. *An improved combination of metal with india-rubber or gutta percha, or with india-rubber or gutta percha combined with other substances, in the manufacture of belting, hose, valves, and other articles.* (A communication.) Dated August 14, 1858.

This consists in the combination of wire cloth or wire netting with india-rubber or gutta percha in the manufacture of the above-named articles. *Patent abandoned.*

1864. L. A. FOROT. *A new mode of ornamenting fabrics, and in the apparatus connected therewith.* (A communication.) Dated August 14, 1858.

The object here is the manufacture of a new kind of fabric composed of threads of silk or other fine material, glued upon paper or any kind of materials, and in ornamenting the said fabric. This is done by a cylinder upon which the material is fixed. One or several bobbins, or a comb containing a certain number of threads, are supported above the cylinder by a screw or otherwise. The paper or material placed upon the cylinder is glued by a sponge or otherwise, and the cylinder in turning communicates the movement to the screw, which distributes the silk or other material, so that it will be glued spirally upon the cover of the cylinder, and when the operation is finished the fabric is separated from the cylinder by a knife. *Patent completed.*

1865. G. K. GETFLIN. *Folding bedsteads, and which he calls the universal and folding joint for bedsteads.* Dated August 16, 1858.

To the bedstead posts the inventor fixes a plate with one or more holes which serve as centres from either of which the head and foot rails may be folded on the frame. Through these centre holes set screws or bolts are screwed into the frame, by which a bedstead can either be folded or taken to pieces like an ordinary bedstead. *Patent abandoned.*

1866. P. E. CHAPPUIS. *Improvements in stereoscopes and stereoscopic apparatus.* Dated August 16, 1858.

This comprises the construction and arrangement of stereoscopes, 1, folding in the form of a book. 2, in the form of an oblong box, resembling a colour box with a sliding lid. *Patent completed.*

1867. C. G. CUTCHEY. *A railway danger signal whistle.* Dated August 16, 1858.

Here upon a rod being liberated, certain catches are raised, and upon an engine passing the catch, a lever, which projects some inches below, strikes against one of them, and which lever moving on a pivot or moveable joint is thrown out of a notch or groove in the handle of the whistle, which being acted upon by a spring opens the cock, thereby letting the steam into and blowing the whistle. *Patent abandoned.*

1868. L. A. and E. I. E. HERMANN. *Improvements in connecting together pipes, tubes, or ways, for the conveyance of water or other fluid, and in the means or apparatus for regulating the flow, or discharge and supply of such fluid, and in means or apparatus for facilitating the forming of such connections.* Dated August 16, 1858.

One object here is to facilitate the connecting together of lengths of pipe, without employing hot metal, or of soldering; and also the use of piping without flanges. The patentees apply over the adjoining ends of the pipe a band or ring of lead, and force such into close contact by two compressing rings of iron formed conical on the inside, to press tightly upon the ring or band of lead *Patent completed.*

1869. A. V. NEWTON. *Certain improvements in machinery for forging horse-shoes.* (A communication.) Dated August 16, 1858.

This consists in certain methods of operating mandrills, die rollers, and punches, for forming horseshoes from bar iron, producing the creases in the same, and punching the holes therein. Also in improved application of discharging apparatus for delivering the shoes from the machine as fast as they are completed. *Patent completed.*

1870. P. RICHARD. *Improvements in apparatus for obtaining motive power.* Dated August 16, 1858.

This consists in communicating a rotary motion to a fly-wheel or drum, by a set of falling weights tied together by chains, ropes, or straps. *Patent abandoned.*

1871. J. WEBSTER. *A new or improved projectile.* Dated Aug. 17, 1858.

This consists of a projectile having an external figure resembling that of the Minié bullet, and having a hole in its axis, which hole is rifled, or has a series of helical grooves or planes formed therein. The effect of the rifled hole is to give the projectile a rotary motion as it progresses through the air. *Patent abandoned.*

1872. W. E. EVANS. *Improvements in harmoniums, concertinas, organs, and other similar keyed instruments.* Dated Aug. 17, 1858.

This invention has reference to eliciting immediate tone from what are called the free reeds of harmoniums and similar-keyed instruments, on touching the keys or pedals of the same by mechanism attached to the keys or pedals, and actuated solely by the hand or foot of the performer. The invention is not described in detail apart from the drawings. *Patent completed.*

1873. J. JACKSON and A. FISHER. *An improvement in the manufacture of hats.* Dated Aug. 17, 1858.

This consists in substituting thin sheet steel or copper, in lieu of the materials at present in use for the bodies of hats and shakoes. *Patent abandoned.*

1874. G. HALKERSTON. *Improvements in mangles.* Dated Aug. 17, 1858.

This consists of a pair of vertical parallel standards of cast iron, held together transversely by horizontal tie rods, so as to abut at their ends, and a pair of wood rollers of large diameter, the upper one of which has attached to it the ordinary taking-in cloth. The end journals of the lower roller on which the pressure comes rest in upon a pair of antifriction disc wheels, the stud spindles of which run in bearings carried by an adjustable block or saddle-piece let into an opening in the standard. The end journals of the upper roller run in vertically adjustable bearings, fitted into slots in the main standards above, the pressure upon the pair of rollers being regulated by a compound plate spring. *Patent abandoned.*

1875. J. NORTON. *Improvements in projectiles.* Dated Aug. 17, 1858.

This invention was described and illustrated at, page 250, No. 1831, of the MECHANICS' MAGAZINE. (Old Series.) *Patent completed.*

1876. F. SHAW. *Improvements in spindles for the spinning of silk and other fibrous material.* Dated Aug. 17, 1858.

This relates to hollow brass spindles, and consists in working them upon a steel stud, having a steel cap at top of about one inch and a quarter in length, to protect the part from abrasion, the brass or metal passing through the steel cap and thus forming a bush, whereby the patentee can drive the spindles at a high speed. The bottom of the spindle is secured by a thumb-screw. The spindles are each only about seven inches in length. *Patent completed.*

1877. G. MILLS. *Improvements in machinery for cutting wood for staves.* Dated Aug. 17, 1858.

The wood is moved to the saw by a cylindrical drum, and a flexible band which is fixed at one end to the circumference of the drum, and at the other end presses against the end of the piece of wood, so as to move it as the flexible band is wound on to the circumference of the drum. The piece of wood is, whilst being moved up to the saw, held between two wheels or rollers, one acting as a pressing roller to press the wood against the periphery of the other. The wheel or roller against which the wood is pressed is of the same diameter as the wheel on which the flexible band is wound, and they are both formed with cog-wheels, and are driven at a like surface speed by a pinion. By these means straight sawing will be accomplished, but to cut the staves thicker at the ends, provision is made to incline the wood to the saw at the two ends, to cause the saw to cut in an inclined direction; and there are recesses in the wheel against which the wood is pressed, into which the ends of the piece of wood enter, and these recesses are varied in position to suit different lengths of wood. *Patent abandoned.*

1878. D. LICHTENSTADT and C. DUFF. *Improvements in treating tan and tanning refuse to obtain valuable products therefrom.* (A communication.) Dated Aug. 17, 1858.

The object here is to bring into use the refuse material of tan oak bark, its properties having been exhausted, and which, after passing through a certain process, is converted into, 1, charcoal, for the manufacture of gunpowder; 2, charcoal for filtering purposes. After such process there remains, 1, liquecous acid for different chemical and technical purposes; 2, wood tar; 3, the hydro-carbonic gas, which is used in the distillery processes by burning under the apparatus, which greatly reduces the expenditure of fuel. *Patent abandoned.*

1879. J. LUIS. *A new safety system for preventing an accidental discharge in fire-arms.* (A communication.) Dated Aug. 18, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1880. A. V. PINTA. *Improvements in blank forms of cheques, or drafts on bankers, payable on demand, relating to the crossing of such cheques or drafts.* Dated Aug. 18, 1858.

A complete specification of this invention was filed with the application, and an abridgement of it was published at page 621, No. 1846, of the MECHANICS' MAGAZINE (Old Series). *Patent completed.*

1881. W. SOELMAN. *Additional improvements in the construction of propellers, chiefly with reference to his former patent.* Dated Aug. 18, 1858.

This relates to a former patent, and consists of certain modifications in the form of the floats. It is not described apart from the drawings. *Patent abandoned.*

1882. T. WILLIAMS. *An apparatus to be used for a churn or for a washing-machine.* Dated Aug. 18, 1858.

This consists of a cylindrical or conical vessel, with a vertical shaft, mounted in bearings and fitted with open framework beaters or stirrers, to which a lateral alternating or rotary movement is given by a link motion attached horizontally to the said spindle, which is driven direct from a crank action through the medium of a connecting rod and fly-wheel. *Patent abandoned.*

1883. R. ANDERSON. *Improvements in stuffing-boxes and packings.* Dated August 18, 1858.

This relates, principally, to piston-valve and pump-rod stuffing-boxes; and consists of a quadruple or other set of brass segments, made to fit accurately to the rod by being unbraced by two external plate-springs. *Patent completed.*

1884. T. O. DUKE. *Improvements in preparing cheques and such like documents, and in the means of preventing forgery or surreptitious alterations.* Dated August 18, 1858.

The inventor punches out from documents pieces according to any design, and as these openings cannot be filled up without detection, it prevents tampering with crossed cheques, drafts, &c. *Patent abandoned.*

1885. A. PILBEAM. *A bradawl screw.* Dated August 19, 1858.

The patentee describes a screw terminating with an end similar to the bradawl in use. It merely requires to be struck with the hammer down to the end of the bradawl part and commencement of the screw; the screw driver must then be applied to turn it, and it will be found to penetrate the wood as quickly, if not quicker, than the ordinary screw, which requires a hole to be made for it. *Patent completed.*

1886. W. HUDSON and C. CATLOW. *Certain improvements in looms for weaving.* Dated Aug. 19, 1858.

This consists, 1, in regulating the delivery of the warp from the warp beam, in which the warp as it passes from the warp beam to the healds is caused to pass under a moveable rod, shaft, or roller, connected to the weight levers. 2, In regulating and controlling the delivery of warp from the warp beam, in which the said warp is caused to pass under a moveable rod, roller, or shaft, which falls or rises as the weaving proceeds according as the quantity of warp delivered is in excess or deficiency. 3, In the use of a stop, latch, detent, &c., to retain the stop rod in its working position, and to prevent it from recoiling. 4, In the use of a pair of buffers (one upon each spindle) to absorb the momentum of the pickers, and to prevent the collision thereof with the spindle studs. 5, In an apparatus for preventing floats. *Patent abandoned.*

1887. W. F. PADWICK. *A machine or implement to be employed on and sown with turnips to protect them from the ravages of the fly, applicable also to the protection of other crops.* Dated Aug. 19, 1858.

Upon a suitable frame and mounted upon wheels the patentee places a vessel for holding water or other liquid. This liquid vessel has a pipe extending across the implement fitted with cocks in various parts, some of which are opened to come over the rows of plants. Under the taps is a wire-gauze or rose-spreader for depositing the liquid in a fine shower upon the plants. A hopper extending across the implement is supported upon the frame behind the liquid vessel. This hopper contains the dry material to be applied over the moistened plants. The hopper has a shaft with arms rocking in it for delivering the contents into as many shoots provided with adjustable parts as there are rows of plants between the wheels of the implement. From the shoots the material falls into sieves which have a jogging motion imparted to them, and which distribute the dust, grit, &c., over the plants. *Patent completed.*

1888. J. C. PLOMLEY. *Improvements in joists and laths used for supporting hair and other pervious floors in oast houses.* Dated Aug. 19, 1858.

This consists in making the joists and laths taper off towards the top on which the floor rests, whereby much less of the floor will be covered, and consequently an extended floor surface will be exposed to the rising currents of heated air and other drying and evaporating agents. *Patent abandoned.*

1889. M. F. J. DELFOSSE. *Improvements in electro-magnetic machines.* Dated Aug. 19, 1858.

This relates to that class of electro-magnetic machines in which powerful induced currents are obtained by the revolution of wheels or discs carrying covers of soft iron surrounded with coils of wire and made to revolve between the poles of fixed permanent magnets; the induced currents are collected from the whole series of coils, and conveyed by metal conductors to be used as required. This invention consists in the apportioning of the number of coils composing each disc or wheel to the magnets between which they pass; in arrangements of the conducting rings in order to avoid the electric spark; in the employment under certain circumstances of uninterrupted or unsplit annular rings; in means of coupling the coils according to the intensity or quantity of the current desired to be obtained; in the arrangements of the coupling of the coils with the split or full rings for those applications where the electric currents are required to be fixed or changeable, of weak or strong intensity; and in the employment of split coils for the purpose of increasing the energy of the currents. *Patent abandoned.*

1890. W. SMITH. *Improvements in steam engines.* (A communication.) Dated Aug. 19, 1858.

Here two cylinders are placed each at an angle of about 25 or 30 deg., their connections converging to the crank, axle, or shaft, the air pump and condenser being disposed between the two cylinders, and immediately under the crank shaft, and the cold water, injection, feed, and bilge pumps are disposed alongside the air pump, working vertically or horizontally, the starting and reversing gear being worked by a wheel acting by means of connecting rods upon the links and eccentric and slide gear of the two cylinders. The exhaust pipes branch out from either side of the condenser to the lower side of the steam chest of each cylinder, whilst each cylinder has upon the upper side or face of the steam chest a pipe branching from the boiler. High pressure steam is used, which, after having performed its work in propelling the piston in one direction, is caused to pass through a double or hollow slide valve, by which the steam at the end of the stroke has free access to the opposite

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end and greater area of the piston, where it expands and propels the piston back, or performs the up-stroke, which having been done, the steam which has been expanded and performed its work as described escapes into the condenser. *Patent completed.*

1891. W. PEARCE. *Improvements in the manufacture of air-tight bottles, jars, or similar articles.* Dated August 20, 1858.

The patentee claims making bottles, jars, &c., with projecting studs or lugs on the necks thereof, such studs or lugs entering into grooves, and so forming air-tight coverings thereto. *Patent completed.*

1892. W. A. MUNN. *An improved method of constructing railway carriages, whereby greater safety is insured in case of collision.* Dated August 20, 1858.

Here the body of the carriage is built separately from the platform or bed on which it rests in grooves, in such a manner as to be capable, when a considerable force is applied, to slide along either end of the platform or bed. *Patent abandoned.*

1893. F. PRESTON and W. MC GREGOR. *Improvements in machinery for cutting files.* Dated August 20, 1858.

This consists, 1, in a mode of constructing the socket and joint of the chisel-holder in combination with a spring applied to the tail of the chisel-holder. 2, in holding the chisel rigidly between the jaws of a vice or clamp forming the chisel-holder, the chisel being held in its place in the vice or clamp by a pin, key, or a cottar. 3, in so constructing the cam for working the screw by which the table is moved, that after the table has been moved the necessary distance for cutting a fresh tooth, the action of the cam imparts a slight forward pressure on the table until the blow of the hammer has been given. 4, in the application of a friction clip or brake to the screw by which the table is moved. 5, in the application of a loose weight or weights to the top of the hammer. 6, in supporting the chisel-holder in a slide, in order that the chisel may be raised off the file in a line parallel to the cut. *Patent completed.*

1894. H HOOD. *Improvements in the manufacture of railway tyre bars, boiler plates, bar iron, and forgings.* Dated August 20, 1858.

This consists in the application of Swedish and Russian pig-iron in the manufacture of railway tyre bars. Also in the manufacture of railway tyre bars, boiler plates, bar iron, and forgings from Swedish and Russian pig-iron combined with the pig-iron manufactured in England, Scotland, and Ireland. *Patent abandoned.*

1895. L. F. H. DROINET. *Improvements in bearings and packings for rotating and reciprocating shafts, the joints of pipes, and other like purposes.* Dated August 20, 1858.

These bearings and packings are composed of three or more segmental blocks, which when brought together form a circular hole on the inside for the reception of the shaft or pipe; each segment is pressed inwards by a spring or springs. *Patent abandoned.*

1896. P. SPENCE. *Improvements in the manufacture of alum.* Dated August 20, 1858.

This consists in a method of obtaining small crystals or powder of alum, and consists in accomplishing this object by the adaptation to the pans which contain the solution of mechanism, which by a rotatory or reciprocating action keeps the fluid in agitation. *Patent completed.*

1897. J. L. FIGGETT. *An improved construction of syringe or hand pump.* Dated August 20, 1858.

The patentee claims constructing syringes or hand-pumps, whereby with the exercise of one hand alternately pressing upon and releasing the pressure from the barrel, the operator is enabled to throw a continuous stream: thus leaving the other hand free for directing the stream, or for other use. *Patent completed.*

1898. W. CLAY and E. L. BENZON. *Improvements in the manufacture of iron and steel.* Dated August 20, 1858.

In carrying out this invention in a puddling furnace of the ordinary construction, a charge of pig iron, or refined iron, or plate metal, is introduced into the furnace in the usual manner, together with an equal quantity of hammer slag or cinder, or other vitreous material, and when these ingredients are melted together they are worked in a similar manner to that usually adopted in puddling iron, taking care to melt and boil the iron at as great a heat as possible. The iron, after boiling for a considerable time, commences to thicken, and grains of steel begin to appear on the puddling tool, or to rise through the covering layer of cinder, or vitreous material. The damper must then be shut down, and as soon as the ebullition subsides, the metal must be gathered together and balled up quickly, taking care to keep the mass as compact as possible, and protected from the influence of the atmosphere. The ball when withdrawn from the furnace may be hammered, squeezed, and rolled in the usual manner. *Patent completed.*

1899. T. KNOWLES. *Improvements in looms for weaving.* (A communication.) Dated August 20, 1858.

This relates to arrangements of the parts constituting several motions of the loom; the strap pulley is mounted upon a shaft capable of actuating a second or main shaft by gear. Upon this second shaft is a stud, which, when the loom is driven, is held by a catch mounted on the wheel, which is driven by the pulley and brought into action by the stop rod. The lathe vibrates by a cam acting against a lever, which lever causes a bell crank to turn upon its centre, and communicates motion to the lathe by a connecting rod. The lever is kept in contact with the cam, and the lathe brought back by a spring. In the picking motion a lever is forced backward against the spring, and carries with it the picking stick; in this situation it is confined by a catch, which is liberated when the pick is required, and the force of the spring projects the shuttle. To the lever an arm is connected which causes the picker to occupy its proper starting position. To the warp beam is applied a metal band as a brake. This band is held by levers which are regulated in position by a roller placed in contact with the warp. *Patent abandoned.*

1900. A. BAKER. *An improved method of, and apparatus for submerging or laying under water electric cables, wires, or lines, and for the recovery thereof.* Dated Aug. 20, 1858.

The inventor claims a kink indicator apparatus, and certain self-inflating buoyant and retarding floats. Also, self-attaching and self-detaching nippers, whether used the latter in connection with the floats or otherwise, and whether constructed principally of wood or metal, or a combination of both. The invention is not described apart from the drawings. *Patent abandoned.*

1901. F. F. DELPY. *Improvement or improvements in metallic stay-busks.* Dated Aug. 21, 1858.

The patentee makes the busks without the rivetted studs, or gives them a different disposition. The blades are punched out from steel sheets. *Patent completed.*

1902. G. J. WALKER. *Improvements in funeral carriages.* Dated Aug. 21, 1858.

This consists in fitting mourning-coaches with arrangements for carrying the coffin upon the roof thereof; for which object a sarcophagus-shaped top is employed in connection with a shifting scroll iron step, together with fixed and moveable rollers for raising or lowering the coffin. *Patent abandoned.*

1903. M. BENSON. *Improved apparatus for generating steam.* (A communication.) Dated Aug. 21, 1858.

This relates to apparatus for generating steam with great rapidity and economy, and with perfect safety. The centre or flue space of the boiler (which is jacketed) is divided into compartments by vertical partitions, and in each of the compartments a system of serpentine pipes is fixed, their lower ends in communication with a pump, and their upper ends communicating with the steam space of the boiler. The flame and heated gases from the fire-place play upon and around the pipes. A circulation of water is kept up through the pipes by a pump. A second pump is used for supplying water to the jacket of the boiler. *Patent completed.*

1904. R. A. BROOMAN. *Improvements in sewing machines.* (A communication.) Dated Aug. 21, 1858.

These relate to the feed of material to be sewn in a sewing machine, and consist in a means of causing the cloth to progress by a mechanism acting so as to grasp the cloth between two surfaces, and give the feed without the aid of spring pressure. *Patent abandoned.*

1905. W. HENSON. *Improvements in circular looms or knitting frames.* Dated Aug. 21, 1858.

This consists in arranging such machines so that the fabric produced upon them may be increased or diminished in width by the automatic action of the machine. *Patent completed.*

1906. C. DE JONGH. *Improvements in machinery for combing and heckling fibrous materials.* Dated August 21, 1858.

This relates to a machine patented 29th October, 1856. In this machine the fibres were fed up to rotary combs between endless chains, which were pressed into contact with the fibres by pressing rollers, and thereby caused to hold the fibres fast while under the heckling or combing action. The patentee now proposes to construct them of flat blocks of wood or plates of iron, with square abutting ends, and to connect them together by securing them to an endless band of vulcanised india-rubber, &c. *Patent completed.*

1907. R. LAMING. *Improvements in purifying gases and liquids, in preparing and purifying liquids, and in apparatus for apportioning or measuring liquids.* Dated Aug. 21, 1858.

This consists, 1, in removing sulphuretted hydrogen from foul gases by the catalyptic use of certain metals in combination with oxygen, as, for example, the precipitated sesquioxide or peroxide of manganese. 2, in removing sulphuretted hydrogen from gas, liquor, or other foul liquids, by the use of the re-agents above indicated. 3, in a "tumbling box" or fluid measurer controlled by a weight spontaneously shifting, as required, from one part of the apparatus to another. *Patent abandoned.*

1908. W. W. HARRISON. *An improvement in cruet and liqueur stands.* Dated August 21, 1858.

This consists principally in forming such stands with an open frame of silver or other metal, and filling in such frame with sides or panels of glass, porcelain, &c. *Patent abandoned.*

1909. F. PULS. *Improvements in the distillation of coal.* Dated August 21, 1858.

This consists of a mode of distilling coal with the addition of earthy, alkaline, or metallic oxides, peroxides, sesquioxides, or protoxides, or the carbonates or hydrates of those substances, for obtaining gaseous products and tar from the coal distilled. *Patent completed.*

1910. F. PULS. *Improvements in the distillation of bituminous matters and gas tar.* Dated August 21, 1858.

This consists in a mode of distilling such matters or gas tar with the addition of, or mixed with, earthy, alkaline, or metallic oxides, peroxides, sesquioxides, or protoxides, or the carbonates of hydrates of those substances, for preventing the adhesion of the residuum to the interior of the retort, and for obtaining fluid, solid, and gaseous hydrocarbons or products from such bituminous matters. *Patent completed.*

1911. M. R. PILON. *Improvements in the manufacture and construction of fire-arms, and in the means of loading the same.* Dated August 23, 1858.

The objects here are, 1, to control the recoil. 2, to secure the precision of the aim by altering the position of the trigger of small arms. 3, to load quickly by a metallic charge-bearer for the weapons that are charged through the breech. The breech is closed up with a cap or stopper having a spiral spring; this spring has a fulcrum at the back part on the carriage. When the gun is fired the recoil presses upon the spring, and by thus pressing it the cap which stops the breech is maintained at its place. The carriage of the cannon has cog-wheels or springs, on which the trunnions press. *Patent completed.*

1912. C. BUONO-CORE. *A liquid or composition which when applied to substances of any kind will render them fire-proofs or uninflammables.* Dated August 23, 1858.

The object here is to render fire-proof every substance or material, and the inventor effects this with the following composition:—A solution of alum, 20 parts; extract of archicouta, 30 parts; fluoric acid, 50 parts; a solution of glass, 100 parts. The coating is made by a brush, and it is placed upon the furniture instead of the ordinary varnish. *Patent abandoned.*

1913. L. HIGGINS AND A. BROWN. *Improvements in reefing the sails of navigable vessels,* Dated August 23, 1858.

The patentees employ a combination of parts, to effect the rolling up of the topsails upon revolving yards. *Patent completed.*

1914. A BOYLE. *Improvements in the manufacture of certain parts of umbrellas and parasols, and in machinery employed in the said manufacture.* Dated August 23, 1858.

This consists in making the runners from circular discs of sheet metal, by raising tools; also in a machine for effecting the flattening, and also for making the knob at the ends of umbrella and parasol ribs. *Patent completed.*

1915. T. AVERILL. *An improvement or improvements in mills for grinding.* Dated August 23, 1858.

The patentee claims, 1, making a grinding mill of a series of nearly flat plates of sufficiently hard metal or alloy, the surfaces of the said plates being corrugated or grooved, some of the said plates being stationary, and others of the said plates moveable, the said moveable plates alternating with the stationary ones; the said moveable plates being actuated by a crank 2, making the upper edges of the plates thinner than the lower edges in those parts constituting the bottoms of the grooves, the thickness of the said plates gradually increasing from the top to the bottom; or making the grooves or depressions between the ribs on the said plates shallow at the bottom, and gradually deeper as the said grooves or depressions approach the tops of the plates. 3, notching the plates on their upper edges, to facilitate the breaking and feeding of the substance to be ground. *Patent completed.*

1916. H. D. JENCKEN. *Improvements in electric telegraphs.* (Partly a communication.) Dated Aug. 23, 1858.

This consists in the use of the earth itself as a conductor of galvanic, magnetic, electro-magnetic, and electric fluids of all kinds, without any conducting wire or wires. In the use of substances in a dry or wet state under ground for producing an electric current at the transmitting and receiving points and stations. In insulating and preventing by non-conducting substances any lateral action from interfering with the direct communications from point to point. In changing the characters of the electric fluids, to prevent the interfering action electric currents would be liable to in their course from one point to another. *Patent abandoned.*

1917. J. H. ROBINSON. *An improved shirt.* Dated Aug. 23, 1858.

This relates to a shirt which may be worn as a shirt and waistcoat, or simply as a shirt. Marsala or other waistcoat stuff is sewn to the front of the shirt extending from the neck to the waist, and allowed to hang loose to the length of an ordinary waistcoat. The waistcoat stuff is carried from the neck to the shoulder on each side, and down each side-seam of the shirt as far as the waist; or the fore part of the shirt may be formed entirely of waistcoat stuff, and the fore part of the shirt attached to the waistcoat stuff inside. *Patent abandoned.*

1918. W. H. HARFIELD. *Improvements in windlasses.* Dated Aug. 23, 1858.

Here, in order to give motion to a windlass barrel, two cog or toothed wheels on parallel axes are used, which gear into each other, and one of them also gears into a wheel on the axis of the windlass barrel. On the axis of one of the two cog-wheels there is a lever which is caused to vibrate by windlass bars, and by connecting rods motion is communicated from the above-mentioned lever to a second lever which moves on the axis of the other cog-wheel. Each lever carries a driver or drivers arranged to give motion to its cog-wheel, and so that the two cog-wheels are driven alternately by their respective levers and drivers. That a windlass may be more conveniently arranged to deliver a cable, there is a brake-wheel fixed on the axis of one of the cog-wheels, to which there is applied a brake-strap and lever. *Patent completed.*

1919. A. ROTTMAN. *Improvements in fastenings for bags, porte-monnaies, pocket-books, and similar articles.* (A communication.) Dated Aug. 23, 1858.

The patentee bends a piece of steel wire into a staple or loop or V-form, passes the ends of the branches through a slit or slits in one of the jaws of the bag, and attaches knobs to them. The angle or bond of the staple may be secured by a screw. By pressing the two knobs towards each other this spring staple is compressed, and can enter a recess or recesses in the other jaw, and then being allowed to expand again it enters notches at each end of the recess, and thus secures the two jaws together. The edges or ends of the recess are bevelled to allow the spring staple to enter the recess by merely pressing the jaws together. *Patent completed.*

1920. C. A. SCHRADER. *An instrument to be used in boring, for mining or other purposes.* Dated Aug. 23, 1858.

This consists of a metallic bar or stem, with a point or head of steel, furnished with three chisel-pointed cutters, so arranged as to admit of the instrument turning on the centre one, the point of which is formed to extend below the others for that purpose, so that by a downward force and rotary movement being communicated to the said instrument, the operation of boring may be effected with little labour and great precision. *Patent abandoned.*

1921. H. B. BARLOW. *Improvements in self-acting lubricators.* (A communication.) Dated Aug. 23, 1858.

This consists, 1, in apparatus for lubricating, whereby a uniform supply of oil or other lubricating material is delivered at intervals to the axle; 2, in marking divisions on the glass, oil-cup, &c., for indicating the consumption of the lubricating material; 3, in a mode of constructing lubricators with endless chains or bands, by which the oil, &c., is raised from the oil-cup and delivered to the axle; 4, in supplying oil, &c., to the axle by a roller (around which a strip of felt or other elastic substance is wound in the form of a thread or spiral), floating in the oil, &c. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, APRIL 15, 1859.

THE SHIPS OF THE NAVY.

We have received with pleasure the mass of information on the navy lately presented to the House of Commons, and have published that portion of it with which the bulk of our readers are likely to concern themselves. Into the great question of naval expenditure we have never up to the present time entered, nor do we propose to enter upon it now. Our business has hitherto been, and still is, with the ships of the navy, and with them only.

Our present purpose is simply to draw attention to the manner in which Lord Clarence Paget's statements with reference to the alterations of ships have been disposed of by the Surveyor of the Navy. And that this matter may be made perfectly plain to the public we have placed the rejoinders of the Surveyor by the side of Lord Paget's assertions—adding our own in a third column, in order to verify their accuracy. The result of the whole affair is, that Lord Paget is left without the least basis of truth for his allegations. Nor is this all. Sir Baldwin Walker takes occasion in his explanations to remind the Admiralty and the public that a sum less than £400 is "the only sum expended on all the screw-ships designed within the last eleven years, which might have been saved if the views subsequently carried into effect had been adopted in the first instance." This is a fact which not only Lord Paget, but the Admiralty themselves would do well to bear in mind; for such is the present efficiency of the "construction" branch of the Surveyor of the Navy's department, that neither Lord Paget, nor Sir John Pakington, nor Mr. Corry can interfere in its operations without disadvantage to the service; and all of them seem disposed to do so, if we may judge by their speeches in Parliament. Not a word of truth has been adduced in proof of any serious inefficiency in our ships of war. The constructors of the navy are at the head of their profession, and unprofessional persons cannot therefore give satisfaction by interfering with their business. To the criticism and interference of competent persons no sensible person would object; but when men without the most elementary knowledge of ship-construction are so indecorous as to interpose in such a matter, it is high time to protest against their presumption.

SIR J. PAKINGTON *versus* SIR C. WOOD

We do not know what the temper of the House of Commons was last Wednesday afternoon, during the war waged between the present and the late First Lords of the Admiralty, but the report of the wordy strife has given us considerable amusement. Take this little dialogue:—

First Lord—I come now to the year 1858, when I succeeded to office. What had the right hon. gentleman done then? I understood him to say that eight line-of-battle ships were launched in 1858.

Ex-First Lord—What I said was, that eight line-of-battle ships were added to the navy in 1858, as appears by a return which I hold in my hand.

First Lord—I hold in my hand a return from which it appears that, instead of eight, the number is only four.

Ex-First Lord—Here is a return signed by Sir Baldwin Walker, Surveyor of the Navy, showing that of steam-vessels added to the navy in 1858 there were eight ships-of-the-line, viz., four built and four converted. That is the statement contained in paper 65 of the present session, for which I moved on the 16th of February.

First Lord—Well, I hold in my hand a printed return showing that there were only four added, viz., the Donegal, the Windsor Castle, the Hero, and the Edgar. I can only reconcile the difference by assuming that there were four built and four converted.

And so two honourable gentlemen bother each other, and mystify the House, because it is a State necessity that farmers, and lawyers, and county magistrates—any one, in fact, but a seaman—should manage the British Navy. It is to us a most surprising thing that the nation should ever have tolerated such an anomaly. Observe in the progress of this remarkable debate how the system works. Sir John Pakington had said on a previous occasion, that when he succeeded to office he did not find the navy of this country in a proper state, or adequate for the defence of our coasts and the protection of our commerce. Sir Charles takes this opportunity of defending himself, and does so with his usual adroitness and success. He considers that the accusation against him resolves itself into three heads:—that the late Board had neglected to ascertain the state of the French navy; that they did not build an adequate number of ships-of-the-line; and that they left the coasts of this country unprotected, so far as its safety depended upon the existence of an efficient naval force. Sir Charles said, with reference to the first of these points, that in May, 1857, he went at considerable length into a comparison between the existing states of our own and of the French Navy; that he adverted to the comparative strength of both at various periods of our history, and referred to the additional cost of a steam as compared with a sailing fleet. After stating that at the time he left office the French had twenty-two line-of-battle ships, and we had twenty-five, in addition to nine block ships, making a total of thirty-four vessels fit to take part in any action in the Channel, he quotes a portion of a speech made by Sir John Pakington, when defending his reduction in the estimates prepared by Sir Charles in respect of the outlay for the building of steam line-of-battle ships. On that occasion Sir John said—"The right hon. member for Halifax (Sir C. Wood) had complained that we had not line-of-battle ships enough, and that we had only two more than the French. That was true if only the line-of-battle ships actually afloat were meant, and the block ships were excluded. He admitted that those block ships should be superseded by line-of-battle ships as soon as possible; but four or five of those ships were in good condition, and it was not fair to exclude them." With reference to the next point—that they did not build an adequate number of ships-of-the-line—Sir Charles shows that he kept up such a supply of men in the dockyards after the close of the Russian war as to incur the condemnation of Sir James Graham. This he did because the labour which should have been employed in building large ships had been absorbed in fitting the transports and small vessels required by the exigencies of that war. Lord Clarence Paget said at that time in the House with reference to large ships—what we well remember was echoed loudly out of doors—"He was of opinion, therefore, that the First Lord might with great propriety rest upon his oars, and take the opportunity of consulting members of the naval service before he proceeded to add to the number of these vessels. Instead of increasing our line-of-battle ships he should appoint a committee to consider what description of vessels ought to be built." But Sir Charles thought this advice injudicious, and prepared the estimates for 1858—9, containing a very considerable increase in the building force of the dockyards, for the purpose of supplying the deficiency in large ships. The average number of men employed in building in 1856 was 1,600, but he proposed an addition of 1,340 men, or about 83 per cent. These estimates came into the hands of Sir John Pakington before they could be passed, and after having carefully considered them, he came to the conclusion that this increase in the establishment was not needed, and argued against Sir Charles upon our superiority over the French Navy.

After having the tables thus turned upon him by the statement of these facts, Sir John gets angry—adduces the arguments employed by Sir Charles Wood, in 1857, against the public feeling, and in favour of an increase in line-of-battle ships, to prove that the navy was in an inefficient state, and had been neglected—and actually condemns Sir Charles for adding *only* such a paltry sum as the £70,000 which he had himself struck out of the estimates as unnecessary! He says:—

"I leave it to the House to determine whether an addition of £70,000 to our naval estimates was sufficient to bring up our force to the position in which it ought to be, considering the state in which it was at that moment..... To come down to this House, as the Naval Minister, and propose an increase of only £70,000 to the estimates at a time when we had only 25 line-of-battle ships, I say was to fall greatly short of the duty which he owed to this country..... The right hon. gentleman complains that I cut down his estimates. But how much? Upon the matter of dockyard labour, I took off £20,000. I first proposed to take off £100,000. Sir Baldwin Walker remonstrated, and said he wished I would add £50,000. I did so. I then discovered the error about the £30,000 to which I adverted, and I added that sum; so that when I made my statement to the House in April the real difference between the right hon. gentleman's estimates and mine was only £20,000. But I would not have made that difference, or, indeed, any difference, if I had known then what I know now of the inefficient state in which the navy was left by the right hon. gentleman..... And now that we have come to a new session of Parliament, and have had to frame our own estimates, we have not, like the right hon. gentleman, made a proposal to take a vote of £70,000. Instead of this, we have proposed to take one for £1,300,000, which will enable us to add 26 powerful men-of-war to the navy, and to redress, so far as it is possible to redress, that positive and relative deficiency in our naval force which the late Government had allowed to exist." (Cheers.)

Not a bad day's work, Sir John! In order to squeeze out this money you had to show (if you could) that our navy was in a desperate condition when you came into office, and that your predecessors were grossly culpable; and this while you had yourself thrown away the means prepared by them for its improvement. And yet the House listens amiably, cheers, and votes the odd millions! You congratulate yourself, doubtless, on your lucky escape, and Sir Charles himself on the probability of having shortly to control the expenditure of the store which we, under the uncomfortable impression that we are being bamboozled by both of you, must work brain and hands to procure.

THE NATIONAL LIFE-BOAT INSTITUTION.

That sweet little cherub that sits up aloft and keeps watch for the life of poor Jack must witness with ineffable delight the proceedings of the National Life-Boat Institution. If his perch is sufficiently high for him to see the whole of our coast at once, and if, as we presume, he keeps his station all the year round, he must have had the gratification of be-

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holding no less than four hundred and twenty-seven persons rescued in 1858 alone by its agency, and of seeing it distribute gold medals, silver medals, honorary distinctions, and pounds sterling in abundance to the gallant saviours of the shipwrecked men.

In order to deepen the interest that is felt in the proceedings of this invaluable Institution—which includes among its managers many eminent naval officers, and not a few of our own subscribers, we are glad to know—we will give a short summary of what it did last year in pursuit of its beneficent objects. In the first place it added 15 to the number of its life-boat establishments, of which it now possesses 81. It was also engaged in completing and re-organising the life-boat stations on the Norfolk coast, which have been transferred to its management and control by the merging of the Norfolk County Association into the Institution. The Tees Life-boat Society was also united with it, and its three life-boat establishments were re-organised and re-equipped. New life-boats were stationed in England at Cromer, Mundesley, Bacton, Winterton, Yarmouth (2 boats), Aberdovey, and Fleetwood; in Ireland—at Dundalk, Carnsore, Tramore, Dungarvan, and Newcastle, the last-named in lieu of a previous boat; and in Scotland—at Fraserburgh and Lossiemouth. New boats were also got ready to be sent to Exmouth and Kilmore. All these boats are on the self-righting principle, of which the committee continue to receive the most satisfactory reports. (We may mention incidently that one instance occurred of a single-banked self-righting boat having been upset by broaching-to when running before a heavy broken sea on her return from a wreck off Dungeness. Although this accident took place in the middle of the night, and at some distance from the land, yet the whole of the crew regained their boat after she had self-righted, which she immediately did, and not one of them was even hurt on the occasion—a striking proof of the value of the self-righting principle adopted by the Institution, and of the efficiency of the life-belts with which the crews of its boats are all provided, and which they are compelled to wear whenever they are on service). Anxious to make the valuable properties of the boats universally known, the Committee forwarded to the Governments of foreign maritime countries, and to the Colonial Governments of this Empire, lithographed drawings of the boats, and also of the transporting-carriages used with them, similar to those described on page 253 of this Number. The expense of these drawings was defrayed, at his own desire, by His Grace the Duke of Northumberland, the President of the Institution. The satisfactory result was that the builders to the Society were ordered to construct life-boats by the Governments of Russia, Prussia, and Portugal, and by some of our own Colonial Governments, the Committee being in every case requested to superintend their construction. Some of these boats have already arrived at their destination, and given much satisfaction. The life-boats of the Institution were instrumental in saving 110 lives during the past year. They also went off on 29 occasions to the assistance of vessels showing signals of distress, but the crews of which were eventually enabled to remain on board them, or were brought ashore by their own or other boats. Although some of these services were of the most arduous and dangerous character, they were performed without the loss of a single life. New life-boat carriages were built during the past year for Fraserburgh, Berwick, Boulmer, Alnmouth, Whitburn, Hornsea Cromer, Mundesley, Bacton, Winterton, Yarmouth, Camber, Bideford, Aberdovey, Groomsport, Newcastle, Carnsore, Tramore, Dungarvan, Ardmore, and Ballycotton. Further experience has suggested improvements in the construction of these important adjuncts to a life-boat, which the Committee have not failed to adopt. New boat-houses have been erected at Fraserburgh, Whitburn, Bacton, Winterton, Yarmouth, Penmon, Aberdovey, Groomsport, Newcastle, Tramore, and Ardmore; whilst others are in course of construction at Redcar, Fleetwood, Exmouth, Lossiemouth, and Dungarvan.

The total number of lives saved from shipwreck on our coasts during the past year, as stated in the Official Return of the Board of Trade, is as follows:—

By life-boats	206
By luggers, coastguard boats, and small craft	719
By assistance from shore with ropes, mortar apparatus, &c.	210
By ships' own boats, and steam vessels	394
By individual exertion of a meritorious character	26
Total	1,555

Although by these returns a much larger number of lives are represented as having been saved by ordinary boats, ships' boats, &c., than by life-boats, yet it must be borne in mind, as the officers of the Institution state, that the majority of such services have been performed under circumstances of little or no danger; whereas the life-boats are, for the most part, only called into requisition when the sea is too heavy and the wind too high for an ordinary boat to venture out. It has been reported to the Committee, by Coastguard officers and Lloyd's Agents, that upwards of *sixty* additional life-boats are required on the coasts. It may be reasonably anticipated, when the means for saving life on our shores have been thoroughly completed, that few lives will be lost from disasters at sea that could possibly be saved by human skill and exertion.

The total number of persons saved from shipwreck since the first establishment of the National Life-Boat Institution, and for rescuing whom the Committee have granted honorary and pecuniary rewards, is shown in the following list:—

In the Year	No. of Lives Saved.	In the Year	No. of Lives Saved.
1824	124	1842	276
1825	218	1843	236
1826	175	1844	193
1827	163	1845	235
1828	301	1846	134
1829	463	1847	157
1830	372	1848	123
1831	287	1849	209
1832	310	1850	470
1833	449	1851	230
1834	214	1852	773
1835	364	1853	678
1836	225	1854	355
1837	272	1855	406
1838	456	1856	473
1839	279	1857	374
1840	353	1858	427
1841	128	Total	10,902

This good work is not, of course, carried on without large funds, and we would urge the claims of the society to pecuniary support upon our readers. We take no pains to picture either the blessed consequences which attend its labours, or the calamities which it so successfully prevents. Each reader can do this for himself. All we say is, that he who has money to spare for a genuine work of mercy—a work free from those defects which taint very many of our so-called charitable societies — cannot possibly do better than bestow it upon the National Life-boat Institution.

THE ENFIELD RIFLE.

The impossibility of loading the Enfield rifle in India after the first few rounds, as alleged by the special correspondent of the *Times*, is placed altogether beyond doubt by the corroborative testimony which has reached this country from time to time. One example, quoted by Mr. Wilkinson in a pamphlet published some months since, may be taken as a specimen of the statements made by professional men upon the subject. An officer writing from Lucknow, April 7, 1858, after speaking of the number of Enfield rifles that have burst, "not only in action, but at simple ball-firing parades," says, "they all invariably, without one exception, go about four inches or less from the muzzle. Why or wherefore they so conduct themselves I cannot conceive, for I have suggested dirt, inversion of the bullet, foreign bodies, careless loading, &c., and each and all were disproved before my own eyes by careful men's muskets bursting without rhyme or reason, and this in an enormous per-centage to the force employed. *Add to this the impossibility of loading after a few rounds out here.* In the centre of infallibity (Hythe) you have a climate that produces a lubricity from the dirt, and scarcely impedes loading. On the plains of Oude, with the thermometer as high as an alderman's haunch of venison, and a dry pulverising air, the residium crystallizes instantaneously, and the product is a fair resemblance to an inverted nutmeg-grater, and renders loading *utterly impracticable.* Mind, I know what I am saying, and am unbiassed; moreover, I am enthusiastically fond of the Enfield and its practice, but in the two points I name (rather important ones), it is a failure as to an arm for the service."

This officer not only records the evil, but also throws much light upon the cause of it. It is the climate of India that occasions all the mischief. In the first place, the fatty matter composing the grease of the cartridge is to a certain extent dried up by the heat, while what is left of it is changed into a wax-like material which clings to the interior of the barrel and fouls it. Then, again, as this writer says, the residium is crystallized instantaneously in the dry air, and thus is produced a roughness which, of course, diminishes the bore, and prevents the entrance of the new cartridge, which, under the most favourable circumstances, would fit the bore with great nicety.

But why need we argue this part of the question? The fact is no longer, we believe, denied by the authorities at home. The evil is admitted, and in order to remedy it the diameter of the charge has been reduced. But hereby, unhappily, another and still greater evil has been produced, for the arm no longer possesses the indispensable quality of accuracy at considerable ranges. This will probably be denied also, and the results of Woolwich practice with the new ammunition will be brought against us. Forewarned of this, we must fore-arm ourselves likewise. And this we will do by stating fearlessly that the results of experiments sent forth from Woolwich are not esteemed reliable either by the public or by the gun-making profession. Whether there is anything in the atmosphere of Woolwich peculiarly favourable to good shooting, we do not know; but we do know that such shooting as is made there can nowhere else be obtained—in trials, that is, of arms to which the authorities are known to be favourable. This fact has been frequently tested, and we know not how to doubt it.

As a correspondent wishes to know "how the oval-bore Lancasters, supplied to the Ordnance, have answered," we must add a word or

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two in respect to these weapons. The Lancaster rifles have answered admirably in the hands of the sappers in India. No complaints of any kind have, so far as we can learn, been made of them; on the contrary, they have been reported upon with unqualified favour. We make these statements on the authority of military officers who are able to speak to the facts from personal knowledge. Indeed, so far as the difficulty experienced in the loading of the Enfield rifle is concerned, a similar evil cannot occur with the Lancaster arm. This will be plain on consideration. In the Enfield rifle, a cylindrical charge has to be inserted in a cylindrical barrel. Consequently the smallest solid obstruction at any part of the bore throws the centre of the charge out of the centre of the barrel, and jams the one in the other. The Lancaster arm possesses a curious, but most important, immunity from this evil. In it, a cylindrical charge (the ordinary service ammunition) has to be inserted in an elliptical barrel, and the one therefore touches the other along two lines or two series of points only, viz., at the minor axis of the barrel. Consequently an obstruction, or even numerous small obstructions, may lodge themselves in the barrel without offering any obstacle to the descent of the charge. The fouling of this arm therefore is scarcely, if at all, possible all the time ordinary care is taken of it. And by ordinary care we mean such care only as troops can be expected to bestow upon their arms under the exigencies of arduous campaigns. Our troops in India, for example, as everybody has learnt from the *Times'* special correspondent, have been severely pressed. The rapidity and continuance of their movements have been so great that the men could not possibly keep their arms in their usual order. The arms should therefore be such as will retain their efficiency despite the unavoidable neglect of these Indian marches. This, we are confident, the Lancaster rifle will do. Of its accuracy we need not add a word, its decided superiority to the Enfield arm having been so frequently demonstrated lately in the official trials at Chatham and elsewhere.

In conclusion, we would ask—if the authorities really desire to render the Enfield gun as efficient as possible, notwithstanding its defects—whether it would not be worth their while to try if Captain Norton's gossamer cartridge will remove or reduce the evil experienced in Oude. We believe it would.

THE REWARD OF A MILITARY INVENTOR.

We sit down to write this article with peculiar feelings, having just returned from one of those philanthropic meetings at which the bright particular stars of our aristocracy are now wont to display their splendours. The voices of the Earl of Carlisle, the Earl of Shaftesbury, the Earl of Albermarle, Lord Radstock, and, above all (for the moment, at least), of Lord John Russell, still linger in our ears, and with them the "clink of compliment"—compliment to the working classes, of course! The aim of their persuasive eloquence was a very honourable one most assuredly, for it was that of establishing free drinking fountains for the masses throughout the metropolis, to the extent of 400 or more. Success to so sensible and serviceable a work! But it certainly seems a remarkable fact that while our governing classes have hearts so accessible to charitable emotions, and find so much time for "labours of love," they should be sadly insensible to that which, in our plain way, we prefer to charity—viz., justice and right! We say—with as much confidence as sorrow—that there is no civilized country under the sun in which the public administrators are more callous, more dead to common honour, not to say common honesty, than they are in England. Especially is this true in respect to their conduct towards that class of men to whom this country owes far more of its material greatness and security than to any other—the inventors and improvers of our mechanical arts. We verily believe it would be no exaggeration to say that we *kill* more men of this stamp than we reward.

This is, however, too large a subject to be treated here in any general way; we must, therefore, confine ourselves to the one case of improvements in military weapons, and to the one improver of them whom we had in our minds when we sat down to pen these lines, viz., the gallant and veteran Captain Norton. In the history of this officer's career, up to the present point, we have a succession of facts which rise up into a towering monument of dishonour—dishonour not only to the successive civil and professional chiefs of the military class, but also, we fear, indirectly to the profession itself. We could substantiate this statement by abundant evidence, gathered from sources which are not to be doubted; but in order to confine our remarks to the narrowest limits possible, let us name only a few of the more important of the gallant officer's inventions. To him we owe the so-called Minié bullet in its best form—the concussion fuse—the liquid-fire shell—and lead-coated projectiles—four things which have no parallels, in so far as their value to military science is concerned. We do not say we have openly received all these from Captain Norton. On the contrary, one great ground of our complaint is that we have obstinately rejected his offers of them, only to receive them (or most of them) later from the hands of others. A letter written by Lieut. Col. Beamish, in 1852, and published in the *United Service Magazine* for August of that year, sets forth the facts of the case, so far as they had then proceeded, in a very clear manner; and to this we must refer our readers. Besides this, the former and present volumes of our own Magazine bear ample evidence of the magnitude and success of the gallant officer's improvements. The *Journal of the United Service Institution* for November last likewise contains a résumé and description of many of them.

Here, then, we have a man of great and admitted merit as an inventor of military weapons, and one who still, in the advanced stages of his life, is affording renewed evidences of his zeal and skill daily, as the military columns of the *Times* have lately shown with much prominence—a man, therefore, who is lifted out of the category of those who by happy chances do us service, and ranks with those who benefit us by the life-long devotion of extraordinary faculties. And, more than this; for Captain Norton earned honours as a military officer in the six Peninsular campaigns, and shared the perils even of the "bloody Albuera," before he began his work as an inventor. And if even more be needed—to satisfy the predilections of the upper ten thousand—more may yet be said, for, upon the authority of Colonel Beamish, we may state that Captain Norton is the lineal representative of Parrice de Rynville, second brother of Thibbault (Theobald) de Rynville, Constable of Normandy, in the time of William the Conqueror. Parrice married the sole heiress of the Baron of *King's-Norton*, in Worcestershire, and took the name of *Norton*, according to the custom of the time. Captain Norton is, therefore, the representative of the Barons of King's-Norton, in the female line. (See Burke's Heraldry). In the family records, nearly three hundred years old, are the following Latin lines, which may have had their influence upon the professional choice and labours of the gallant inventor:—

"Est aliquid clarus magnorum splendor avorum,
Illud posteritas emula calcar habet."

Here the Government may surely discover sufficient claims for recompense and distinction. How is it, then, that such a man as this still moves about neglected amid the most generous people on earth? How is it that of all the millions granted annually by this nation for military services, not a fraction is spared for the reward of such services as his? Is it because we are ruled by a class out of most of whom all true honour has departed, and who can do nothing but clutch at place, and power, and perquisites for themselves—who have not even a blush left in them for deeds which would make the cheeks of poor men flame? Because, if it be so, it is high time that a hearty hatred and contempt of that class were engendered, and its place supplied by men of nobler spirit.

THE ARMSTRONG GUN.

There is so manifest a want of novelty in some of the principal features of the Armstrong gun that we are not surprised to learn that the granting of Sir William's patent has been opposed. Oppositions to it have been entered by several inventors. In consequence of this, and as there is much more to be said respecting the history, at least, of this gun than has yet appeared, and as, moreover, certain individuals are making an improper use of our former article, and some are even publishing volumes upon the subject—volumes containing nothing (except errors) in addition to what we there made public—we propose bringing together a mass of information respecting the gun in our next number. In doing this we shall draw largely upon papers drawn up at various times by Sir William Armstrong himself, and shall also point out the inventors who have forestalled him.

PATENTS FOR INSTRUMENTS AND MUNITIONS OF WAR.

The Government measure for putting the inventors of instruments and munitions of war more hopelessly than ever into the hands of official persons who know nothing whatever about such instruments and munitions, has passed both Houses of Parliament, and received the Royal Assent. In its progress it has undergone no change or amendment of any kind, except that in the printed Act the authors have taken our hint respecting Clause X., and instead of printing in the margin, as they did in the margin of the Bill, an unmeaning sentence, they have merely printed—"No *scire facias* to be brought." We have only now to watch the operation of the measure.

Parliamentary Proceedings.

CONDENSED FOR THE "MECHANICS' MAGAZINE."

THURSDAY, APRIL 7.

HOUSE OF COMMONS.

CAPTAIN KYNASTON'S INVENTION.

Sir G. Pechell called attention to the valuable invention of Captain Kynaston, R. N., for lowering boats, the value of which had lately been demonstrated on board H. M. ship Euryalus, when, a seaman having fallen overboard off Alexandria, the boat was lowered in a strong wind and heavy sea, the ship going eight knots through the water, and the man was saved. He (Sir G. Pechell) wished the right hon. baronet to obtain a report of the different trials made of Captain Kynaston's disengaging hooks, and, as rewards were given for valuable inventions for the destruction of life by means of explosive materials and large guns—as baronetages, and perhaps peerages, were the rewards of such inventions—it was certainly expedient that some due acknowledgement should be awarded to those who had projected the means of saving life. Captain Kynaston was suffering from wounds sustained in the Crimea, and his case was in every way deserving of consideration.

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Sir J. PAKINGTON said the experimental trials of the invention were not completed, and the Admiralty were not yet in possession of any report on the subject. He sympathised most sincerely with Captain Kynaston under his sufferings, which were the results of valuable services rendered to his country, and he also felt grateful to that gallant officer for the endeavours he had made to bring to perfection a most useful invention for the preservation of life. He heartily hoped, for the sake of the gallant officer, that his invention might prove successful.

SIR W. ARMSTRONG'S GUN.

General PEEL proposed a supplementary estimate of £30,000 for the establishment of a manufactory of Sir William Armstrong's guns at Woolwich, to be under the immediate superintendence of that gentleman.

MR. MALLET'S MONSTER MORTAR.

Lord PALMERSTON asked what had been done with regard to the large mortar invented and made by Mr. Mallet. He understood that there had been several trials of this weapon, that in the main it had succeeded, and that, though parts of the mortar had at different times given way, these defects had been on each occasion remedied. At the last experiment one of the stays which held together the segments of which the mortar was compounded, being more tightened than the other stays, and having therefore to bear the whole strain of the explosion, gave way, but another stay was ready, and that accident was no proof whatever of failure. Hitherto, he understood, the mortar had not been tried with a full charge calculated to produce the greatest range of flight, and as yet no experiment had been made, by burying one of the shells to the depth to which it would probably penetrate when falling loaded at the end of its flight, and then exploding it while so buried, in order to see what would be the extent of the crater which the explosion would produce. He thought it exceedingly important that the weapon should be tried to the utmost, and he wished to know, therefore, whether these trials had been made, and, and if not, what reason existed for not carrying the experiments further, so as to ascertain the applicability of the mortar for warlike purposes.

General PEEL said he had had no notice of the question, and therefore could only speak from memory, but as far as he recollected an expense of nearly £13,000 had been already incurred in the trial of this mortar, and the last report of the Ordnance Committee was to the effect that they did not consider it advisable to continue these experiments. He did not say that the experiments should not be renewed, but at the present moment the Ordnance Committee did not think it advisable to incur any further expenditure in this way.

FRIDAY, APRIL 8.

HOUSE OF LORDS.

The Royal assent was given by commission to the Patent Law Amendment Bill (Munitions of War).

NEW MODE OF JOINING PIPES.

AFTER the meeting at the Institution of Civil Engineers, on the 29th ult., Mr. Siemens (Assoc. Inst, C. E.) exhibited a machine of his invention, manufactured by Messrs. Guest and Chrimes, for joining lead and other pipes by pressure only. The machine consisted of a strap of wrought iron in the shape of the letter V, and of three dies, two of which were free to slide upon the inclined planes, while the third was pressed down upon them by means of a screw passing through a moveable cross-head, embracing the sides of the open strap. The pipes to be joined were placed end to end, and a collar of lead was slipped over them. The collar was then placed between the three dies, and the pressure was applied, by means of a screw-key, until the annular beads or rings projecting from the internal surface of the dies were imbedded into the lead collar. The machine was then removed, and a joint was formed, capable of resisting a hydraulic pressure of 1,100 feet. The security of the joint was increased by coating the surfaces, previously to their being joined, with white or red lead. The advantages claimed for this method of joining lead or other pipes over the ordinary plumber's joint, were the comparative facility and cheapness of execution, as the cost of a joint of this description was said to be only about one-third or one-fourth that of the plumber's joint. A machine of a similar description was also used for joining telegraphic line wires, a specimen of which was likewise exhibited by Mr. Siemens.

CHESS AND DRAUGHTS FOR THE POCKET.—We are pleased to observe that a simple and ingenious combination of "men," &c., for playing these games has been produced especially for the use of the working masses. It comprises a flat box about four inches square, containing a folding board; also flat chess-men, stamped in gold on dark purple and white grounds, the reverse of which form draughts. All go easily in the pocket; and, for the convenience of the reader, we add, may be had post free, by sending seven stamps to Mr. Beal, 4 Grove Terrace, West Ham, Essex, E.

THE SURVEYOR OF THE NAVY'S REJOINDER TO LORD CLARENCE PAGET.

THE following documents have been prepared by the Surveyor of the Navy, in reference to Lord Clarence Paget's statement in the House of Commons on the 11th March. In a third column, we add our own explanations, which are in all respects confirmed by the Official Report, as will be seen:—

STATEMENT RESPECTING SHIPS ALTERED.

Lord Clarence Paget, March 11.

"The Lyra, the Racer, and other noble vessels, began life at 450 tons, but they gradually grew in size until they arrived at 750 tons, when they were launched."

"He would now ask their attention to a case which was almost incredible; some time ago, a frigate, the San Fiorenzo, was being built either at Deptford or Woolwich; she was a great favourite with the London folks, who used to visit her in large numbers, and a beautiful model she was.

"The First Lord asked where she was now? Why she had vanished into thin air—gone, he hoped, to another and a better world."

"Another case was that of the Immortalité, a 51-gun frigate, now being built at Pembroke; that unfortunate ship had gone through a deal of trouble; she was first of all lengthened amidships, last year orders went down from the Admiralty to lengthen her five feet by the bow; certain parties, he did not know who, but he had no doubt persons at Pembroke, thought that to lengthen a frigate five feet by the bow, would be to make an imperceptible alteration, and would have no effect whatever. We lengthened yachts 14 to 20 feet by the bow; but the authorities were inexorable, their orders were reiterated, and the poor ship was lengthened five feet by the bow. The result was as might be naturally supposed, that either the First Lord himself, with his fine nautical eye, or some other member of the Admiralty Board, saw, upon visiting her, that she was not fit to go to sea, and ordered her to be pulled down again and lengthened 15 feet."

"The Orlando, the Mersey, and indeed almost all that class of ships, had been treated in a similar manner."

"He wished to speak of the reckless alterations of new ships, their name was legion, almost every ship was altered; take the case of a three-decker, the Howe, 121 guns; she was laid down only last year or the winter before, but the dockyard people were now pulling her down to put a new bow upon her. Had any great improvement been made in the bows of ships within the last 2 years? Nothing of the kind had taken place."

Surveyor of the Navy, March 29.

The Lyra of 488 tons, and the Racer of 577 tons, were built in 1857 as originally designed, without having undergone any alteration, and none of the vessels of these classes built or building have undergone any alteration.

The San Fiorenzo, a 50-gun sailing frigate, designed by Messrs. Read, Chatfield, and Creuze, was laid down in June, 1850; she was in frame at Woolwich, and had a few streaks of her wales and diminishing plank temporarily fastened by screw bolts, when orders were given to take her down in 1856. She could not have been lengthened to convert her into a screw frigate on the slip on which she stood, it being too short; moreover, her form of section and scantling were ill-suited to such an alteration. Her timbers were in consequence reconverted for building the corvettes, &c., at that yard. The loss by reconversion could not have been considerable, but whether much or little, it was consequent upon the transition from sailing to screw ships. It would have been out of the question to complete this frigate as a sailing ship.

The Immortalité was laid down in November, 1849, and partly built as a 50-gun sailing frigate, and on the 9th June, 1856, she was ordered to be converted into a screw frigate, in the same manner as the Emerald had been, and the Melpomene was being converted, viz., lengthened forward, 5 feet; amidships, 33 feet 6 inches; and aft, 12 feet 1 inch. It was subsequently decided—viz., in December, 1857, to increase the length of the Immortalité, by the bow, an additional 14 feet, with a view of ascertaining beyond all doubt the value of that improvement by actual trial with her sister ship the Melpomene. Her bow was then only in frame. It was estimated that the difference of expense between lengthening the bow 19 feet at one operation, and doing it at two separate times would be about £200. The actual expense was £257 10s.

The Orlando and Mersey, the only ships of this class, were both begun in September, 1856, and were completed in strict conformity with the drawings without any alteration.

The Howe was ordered to be built in January, 1855, and in December, 1857, it was decided to lengthen her by the bow 15 feet, with a view of ascertaining, by actual trial with the Victoria, a similar ship, the advantage which would be gained by finer lines. She was at that time in frame only. This is the only ship designed for the screw during the last eleven years which has undergone any alteration. The actual expense of taking down the timbers, and retrimming and replacing them, was £384 5s. 3d.; and this is the only sum expended on all the screw ships designed within the last eleven years, which might have been saved if the views subsequently carried into effect had been adopted in the first instance.

The responsibility of having recommended to the Board the alteration in which this so-called wasteful expenditure was incurred, and about which so many erroneous statements have been made, rests with the Surveyor of the Navy.

B. W. WALKER,
Surveyor of the Navy.

Admiralty, 29th March, 1859.

From the MECHANICS' MAGAZINE *for March* 18, 1859.

The vessels Lyra and Racer have undergone no kind of alteration whatever.

The facts respecting this ship (the San Fiorenzo,) are very simple. Before the use of the screw became general, she was laid down at Woolwich as a sailing frigate 188 ft. 9 in. long. After she had been put into frame, and before her planking was nearly completed, it was proved advisable to discontinue building sailing ships of war. In order to convert her into an efficient screw ship, it would have been absolutely necessary to length-en her nearly 50 ft.... But unfortunately the slip at Woolwich would not admit of the extra length being added, and from the extreme narrowness of that dockyard at the building end of it, the slip itself could not be lengthened.... The only course left, therefore, was to take down the frame of the ship, and apply its timbers in the construction of some other vessel.

For the lengthening of the bow of the Immortalité, Sir Charles Wood was responsible, and has since made, in the House of Commons, the following statement respecting it:—"The fact is," he says, "the ship was in frame, and it was only necessary for the purposes of the alteration that a few bolts should be removed; the whole of the extra expense being the mere cost of additional labour. I may add that the reason why the change was made was to secure the advantage of her having fine lines at the bow." This statement is, we can assure our readers, perfectly true, and we need only add that the first lengthening of the ship amidships was absolutely essential to her conversion from a sailing ship into a screw.

With regard to the Orlando and the Mersey, we have only to offer an unqualified contradiction to Lord Paget's assertion. These vessels have never been lengthened or interfered with in any such way since their keels were first laid.

Of the first case adduced—that of the Howe—we have but little to say, because it happens that the alteration to which she has been subjected was never altogether approved by ourselves. That alteration, however, in the vessel has by no means involved the "pulling down" of the ship, as Lord Paget implies. And if no great improvement has been made in the bows of ships during the last two years, facts have been observed which induced the Admiralty to consider a further increase in the fineness of the bows of our large screw ships desirable; and it was in consequence of this, and not from mere wantonness, of course, that the change in the bow of the Howe is being made.

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STATEMENT showing the Votes and Expenditure for Ten years, from the 1st April, 1848, to the 31st March, 1858.

AMOUNTS VOTED.

Statement of Lord C. Paget.	£	*Admiralty Statement.*	£
Vote 8.		Vote 8.	
Wages at home yards, &c.	6,963,844	Wages at home yards, &c.	7,140,970
Vote 9.		Vote 9.	
Wages abroad.....	389,752	Wages naval establishments abroad.....	340,586
Vote 10.		Vote 10.	
Naval Stores, exclusive of coals for steam-vessels, and purchase and repair of steam machinery.....	10,180,194	Naval stores, *exclusive* of coals and steam machinery	10,730,204
		For ships built by contract, and for ships purchased, exclusive of machinery.....	2,207,367
Amount of excesses during the eleven years on the sums above voted.....	1,861,154	Amount of excesses during the eleven years on the sums above voted.....	1,887,810
Total.....	£19,399,944	Total.....	£22,306,937

Admiralty, 29th March, 1859.

AMOUNTS EXPENDED.

Statement of Lord C. Paget.		*Admiralty Statement.*	
For building new vessels...	6,000,000	Expenses incurred in building ships.....	4,948,378
For sailing ships which might have been built...	400,000		
For converting sailing ships into screws.....	630,000	For converting sailing ships into screws.....	323,118
Wear and tear of ships in commission (an *average* number) during the 11 years, at 6 per cent. on the estimated cost	5,929,000	Making good defects, refitting, and fitting ships for sea and in commission (including the fitting, &c., of 309 gun-boats and other vessels, built by contract,) troop and store ships, yachts, tenders, &c.; fitting ships for the several divisions of the steam reserve, and in repairing ships	6,950,766
Maintaining ships in ordinary	550,000	Maintaining ships, hulks, &c., in ordinary.....	235,438
Estimated excess of stock of naval stores on 31st Dec., 1858, over 1848...	500,000	Value of stock of naval stores in the home yards on the 31st December, 1858, in excess of that on the 31st Dec., 1848...	1,550,000
		Expense incurred in foreign yards for the repair, &c., of ships (exclusive of coals).....	529,424
		Value of stores sent from England to foreign stations, not included in amounts for foreign yards	353,939
		Value of stores purchased by captains of ships in commission, consuls, &c., for the refit of the fleet (exclusive of coals)	340,000
		Expenditure under Votes 8 and 9 for extra pay to artificers of the fleet.....	91,436
		Incidental expenses, including those for navigating ships from one port to another, and for stores supplied to barracks, hospitals, victualling yards, &c.	157,1 2 1
		Expenses incurred in moorings, cables, buoys, &c.; transporting and docking ships, cranes, carts, capstans, &c.; repairs to Yard transports, lighters, barges, and boats; receiving, delivering, landing and shipping stores and timber; canting, carting, pitting, and issuing timber, &c.	2,469,747
		Stores supplied to other departments of Government and Foreign Powers, and to private individuals. Sale of Offal Timber, &c., paid into the *Exchequer*, and which formerly went in *aid* of Vote 10	1,057,639
		Vessels built by contract and purchased (exclusive of machinery)	2,666,404
		Surplus amounts on Votes 8, 9, and 10, in the years 1849-50, 1850-51, 1851-2, 1853-4, repaid into the Exchequer	627,034
		Amount of *unsettled claims* on Foreign Powers and private individuals	13,324
£14,009,000		Total of Expenditure	22,313,768
		Total of Votes brought forward	22,306,937
		Difference.....	6,831

The difference of £6,831 may be accounted for by the Expenditure for the Year 1858-59 being an Estimate based upon the Expenditure of the Three preceding Years, in consequence of the Accounts for the present Financial Year not being yet completed.

Admiralty, 29th March, 1859. B. W. WALKER, *Surveyor of the Navy.*

Statement showing the Aggregate Tonnage of Ships Built, of the Ships Converted, and of the Ships Fitted, between the 1st April, 1848, and the 1st April, 1859, together with the Cost thereof, as shown in the enclosed Accounts :—

	Tonnage.		Cost.
Ships built, including those converted into screw on the slip	209,408	...	£4,948,378
Sailing ships converted into screw ships in dock	54,700	...	323,118
Ships repaired; ships fitted for commission, for sea, for advanced ships, and for steam reserve; including those which were built by contract, or bought into the service, and subsequently fitted in the dockyards	914,371	...	6,950,766

B. W. WALKER, *Surveyor of the Navy.*

Admiralty, March 29th, 1859.

Besides these documents, the surveyer of the Navy adds a statement showing the expenditure incurred in each year for the various works and services performed from 1848 to 1859; a list of all ships and vessels built and converted in the Royal Dockyards between 1st of April 1848, and 1st of April, 1859; and a list of vessels built by contract and purchased, which have been completed and fitted for sea in the same period.

THE ESTIMATES OF THE ENGLISH AND FRENCH NAVIES.

*An Abstract of a Report of a Committee appointed by the Treasury to inquire into the Navy Estimates, from 1852 to 1858, &c.**

The authors of this report are Mr. G. A. Hamilton, Secretary to the Treasury; Mr. H. T. L. Corry, Secretary to the Admiralty; Sir R. M. Bromley, K.C.B., Accountant General of the Navy; and Mr. W. G. Anderson, Chief Clerk in the Treasury. Feeling that it belongs to the Cabinet alone to determine, on considerations of State policy the amount of force requisite for maintaining the naval supremacy of Great Britain, and the measures to be adopted for that purpose, they profess to have studiously avoided giving expression to any opinion of their own on such subjects, and to have confined themselves to the investigation and statement of facts. "It has been," say they, "our object to arrive at the utmost degree of accuracy as regards these facts; and we have offered only such suggestions as appeared to us to arise immediately out of the facts themselves."†

The total amount of money voted for the navy :—

In the financial year 1852 was		£5,835,588
,, ,, 1858		8,851,371
Vote 1, for Sea Wages	(in excess of 1852)	£858,374
,, 2, Victuals	ditto	482,850
,, 8, Artificers	ditto	299,992
,, 10, Stores	ditto	507,247
,, 11, New Works	ditto	320,722
,, 17, Services not Naval (transport of Troops)	ditto	282,900
		£2,752,285

Showing an increase of £3,015,783, being 51 per cent. on the votes of 1852.

This increase arises mainly under the following votes :—

The first illustration of modern additions to the expense of sea-wages which is adduced by the reporters is that which has been occasioned by the substitution of steam for sailing ships of war, and by augmented rates of pay given to certain officers since 1852. They present the following comparison between a sailing line-of-battle ship and frigate, and steam-ships of the same classes :—

	Guns.		Men.		£
1858, "Marlborough," steam	131	...	1,100	...	35,248
1852, "Britannia," sailing.....	120	...	970	...	26,693
Increase in 1858					8,555
1858, "Shannon," steam	51	...	560	...	19,341
1852, "Arethusa," sailing.....	50	...	500	...	14,585
Increase in 1858					4,756

A considerable part of the increase in the complement of men, as between a steam-ship and a sailing-ship of similar armament, results from the establishment of engineers and stokers, which is an addition to the ordinary complement for working the ship and her guns.

In the Navy Estimates it will be found that almost every vote is influenced by the number of men. An increase in the number of seamen involves a corresponding increase in the force of ships, in the expense of bringing them forward and fitting them for service, and providing for wear and tear. In the establishments at home, one cause of increase is the larger number of superintending officers requisite in the dockyards, victualling, medical, and other establishments, to superintend the additional men employed. Again, in the vote for artificers at home, which were in 1852, £666,929, in 1858, £966,921, the increase is attributable to the larger number of artificers and workmen employed in the dockyards, &c., in the present year. Take two items :—

	Artificers, &c., Employed.		Annual Increase.	Increase per cent.
	1852.	1858.		
Dockyards.....	9,960	12,215	2,255	22
Steam factories for repair of engines	1,046	2,361	1,315	125
Total	11,786	15,499	3,713	

* In preparing this abridgment we have excluded all matters which have no professional interest for our readers.

† It has been considered right to omit from the published Report various passages founded on confidential reports and communications made to the Government. The statements respecting the French navy are said to have been derived from authentic sources.

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The addition to the rates of pay, likewise, of various trades has led to an augmentation of about £45,000, and new factories have been established at Sheerness and Keyham to meet the growing wants of the steam navy.

In the vote for Naval Stores, again, there has been an increase of 57½ per cent. It is obvious that in this vote, and in the votes for establishments and artificers in dockyards and factories, the question of the naval strength of England in ships of war is involved, as well as that of how far the large expenditure in our naval dockyards has been productive of an adequate return. As this is one of the most important subjects connected with the Navy Estimates, the reporters enter into some details explanatory of the causes of increase, having reference to all the years between 1852 and 1858. The number of men voted for the Navy affects peculiarly the votes for stores and artificers' wages, as the entire cost of fitting ships for sea, and of wear and tear, falls on the estimates of the year, whereas the expense of building new ships, however costly, is spread over a number of years. The cost of a new ship of the first class —the Duke of Wellington—is stated to be :—

For hull—labour	£30,652
„ materials	75,639
	£106,291
For masts, rigging, sails, stores	19,224
For engines and gear	46,220
	£171,735

But the maintaining rate annually is on :—

Hull	£6,377
Masts, &c.	3,748
Engines, &c.	4,200
	£14,325

Being more than 8 per cent. on the original cost, viz., 8 per cent. on hull and masts, and 9 per cent. on engines.

An increased ratio in the cost of maintenance appears to apply to smaller vessels, as will appear by the subjoined note.* Every additional ship, therefore, brought into commission in consequence of the vote which increases the number of seamen in the Navy, may be taken as entailing an annual charge varying from 8¼ to 9¾ per cent. on its original cost, which is expended in the purchase of stores and wages of artificers for maintaining it, thereby rendering necessary both an increase in the quantity of stores and number of artificers.

It is stated by the Surveyor of the Navy that, at the end of 15 years, on an average, the hull of each ship requires a complete and expensive repair; that the duration of a ship cannot be estimated at more than 30 years; that during the last 10 years 35 ships of the line and 46 frigates have been removed from the effective list of the Navy; and that on an average three line-of-battle ships ought to be produced every year merely to maintain the Navy on a proper footing as respects line-of-battle ships. The Surveyor of the Navy states that the present force in the dockyards, which comprises 4,000 shipwrights and apprentices, is not more than sufficient to build three line-of-battle ships, three frigates, and six sloops per annum, besides executing the necessary repairs to all the ships in the Navy. If, therefore, the naval supremacy of Great Britain is to be maintained, it is impossible to deny that a large force of artificers, and a large quantity of stores, materials, &c., must be kept up in our dockyards. The number of persons employed in the dockyards and factories at home, during the present year, is no less than 16,334 persons, including 1,279 convicts. The number employed in the steam factories has increased from 1,046 in 1852, to 2,361 in the present year.

Great efforts were made for several years before 1852 to increase the horse-power of marine engines. In the year 1851, the expenditure for steam engines did not amount to £100,000. In 1852 it exceeded £200,000; in the last six years £?,423,021 has been expended, giving an average of £570,503 a year.

The money votes in the six years from 1852 to 1858 for labour, timber, and stores, for the purposes of building and converting ships, and keeping the Navy in repair, exclusive of the purchase of steam engines and coal, and building vessels by contract, amounted to £14,105,096; the amount provided during the late war for building gun-boats and floating batteries, and other vessels, was £1,633,147, but a sum exceeding £3,000,000 was actually expended. The whole sum expended between 1852 and 1858, and voted in the latter year for labour, including superintendence and materials, but not including ordnance, amounts, it will be seen, to about £24,000,000.

With regard to the adequacy of the return for this large expenditure, the reporters observe that the greater part of the money expended on wages of artificers and the purchase of stores is, of necessity, applied to the general service of the fleet, such as fitting ships for sea, providing for wear and tear, for the purchase of coals, &c.; repairing ships, bringing ships forward for the several divisions of the steam reserve, and other such purposes, leaving only a limited sum available for the building and conversion of ships, and the purchase of new machinery. (See Appendix, No. 11, page 35.)

In the year 1852, the Navy possessed horse-power to the extent of 44,482, in the last six years it has been more than doubled, amounting now to 99,512; the number of steam-ships and vessels has increased from 177 in 1852 to 464 in 1858, the tonnage from 182,562 to 457,881; the guns from 3,045 to 8,246.

In 1852, England possessed afloat, building, and converting the following steam-ships, according to the report of the Surveyor of the Navy :—

	Number	Guns.	Horse-power.	Tonnage
Line-of-battle, 1st rates	4	484	1,600	14,113
„ „ 2nd rates	13	1,147	5,050	38,164
Block-ships	4	240	1,800	7,201
Frigates (including 7 now reduced to sloops)	28	620	11,497	41,435
Smaller vessels	86	536	19,817	65,444
	135	3,027	39,764	166,357

Total, 135, exclusive of 42 troop-ships and other steam vessels, making an aggregate of 177 steam-ships and vessels, 3,045 guns, and 45,064 horse-power.*

In 1858 England possesses, according to the report of the Surveyor of the Navy, the following steam-ships :—

	Number	Guns.	Horse-Power.	Tonnage
Line-of-battle ships :				
Completed	29			
Receiving engines	4			
Converting	6	4,735	29,050	155,885
Ordrd. to be convrtd.	1			
Building	10			
	50	4,735	29,050	155,885
Block-ships	9	540	2,800	16,033
Frigates (aftt. screw. 25 and buildg.) pddl. 9	34	1,239	18,690	75,308
Smaller vessels	309	1,688	44,888	173,433
	402	8,202	95,428	420,659

Exclusive of 62 troop-ships, store-ships, yachts, tenders, dispatch-vessels, &c., making an aggregate of 464 steam-ships and vessels, 8,246 guns; horse-power, 105,962, and 457,881 tons.

Of the steam horse-power there is :—

Appropriated	98,532
Unappropriated	1,330
	*99,862
To be supplied (but not yet ordered) for ships building	6,100
Total	105,962

The next class of expenditure to which the reporters direct attention is that comprised in vote 11, under the title of new works, improvements, and repairs of docks, &c. It contains provision not only for the maintenance and improvement of the numerous naval yards at home and abroad, with all their appendages of docks, slips, steam factories, machinery and storehouses, but also for the victualling establishments, hospitals, and marine barracks.

This vote was :—

In 1852	£265,140
In 1858	585,862
Increase in 1858	£320,722

being 120 per cent.

The alteration in the size and length of steam-ships of war which has taken place since 1852, necessarily involved expensive alterations in the docks and slips for the building and repairs of these vessels. The sums actually expended under this vote, during each year, have been £2,855,860. The estimate for 1858 is £585,862. Fortunately for the British Navy, by the foresight of the Admiralty in the year 1844, measures were taken to provide an extensive steam-factory and docks at Keyham (Devonport): £1,259,318 has been already expended on that great work; the estimate for its completion is £265,682, which may be spread over a period of five years. In addition to the works at Keyham, two new docks have been built since 1852; two are now building, five have been lengthened, and three are now being lengthened. Thirteen slips have been lengthened, one has been constructed, and three are now being lengthened. The cost of these improvements has been £388,451; and, in addition, more than £100,000 has been expended in gun-boat slips at Haslar and docks at Malta; 186 acres of land and 507 houses have been purchased as additions to the several dockyards, steam-factories, and marine barracks; £124,519 has been paid for these lands and houses. Many of these works are still in progress, and the expense of them may be spread over several years.

(To be concluded in our next.)

* A second-rate, as Agamemnon = 8½ per cent. A fourth-rate, as Euryalus = 8¼ per cent. A sixth-rate, as Curaçoa = 9¼ per cent. A sloop, as Harrier = 9¾ per cent.

* The small difference in horse-power between the amount specified in the table and the statement in the previous paragraph, results from some small engines not supplied.

Literature.

Transactions of the National Association for the Promotion of Social Science, 1858. Edited by G. W. HASTINGS, LL.B., General Secretary to the Association. London: John W. Parker and Son, West Strand. 1859.

THE promoters of the Social Science Association act very wisely in putting forth their transactions in the form of a compact and well-edited volume like that before us. The papers read at their annual gathering have a value which by no means expires with the occasion that calls them forth. A glance into this volume sufficiently proves this, if proof be needed. Here we have well-studied papers by many of the most famous men of the age. Brougham, Russell (Lord J.), Carlisle (Earl of), Shaftesbury (Earl of), Moncton Milnes, Kingsley, Ruskine, Sir James Stephens, Horace Mann, Canon Girdlestone—these are but a few of those who speak to us thoughtfully and earnestly through these pages. Nor do great men only address us; great women also afford us the advantage of their tender and considerate counsels. Florence Nightingale pleads for healthier hospitals, and tells us how to provide them; Mary Carpenter teaches us how to improve our ragged, industrial, and reformatory schools; and Mary Ann Baines expounds to her sex the means by which they may help the health of the nation. We have mentioned great names, but humbler ones are to be found here; Samuel Broome, for example, with his simple crown of crysanthemums upon his brow, stands up to tell us how the poor make gardens, and to pass yet another eulogium upon his pets—the working classes. The Society has been most fortunate in securing the services of Mr. Hastings as secretary. The truly admirable way in which this volume is put forth does him very great credit. It is larger than the first volume by more than 100 pages, but one does not see how it could have been made smaller without

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sacrificing valuable matter. A wise man will undoubtedly add the book to his library.

Sketch of the Civil Engineering of North America. By David Stevenson, F.R.S., M.I.C.E., &c. *Second Edition.* London: John Weale, 95 High Holborn. 1859.

As we have so much engineering work before us in India and other "new countries" Mr. Weale has very properly thought it desirable to re-publish Mr Stevensons' volume, which, as he says, may be justly regarded as a "Sketch of Engineering Practice, applicable in New Countries." It is a work which no engineer, or student of engineering can do without. It affords very copious information respecting the harbours; the lake, river, and stream navigation; the canals, the roads, bridges, railways, waterworks, and lighthouses of North America. We recommend all our readers to obtain it, for there is not one of them whom it will not interest deeply and instruct usefully.

LIST OF NEW BOOKS.

Annual of Scientific Discovery, 1859, by Wells, 7s. 6d.
Argyll's (Duke of) Lecture: Geology, 1s.
Fincham's Laying off Ships, 3rd edit., 25s.
Haslett's Mechanics, Practical Book of Reference, by Hackley, 10s. 6d.
Jean's Navigation and Nautical Astronomy, Part II., 5s.
Liebig's Letters on Modern Agriculture, by Blyth, 6s.
Salmon's (Rev. G.) Lessons introductory to the Modern Higher Algebra, 6s.
Scoffern's New Resources of Warfare, 2s.

Proceedings of Societies.

INSTITUTION OF CIVIL ENGINEERS.

March 22 and 29, 1859.

THESE two evenings were chiefly occupied with a paper on "THE MELBOURNE GRAVITATION WATER-WORKS," and a lengthy discussion thereupon.

April 5, 1859.

The first paper read on this evening was on "A NEW SYSTEM OF AXLE-BOXES, NOT REQUIRING LUBRICATING, AND WITHOUT LIABILITY TO HEATING," by M. Alphonse de Brussant. The improved axle-boxes were, it will be remembered, elaborately described and illustrated at p. 122 of the MECHANICS' MAGAZINE, for February 18, 1859, No. 8, New Series.

The second paper read was on "THE PERMANENT WAY OF THE MADRAS RAILWAY," by Mr. Bryce McMaster, Assoc. Inst. C.E. It was remarked that two leading features in the construction of railways in India were, the cheapness of those portions of the works which were entirely dependent upon native labour and the resources of the country, and the expense of those dependent upon England for the supply of materials. Among the latter of these was the permanent way, almost every part of which had, as yet, to be furnished from England. Thus, the portion of the Madras railway, from Madras to Arcot, being a length of 65¼ miles, had been constructed for £6,000 per mile, of which amount the permanent way alone had cost upwards of £3,000 per mile. On this portion of the line the earthwork, for a distance of 25 miles, was for a double line, and on the remainder for a single line only. All the bridges and culverts were for a double way. There was only a single line of rails laid throughout. The expense of freight, from England to Madras, for the first portion of the line was very heavy, owing to the Russian war. A reduction in these charges, as well as in the weight of the rails, would diminish the cost of the remaining portion of the line; although the greater distance to which the materials would have to be led, as the works were pushed on into the interior, would add to the cost as the line advanced. It was found that the Indian iron could not compete with the English, and that the Indian railways could not look for any considerable supply from local sources. But what the country could supply was material for sleepers, as its forests and jungles afforded a great variety of hard and durable woods, well adapted for the purpose. On the Madras railway, twenty-eight different kinds of wood had been used; all of which, with few exceptions, had been found to answer well, when carefully selected. The vibration of the passing trains, and the frequent opening out of the ballast by the workmen, seemed sufficient to prevent the attacks of the white ant. Creosoted fir sleepers, sent out from England, were found to be very durable; but their cost at Madras was 8s. 6d. each, or 9s. 6d. each when led fifty miles to the works, while the sleepers procured in the country varied in price from 4s. to 6s. 6d. each. A few thousand half-round Sál sleepers were kyanised, experimentally, with corrosive sublimate, at a cost of sixpence per cubic foot; but they were not found to be more durable than those of the same wood when unprepared. In the neighbourhood of Arcot granite blocks were used, but not to any great extent, on account of the roughness and rigidity of the road. Near the coast, one mile of line was laid with laterite, but the blocks were found to split, and their use was consequently abandoned. Some native-made keys and trenails were used, but the former were not pressed, and although they did very well in wet weather, in the hot season they shrank so much as to be unfit for use. The trenails, which were of teak, answered very well. In laying the road at first, the natives were found, in almost every other kind of work, intelligent and apt, when care and patience were taken in their instruction. The damage to the line from settlements and slips, from the effects of the monsoons, had been much less than was anticipated.

SOCIETY OF ARTS.

April 6.

THE paper read was on "EMBROIDERY BY MACHINERY," by Mr. George Wallis. The object of the paper was simply to give a popular description of the leading features of the embroidering machine, and to illustrate its practical use and capabilities by specimens of textile decoration produced by it. The paper was illustrated by a large number of fine specimens of machine embroidery, lent by Messrs. Houldsworth and Co., of Manchester, as well as by several working diagrams prepared by Mr. Wallis. Messrs. Wilson and Newton exhibited their Boudoir Sewing Machine. The Secretary called attention to an instrument, invented by the Rev. W. Taylor, for enabling the blind to work sums in arithmetic, and solve algebraical problems. A description of the instrument will be found at page 328 of the Society's *Journal*.

ROYAL AGRICULTURAL OF ENGLAND.

Monthly Council, April 6.

HIS Grace the Duke of Marlborough, President, was in the chair. The current cash-balance in the hands of the bankers was £2,206. The Journal Committee recommended that the paper on "POTATOES," by Dr. Lang, ordered to be reprinted, should be reduced so as to be published at a very cheap rate for the use of cottagers. Lord Berners, Chairman of the General Warwick Committee, reported to the Council the satisfactory progress made in the preparations for the Society's ensuing country meeting, to be held at Warwick in the week commencing Monday the 11th of July. Mr. Fisher Hobbs brought forward a motion to recind the resolution of the 5th of May last year. The Council divided, when it was found that the Council by a large majority adhered to their resolution of last year, in which the Local Committee at Warwick had already recommended that there should be no dinner at the Warwick meeting. Memorials were received from Canterbury, Croydon, Guildford, and Reigate, on the subject of the country meeting to be held next year in a district comprising Kent and Surrey. An Inspection Committee was appointed to visit the proposed sites, and report on their suitableness. The Council adjourned to the 13th of April.

ROYAL GEOGRAPHICAL SOCIETY.

April 11th, 1859.

A CROWDED meeting of this Society was held on Monday evening at Burlington-house, Sir R. I. Murchison, President, in the Chair.

ELECTIONS.—Viscount Emlyn, M.P., the Hon and Rev. F. S. Grimston, the Rev. James Booth, LL.D., the Hon. George Barrington, Captain T. Birch, R.N., Consul W. T. Pritchard, and E. C. Buckland, H. D. P. Cunningham, R.N., T. W. L Mackean, W. W. Montell, and W. Wheelwright Esquires, were elected Fellows. A very rare French atlas of Egypt, published by the Dépôt de la Guerre, in 1807, presented by Mr. Stephenson; and a diagram of Captain Selwyn's apparatus for paying out electric telegraph cables were exhibited to the meeting. The President regretted to announce that the hopes entertained for the safety of Mr. Adolphe Schlagintweit had proved fallacious, as it appears from papers which had been communicated by Lord Stanley, F.R.G.S., the Secretary for India, that he was barbarously murdered at Kashgar by a fanatic Synd, named Wolle Khan.

The papers read were:—

1. "ON A NEW PROJECTION OF THE SPHERE," by Sir J. F. W. Herschell, Bart., D.C.L., &c. Communicated by Sir R. I. Murchison. The author observes that his projection offers several, and among others the following:—"Peculiar advantages for geographical purposes, when the whole, or at least the whole accessible part of the globe, has to be mapped down on one sheet. For, first, it gets rid of the extravagant distension in high latitudes, at least on one side of the equator, which the mercator projection necessitates. Second. Like that and the stereographic projection it exhibits all small portions of the sphere in their true forms without distortion of figure. Third. It exhibits large portions (as whole continents) under very much less variation of scale where great amplitudes are concerned than the stereographic, and for the whole of one hemisphere than the mer[illegible] while for the other, as far as the 50th degree of latitude, it is no way offensive. Fourth. It takes in one view the whole accessible surface," &c.

2. "BRIEF REMARKS ON THE ISTHMUS OF SUEZ; WITH SPECIAL REFERENCE TO THE PROPOSED CANAL, &c." By Commander Bedford Pim, R.N., F.R.G.S. The author gave numerous reasons for considering the cutting of a canal across the Isthmus of Suez impracticable, and concluded with a proposal for shortening the route to India, by continuing the railway along the banks of the Nile, from Cairo to Assuan, and thence across the country to Berenice, thus effecting, according to his estimation, a saving of two days as regards time, and avoiding many delays, inconveniences, and difficulties.

The paper gave rise to a warm discussion, in which General Monteith, Messrs. George Rennie, Sidney, Lange, and Robert Stephenson took part, and the meeting was adjourned to the 9th of May.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

Ordinary Meeting, April 5th, 1859.

DR. J. P. JOULE, Vice-President, in the chair. The chairman exhibited several slips of paper, having messages inscribed upon them by Professor Thomson's new electric telegraph apparatus. In these specimens the marking consisted of a succession of minute perforations, produced by sparks from an inductive coil apparatus while the paper was gradually drawn through the machine. The sparks are directed to the paper by a fine platina wire affixed perpendicularly to a light arm attached to a small magnetic needle suspended within a coil of wire. The directive tendency of the needle is made very great by means of adjacent steel magnets. So long as either no current or a uniform flow passes through the coil, the perforations go on in a straight line. To produce signals, temporary electric currents of longer or shorter duration are transmitted. The magnetic needle carrying the platina wire is thus deflected, causing the line of perforations to assume the shape of a succession of letters V of various width and at various distances asunder, and in this way letters and words are indicated by the use of a given code of signals. The chief advantage of this system of telegraphic recording is, that it gives clear legible signals when a "relay" is entirely thrown out of action by inductive embarrassment. It has also the advantage of showing clearly signals superimposed on earth currents. The signal, superimposed either on the large swell or wave of induction or of an earth current, is like a ripple seen distinctly on a large wave. The chairman stated that Professor Thomson had recently discovered the means of giving a surer direction to the electric sparks, and of producing a very considerable increase in the size of the perforations produced by them. He also remarked that the system above described was similar in principle to that employed by Professor Thomson in transmitting the whole of the messages which had crossed the Atlantic from either side. To him, therefore, the merit of having given a temporary success to the Atlantic telegraph exclusively belongs.

Mr. T. T. Wilkinson, F.R.A.S., called the attention of the meeting to the existence of a very valuable manuscript in the Chetham Library, which he had been permitted to copy. It contains nearly forty letters on various mathematical subjects, by the Rev. J. Lawson, B.D., and the Rev. Charles Wildbore, M.A., editor of the *Gentleman's Diary*.

A paper was read by the Rev. Robert Harley, F.R.A.S., entitled, "THE METHOD OF SYMMETRIC PRODUCTS, AND ITS APPLICATION TO THE FINITE ALGEBRAIC SOLUTION OF EQUATIONS."

A paper was also read by the Rev. W. N. Molesworth, M.A., "ON COMPARATIVE SOCIOLOGY, OR THE APPLICATION OF THE COMPARATIVE METHOD TO THE INVESTIGATION OF SOCIAL LAWS." The author proposed the institution of a new science under the title of Comparative Sociology, in which all natural human societies should be comprehended under five great classes: 1. The wedded pair. 2. The family. 3. The community (whether village, town, or city). 4. The tribe or nation. 5. The world or mankind.

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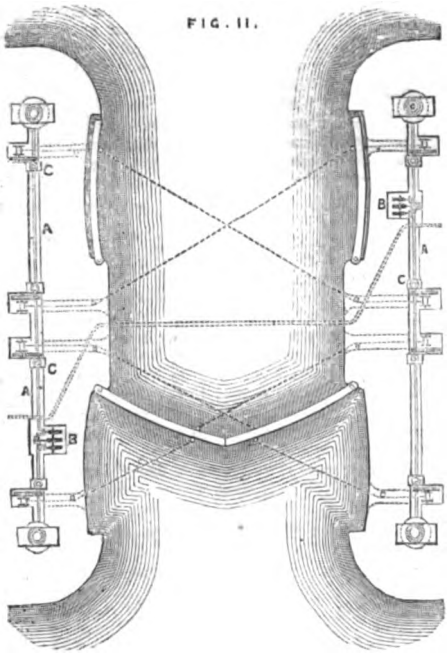
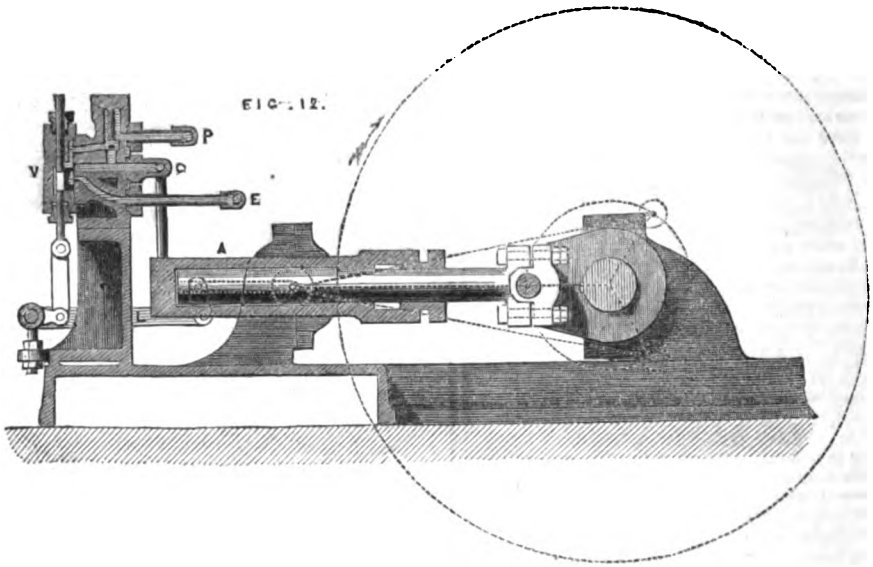
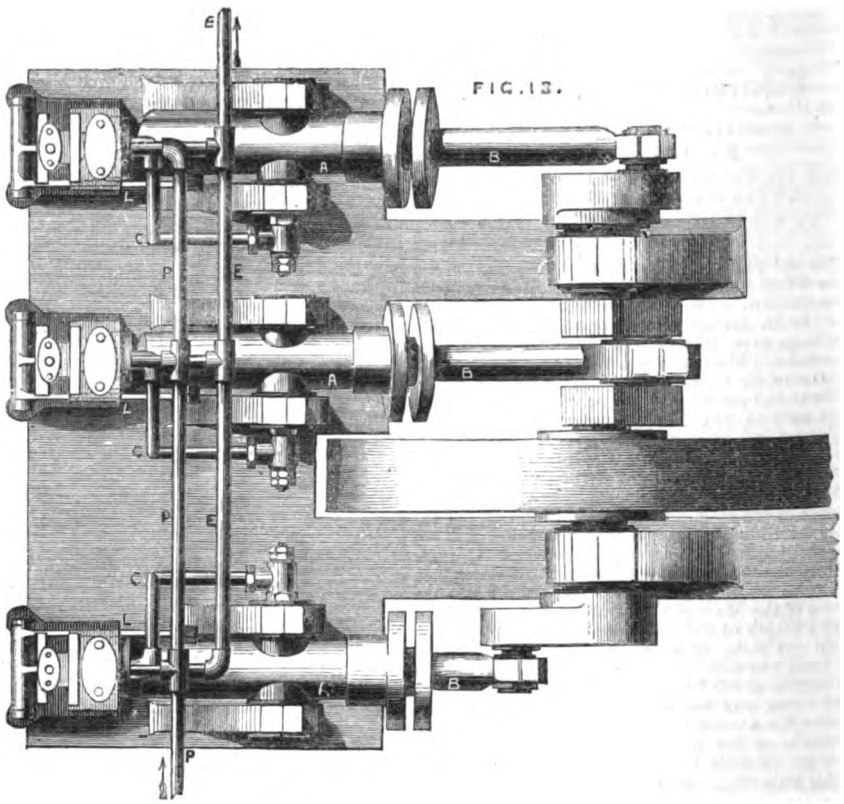
SIR WILLIAM ARMSTRONG'S WATER PRESSURE MACHINERY.







IMPROVED WATER-PRESSURE MACHINERY.

By Sir W. G. ARMSTRONG, C.E., F.R.S., Engineer to the War Department for Rifled Ordnance.

(*Concluded from page* 236.)

ANOTHER method has also been adopted for this purpose in some instances, which has been found to answer extremely well; Fig. 11 is a general plan of a dock entrance, showing the arrangement of the lock gate machinery. Instead of connecting hauling cylinders with each gate, a line of shafting *A*, driven by a small water pressure engine *B*, is laid beneath the surface of the ground, parallel with the coping on each side of the entrance, and by means of clutches is thrown into or out of gear with each gate crab. A wire from the engine extends the whole length of the shafting, so that the motion of the engine can be governed from the point where the work is being done. This method is already in use at several of the ports in South Wales, and is in course of being applied at the Jarrow Docks and the new dock at Silloth.

The rapidity with which dock gates can be opened and closed by these appliances is limited only by considerations of safety to the gates, and the operation is in practice usually performed in about two minutes.

The water pressure engines most recently constructed for driving the shafting consist of a combination of three oscillating cylinders working cranks inclined at 180° to one another, with slide valves simply arranged, as shown in Figs. 12 and 13; and a small engine of this description is exhibited to the meeting. The cylinders *A* are fitted with plungers *B* instead of pistons, and are therefore only single-acting. The slide valves *V* are worked by the oscillation of the cylinders, communicated through the levers *L*. When the back end of the cylinder is depressed, the slide valve is lowered and allows the water to enter from the pressure pipe *P* through the pipe *C* to the cylinders, where it acts upon the plunger in the out-stroke. In the return stroke, the back end of the cylinder being raised, the cylinder port *C* is closed to the pressure pipe *P* and open to the exhaust *E*. A small relief valve is provided in connection with the cylinder pipe *C*, opening against the pressure, which prevents any shock when the communication with the exhaust is closed at the end of the return stroke. These engines have occasionally been made with pistons, so as to be double-acting; but for the heavy pressures employed where accumulators are used the single-acting arrangement with plungers is preferred.

In nearly all cases in which hydraulic pressure has been applied for the moving of dock gates, it is also used for opening and closing the levelling shuttles, and in many cases also for working the capstans. The former purpose is effected by the direct application of a cylinder and piston fixed above the shuttle; and the latter is accomplished by throwing the capstan *C*, Fig. 11, into gear with the shafting *A*, or by applying to it a separate engine similar to that which has been described. A good example of the application of hydraulic pressure to the opening and closing of scouring shuttles may be seen at Sunderland Docks, where by means of this power the enormous area of nearly 500 feet is opened in a few seconds and closed with equal rapidity.

At the same place an example may also be seen of a heavy draw-bridge worked by water pressure. The bridge is supported upon wheels, and is first lifted from its bearings to such a level as to enable the wheels to roll back upon a suitable railway, both operations being performed with great steadiness by the action of the water in little more than a minute.

In working swing bridges by means of water pressure, a central press is applied to lift the entire bridge clear of its supports, and it is then turned by an application similar to that used for slewing a crane. The most remarkable specimen of a bridge of this description is one erected by the writer at Wisbech under the direction of the late Mr. Rendel. In this case an opening of 85 feet is spanned by a double roadway bridge in one leaf, weighing about 450 tons. At present it is but little used as a moveable bridge; but notwithstanding its great length and weight it can be lifted and turned it less than two minutes. The power is derived from an accumulator charged by hand labour, and it is expected that one man by continued working will be able to store up sufficient power for opening and closing the bridge as often as necessary. This system of using an accumulator in connection with a hand force pump has also been successfully applied to a drawbridge erected by the writer near Carmarthen on the main line of the South Wales Railway; and it might be advantageously adopted for many other purposes requiring a concentrated exertion of power with intervening periods of inaction.

Amongst the numerous applications that have been made of water pressure for the purpose of rapidly lifting and lowering heavy loads, there is one which calls for special remark on account of its growing importance: namely, its application in connection with an accumulator for working vertical hoists at the landing stations of steam ferries, in cases where a railway traffic is required to be passed over a river or estuary not easily crossed by a bridge. The traffic of the Aix-la-Chapelle, Dusseldorf, and Rhurort Railway is by this means shipped and unshiped at the ferry across the Rhine; and such is the rapidity and facility of the operation that a train of 12 coal waggons, weighing collectively 133 tons, can be transferred from the deck of the steamer to the railway, a height of about 20 feet in 12 minutes. Each

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hoist lifts two waggons at a time, and raises its load in 10 to 12 seconds. These hoists are so arranged as always to accommodate themselves to the level of the boat, and always to stop at the exact level of the railway.

It is not necessary to say more upon that branch of the subject which embraces the two important principles of accumulation and transmission of power, by means of which a steam engine can be economically applied to give safe and rapid motion to a multiplicity of machines intermittent in their action and distant from each other. But it remains to notice the application made by the writer of the pressure derived from natural falls.

When the moving power consists of a natural column of water, the pressure rarely exceeds 250 or 300 feet; and in such cases he has employed to produce rotary motion, in preference to the original scheme of a rotary engine, a pair of cylinders and pistons, with slide valves resembling in some degree those of a high pressure engine, but having relief valves to prevent shock at the return of the stroke, as shown in Fig. 6 (page 220), already described. Where the engine is single-acting, with plungers instead if pistons, as in the water pressure engine already described, the relief valves are greatly simplified, and, in fact, are reduced to a single clack in connection with each cylinder, opening against the pressure, which is the same as the relief valve in the valve chest of the hydraulic crane. The water pressure engines erected by the writer at Mr. Beaumont's lead mines at Allenheads in Northumberland present examples of such engines applied to natural falls. They were there introduced under the advice of Mr. Sopwith, and are now used for the various purposes of crushing ore, raising materials from the mines, pumping water, giving motion to machinery for washing and separating ore, and driving a saw mill and the machinery of a workshop. In all these cases nature, assisted by art, has provided the power. Small streams of water, which flowed down the steep slopes of the adjoining hills, have been collected into reservoirs at elevations of about 200 feet, and pipes have been laid from these to the engines.

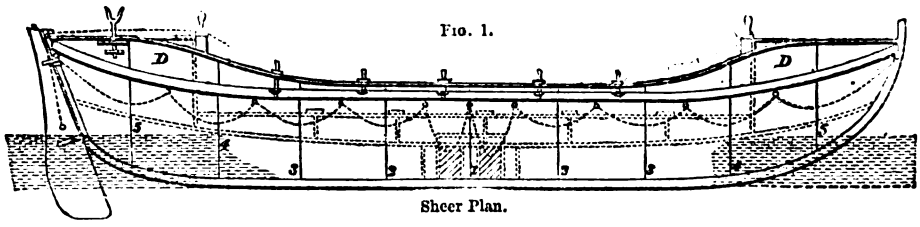
Another application of hydraulic machinery at the same mines is now being made in situations where falls of sufficient altitude for working such engines cannot be obtained, which from its novelty deserves special notice. For the purpose of draining an extensive mining district and searching for new veins, a drift or level nearly six miles in length is now being executed. This drift runs beneath the valley of the Allen nearly in the line of that river, and upon its course three mining establishments are being formed. At each of these power is required for the various purposes above mentioned, and it was desired to obtain this power without resorting to steam engines, The river Allen was the only resource, but its descent was not sufficiently rapid to permit of its being advantageously applied to water pressure engines. On the other hand it abounded with falls suitable for overshot wheels, but these could not be applied to the purposes required without provision for conveying the power to many separate places. Under these circumstances it was determined to employ the stream through the medium of overshot wheels in forcing water into accumulators, and thus generating a power capable of being transmitted by pipes to the numerous points where its agency was required. In this arrangement intensity of pressure takes the place of magnitude of volume, and the power derived from the stream assumes a form susceptible of unlimited distribution and division, and capable of being utilised by small and compact machines.

A somewhat similar plan is also adopted at Portland Harbour, in connection with the coaling establishment there forming for the use of the navy. The object in that case is to provide power for working hydraulic cranes and hauling machines, and more particularly for giving motion to machinery arranged by Mr. Coode, the present engineer of the work, for putting coal into war steamers. A reservoir on the adjoining height affords an available head of upwards of 300 feet; but in order to diminish the size of the pipes, cylinders and valves connected with the hydraulic machinery, and also with a view of obtaining greater rapidity of action, a hydraulic pumping engine and accumulator are interposed, for the purpose of intensifying the pressure and diminishing the volume of water acting as the medium of transmission.

In concluding this survey of the system of water pressure machinery which has grown to such large proportions, chiefly during the last seven years, the writer feels that the present occasion has afforded the fittest opportunity he could have taken of communicating the particulars contained in this paper; and he trusts that the details of the progress of this system may not have proved uninteresting.

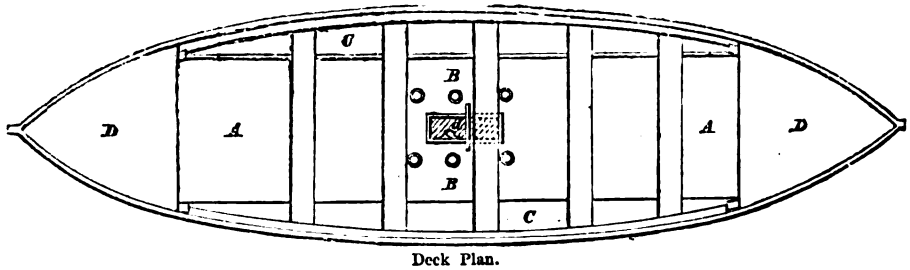
THE LIFE-BOAT OF THE ROYAL NATIONAL LIFE-BOAT INSTITUTION.

Fig. 1.



Sheer Plan.

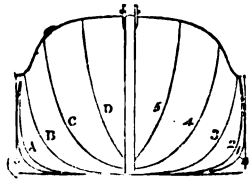
Fig. 2.



Deck Plan.

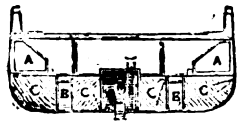
The accompanying figures show the general form, the nature of the fittings, and air-chambers of one of the boats referred to in our leading article. The boat is 30 feet in length, and 7 feet 6 ins. in breadth. In figs. 1 and 2, the elevation and deck plans, the general exterior form of the boat is shown with the sheer of gunwale, length of keel, and rake or slope of stem and stern-posts. The dotted lines of fig. 1 show the position and dimensions of the air-chambers within board, and of the relieving tubes. In fig. 2, *A* represents the deck, *B* the relieving-tubes (6 inches in diameter), *C* the side air-cases, *D* the end air-chambers. In fig. 3, the exterior form of transverse sections, at different distances from stem to stern, is shown. Fig. 4 represents a midship transverse section, *A* being sections of the side air-cases, *B* the relieving-tubes, bored through solid massive chocks of wood of the same depth as the space between the deck and the boat's floor. *C C* are spaces beneath the deck, filled up, over 6 feet in length, at the midship part of the boat, with solid chocks of light wood, forming a portion of the ballast; *d* is a section of a small draining-tier, having a pump on it, by which any leakage can be pumped out by one of the crew whilst afloat. The festooned lines in fig. 1 represent exterior life-lines attached round the entire length of the boat, to which persons in the water may cling till they can be got into the boat; the two central lines are festooned lower than the others, to be used as stirrups, so that a person in the water by stepping on them may climb into the boat.

Fig. 3.



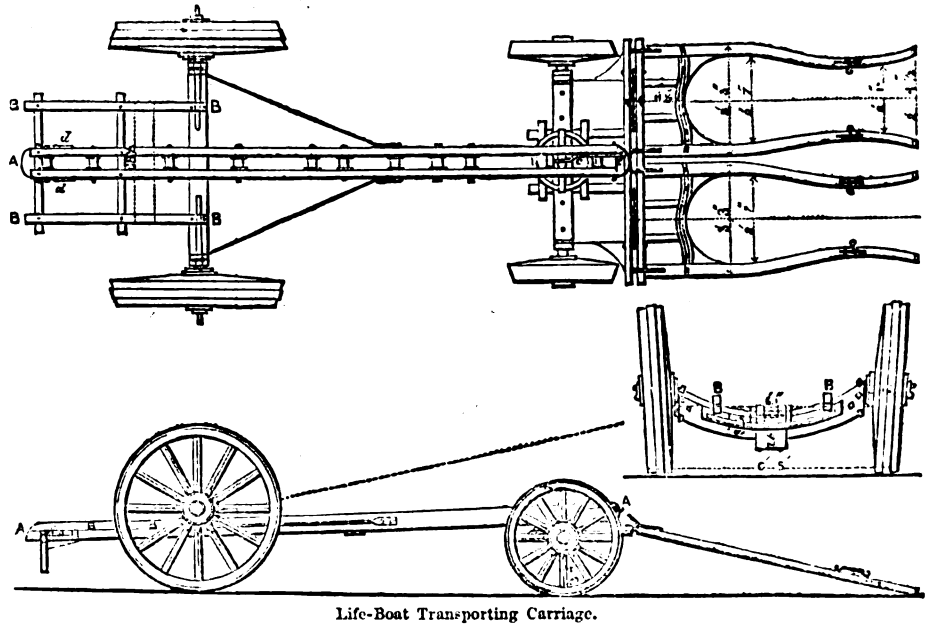
Body Plan.

Fig. 4.



Midship Section.

This life-boat possesses in a very high degree the qualities which it is desirable that a life-boat should possess:—1. Great lateral stability; 2. Speed against a heavy sea; 3. Facility for launching and for taking the shore; 4. Immediate self-discharge of any water breaking into her; 5. The important advantage of self-righting if upset; 6. Strength; 7. Stowage-room for a number of passengers.



Life-Boat Transporting Carriage.

In the remaining figures is represented the life-boat transporting carriage adopted by the Institution. The carriage consists of a fore and main body. The latter is formed of a keelway *A A*, and of slide or bilgeways *B*, *B*, in rear of the main axle, the boat's weight being entirely on the rollers of the keelway. Its leading characteristic

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is that, on the withdrawal of the long forelock pin *C*, the fore and main bodies can be detached from each other. The advantages of this arrangement are that the weight of the boat when she is launched from the rear end forms an inclined plane by elevating the keelway, yet without lifting the fore body off the ground, whilst to replace her on the carriage she can be hauled bow foremost up the fore end or longer incline. The bilgeways *B*, *B* are needed at the rear end, that the boat may be launched in an upright position with her crew on board; but they are not required at the fore end of the carriage. The boat is hauled off the carriage, and launched into the sea by a rope on each side of the boat rove through the sheeve *D*, having one end hooked to a self-detaching hook at the boat's stern, and the other manned by a few persons on the shore, who thus haul the boat and her crew off the carriage, and launch them afloat at once, with their oars in their hands, by which means head-way may be obtained before the breakers have time to beat the boat broadside on to the beach.

SOCIETY OF ARTS.

ON THE PRACTICAL BEARING OF THE THEORY OF ELECTRICITY IN SUBMARINE TELEGRAPHY, THE ELECTRICAL DIFFICULTIES IN LONG CIRCUITS, AND THE CONDITIONS REQUISITE IN A CABLE TO INSURE RAPID AND CERTAIN COMMUNICATION.

BY S. ALFRED VARLEY, Assoc. Inst. C.E.

(*Concluded from page* 233.)

Previous to the first attempt to submerge the Atlantic cable, a series of experiments were undertaken by the company's late electrician, and the result published.* These experiments having been tried at the expense of the capital, and with opportunities which never before presented themselves, are too important not to be noticed, though it is believed that the author of them has lately had reasons to modify some of his conclusions.

The chief results published were these:—1. That no adequate result is obtained by increasing the sectional area of the conductor; that, in fact, in the case of a submarine circuit—a small wire will transmit signals more rapidly than a larger one. 2. That an insulated submarine wire conducts according to a different law to that of a suspended circuit. 3. That the rate at which a voltaic signal travels is not affected by the intensity of the battery. 4. That magneto-electric induced currents have the property of travelling in the first place faster than voltaic ones; and, unlike voltaic currents, when their intensity is increased their rapidity of travelling is increased also.

In the paper I submitted last March to the Institution of Civil Engineers, I pointed out what I conceive to be errors in these results, and endeavoured to show that some of them necessarily followed from the way in which the experiments were conducted, and I cannot more clearly express what I wish to convey on this head than by quoting my own remarks on that occasion:—

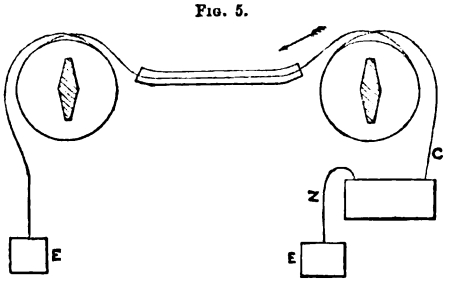
"In examining these conclusions, it has first to be considered whether the conditions of a submarine circuit and a suspended one are different. In a suspended wire, the insulating medium of the air takes the place of the putta percha of the submarine circuit. The earth, which is the nearest conductor, is a considerable distance off, and is only on one side of the wire, therefore but little induction can take place between the wire and the earth; nevertheless, induction to a certain extent does take place, and can be perceived in circuits of very moderate length.

"The author has noticed indications of it in a circuit 60 miles long, and he feels confident that with delicate apparatus it could be perceived in much shorter circuits. If the distance between the wire and the earth were decreased, induction would be developed more strongly, and the wire could be brought down step by step until the condition of a submarine circuit would be approached, where the earth surrounds the circuit on all sides, and is only separated from it by the thickness of one-eighth or three sixteenths of an inch of gutta percha—a substance possessing, moreover, specifically a much greater inductive capacity than air. It, therefore, appears, that the conditions are precisely the same, only differing in degree. Before proceeding further, and to prevent the possibility of mistake, it is desirable to make the following quotation from the work previously referred to† :—

"'The law of squares may possibly apply to the transmission of electricity freely along simple conducting wires, but it certainly does not apply to the case of its transmission along submarine and subterranean gutta percha covered wires (the facility of transmission being estimated by rate of speed), because in this the case is not one of simple conduction, but of transmission, after the wire has been charged inductively to saturation as a Leyden jar.' This quotation shows clearly the reason for concluding that small wires are better conductors for submarine circuits, as far as transmission is concerned, than larger ones; far the smaller the Leyden jar the more quickly will it be charged to saturation. The author, in differing from these conclusions, does not wish it to be understood that he thinks the law of squares is applicable to submarine wires; for he is not aware of any electrical phenomena which obey that law, but he submits that there is a material difference between a Leyden jar and a submarine wire.

"In a Leyden jar the inner and outer coatings are perfectly insulated one from the other. If they were not insulated there could be no statical charge, as is well understood by all electricians. Induction therefore *involves insulation*. But in a submarine circuit this is not the case. If the wire at the further extremity was disconnected from the telegraph instrument, and sealed up with gutta percha, the conditions would be nearly the same. In practice, however, it is quite open through the instrument to the earth, and the resistance opposed by the very long length of wire is the only insulation between the inner and outer coatings, for it unites both, being in connection with the earth at both ends (Fig. 5). It is therefore evident that if the wire offers no resistance there will be no insulation, and, as a consequence, no induction to retard the passage of the current. It is also equally plain that precisely in proportion to the resistance which the wire opposes, provided always the insulating medium be of the same thickness, will induction manifest itself and retardation be experienced.

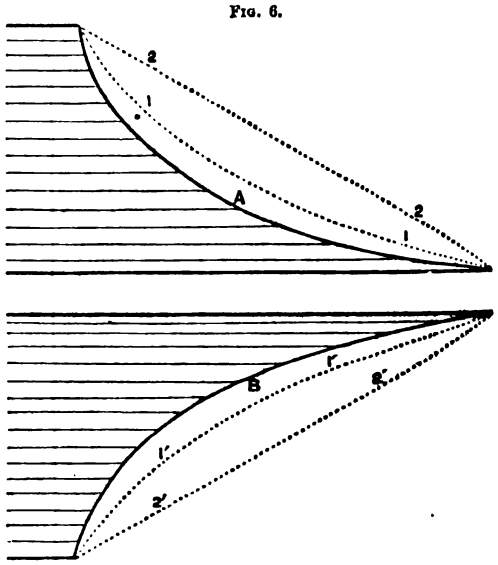
FIG. 5.



"There is also another difference between a Leyden jar and a submarine circuit. The Leyden jar is charged uniformly all over, whilst in a submarine wire the tension of the charge varies in different portions of the circuit, being at its maximum at the end where contact is made with the battery, and dying off to nothing at the further extremity."

The next consideration is the part induction plays in submarine circuits of any considerable length. In a submarine circuit the wire is insulated from the earth by only a thin layer of gutta percha; the conditions, therefore, are favourable for induction through the insulating material; the conductor itself, from its great length, opposes very great resistance, or, in other words, insulates to a very considerable extent. When a battery is connected to send a current, the first impetus is in part directed forward, in part diverted laterally; but as the wire opposes considerable resistance to the passage of the electricity which the battery can generate, whilst the thinness of the insulating material is very favourable for induction taking place through it, the greater portion of the first rush will be occupied in charging the wire statically at the battery end; as, however, it is a balance of forces between the resistance which the wire opposes on the one hand, and the ease with which lateral induction can take place on the other, a very minute portion must pass through instantly, and the period which will elapse between the making contact with the battery and the observing the current at the further extremity will depend upon the capability of the instrument to record very small quantities of electricity. In fact, immediately on contact being made with the battery, a wave will be formed throughout the length of the wire, somewhat like what is shown in the diagram (Fig. 6), which is intended to represent a submarine wire the moment after contact has been made with the battery. The line A represents the internal charge having its maximum tension at the battery end, and diminishing in intensity as it approaches the farther extremity. The line B shows the induced charge of the opposite kind on the outer surface of the gutta percha, and forms an exact counterpart to the internal charge, with the exception of being a little less intense; for as it is spread over a greater surface, and only exactly balances the internal wave, its tension will be less in proportion as its surface is greater. As the tension of the statical charge is raised, so will the flow of electricity at the further extremity increase; both will arrive at their maximum together; the current will then flow in a regular stream as long as contact with the battery continues. The dotted lines 1 1 and 1' 1' are intended to represent the waves after the contact has been made a short time, and the lines 2 2 and 2' 2' are intended to represent the waves when they have attained their maximum height. In the last case they will be perceived to be more regular. When the battery has been disconnected from the wire, the opposite waves will still continue to unite, but the rate of flow as the tension falls will become slower and slower.

FIG. 6.



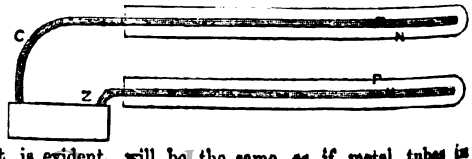
In theory the time which would be occupied by a wire discharging itself completely in this way would be infinite. In practice the wire requires a very appreciable time to charge, and a longer period to discharge. The effect of this is, that if currents are sent at all rapidly one after the other, instead of obtaining a series of distinct impulses at the further extremity, an undulating continuous current is received; and, as to obtain a telegraphic signal, the wire has not only to be charged to a certain degree of tension before an appreciable current is received at the further end, but has also to be discharged afterwards before another signal can be sent, the impulses which are obtained through such circuits as these are very sluggish.

The problem to be solved is the best means of reducing the amount of induction, and of mitigating its effects. Almost the first remedy suggested when this inconvenience was experienced, was to substitute another insulated wire in the place of the earth for a return circuit, for it was argued that, as in this arrangement, one wire would be charged positively and the other negatively, they would neutralise one another. This suggestion was put to the test and failed. Since that time the same plan has been revived by several others; a good deal of argument has also been brought forward lately in support of it, and even amongst those who know its practical inutility, there would still seem to have been lurking some faith in the capability of the method (in theory at least) to neutralise the effects of induction.

The explanation of its failure, if we are guided by the first principles of the science, appears to me to be very simple, and I expect not only to make it plain that no advantage is to be obtained by the adoption of this method, but that it will increase the retardation.

Let two long gutta percha covered wires (Fig. 7) buried in the earth, be connected, one with the zinc pole and the other with the copper pole of a battery, and let the further ends of each of these wires be hermetically sealed. The earth, from its mass, being a perfect conductor, its action it is evident, will be the same as if metal tubes in

FIG. 7.



* *Vide*, "The Atlantic Telegraph. A History of Preliminary Experimental Proceedings, &c., published by order of the Directors of the Company."

† *Vide*, "The Atlantic Telegraph," p. 23.

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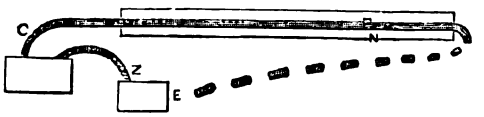
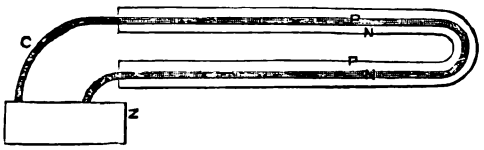
metallic communication with each other surrounded the gutta percha wires. It is therefore clear that the only retardation to induction will be the thickness of the gutta percha covering, and the tension of the statical charge will be in accordance with the intensity of the battery. Now consider the case of a similar gutta percha wire of the same length (Fig. 8) as one of these, but in which one pole of the battery is connected to the earth and the other to one end of the metallic conductor, and the circuit completed by connecting the further extremity to the earth. It will also receive a statical charge to a certain degree, but the tension of the charge will not, *ceteris paribus*, be dependent upon the intensity of the battery, but upon the resistance which the wire opposes, for it has already been shown that this is the only real insulation between the wire and the outer coatings, and that the degree to which statical charge can take place depends on the amount of insulation existing.

Fig. 8.



Now, let the ends of the two wires which are hermetically sealed be connected to each other (Fig. 9) the circumstances are quite as favourable for induction as in the wire in which one end was connected with the earth, but there will be twice the resistance; in other words, double the amount of insulation, and consequently, a proportionate increase in the amount of induction.

Fig. 9.



Another view of this matter will perhaps assist to confirm what has just been stated. It is a well-established fact that when a telegraphic circuit is composed of a loop of wire it will oppose the same resistance as a circuit of double the length where the earth is made use of in the place of a return wire, and this proves that the earth offers no appreciable resistance. If this be the case, what difference can it make whether the battery pole be carried to the end of the wire itself, or through the medium of any length of a perfect conductor, which the earth has been proved to be. Therefore, it would appears that the induction which would be manifested in a circuit composed entirely of an insulated conductor, would be the same as that in a circuit of twice the length, where one half the circuit is completed by the earth, and the only difference which would exist between the one and the other would be, that in a circuit composed entirely of wire, the statical charge will be distributed more uniformly throughout the entire length. But, says a writer on this subject, I admit that no advantage would result if two separate wires are used, and which will therefore necessarily be some distance apart from one another, but place the two wires in the middle of a mass of gutta percha (Fig. 10) and so close to each other that they may become virtually the centre of a system, and let the insulating material be of considerable sectional area, then no induction worth naming will take place between the wires and the earth, and the inductive influence of the positive wire will neutralise that of the negative wire.

Fig. 10.

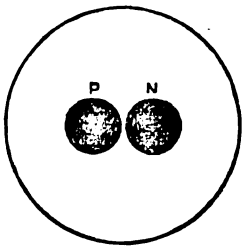
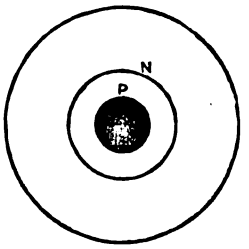


Fig. 11.



The fallacy of the proposition will be at once seen if it be carried out more fully. Instead of letting the wires lie side by side, let the one wrap over the other, and be, in fact, a tube with a thin mass of insulating material between it and the inner wire (Fig. 11). They will now become really the centre of the system, and fulfil completely the object desired by the author of this suggestion, but is it not evident that such an arrangement is the fac-simile of a Leyden jar, and will not the conditions be the most favourable that can be conceived for the development of induction?

The only remedy which has been successful in mitigating the effects of induction, is that of throwing into the wire, immediately after a current has been sent, another of the opposite kind; this absorbs and neutralises the preceding wave much more quickly than when the wire is left to discharge itself in the ordinary way. This method, however, does not reduce the induction, but only mitigates its effects, although in circuits of moderate length its adoption has, for practical purposes, completely removed the inconveniences arising from the induced charge.

There are only two ways of reducing induction, the one is to increase the thickness of the insulating material, and so render the conditions less favourable for its development, and thus approach the conditions of a suspended circuit, where the induction having to take place through a considerable space of air—a dielectric of very low specific inductive capacity—there is but little accumulation of statical charge, and consequently the impetus is almost entirely directed forward, and scarcely diverted laterally to any appreciable extent.

In gutta percha covered wires, when the insulating material is increased in size, it has been shown that the full effect of the increased thickness is not obtained, owing to the outer surface increasing at the same time.

There is also another quality possessed by resinous substances, and probably by gutta percha, worthy of consideration. It is the property of absorbing a charge in the mass of the substance, instead of its being confined entirely to the surface; the tendency of this will be to still further reduce the advantage of an increased thickness of insulating material.

A reference to first principles will make this clearer. All bodies insulate to a certain extent, and the only difference between a so-called conductor and insulator that would appear to exist, is a difference of degree, and if a charged body is brought into the neighbourhood of an insulated conductor, induction will take place through it in the same way as through a dielectric, but owing to the particles of conducting substances possessing the property of readily communicating their forces one to another, the inductive force developed at the further extremity will, within certain limits, be scarcely affected by the length of the conductor through which induction is taking place. The absorption of a charge within the substance of the dielectric is an approach to this condition, but its practical moment when gutta percha is the insulating substance has to be determined by experiment.

Lessening the induction by reducing the resistance has next to be considered. The first thing obviously will be to obtain a metal of the highest specific conducting power, for could the sectional area be diminished without increasing the resistance, the induction would be reduced proportionately to decrease in the surface. The next will be to increase the sectional area of the conductor, and although this involves increased surface, yet there will be a gain; for when the diameter of a wire is enlarged, the surface over which the amount of induction extends does not increase in the same ratio as the sectional area which determines the resistance opposed by a conductor. To make this clearer, let four cables ranged side by side be employed as one conductor. Such an arrangement will possess four times the sectional area, and oppose only one-fourth the resistance; in other words, the same tension of current will force through four times the dynamic quantity of electricity that would be generated through the single cable when used alone. Signals would not, however, be transmitted more rapidly through the four cables than through the one, for although the conducting power has been increased four times, the surface has been quadrupled also, which will exactly counterbalance the lessened resistance; but merge the four into one, the external inductive surface will then be halved, whilst the sectional area will remain the same as before, and there will be only half the induction manifested. It therefore follows when a wire is enlarged, that as the sectional area increases as the square, whilst the surface increases only in regular proportionals, the relative balance of forces in favour of rapidity of conduction will, in a submarine conductor of a given size, be twice the amount of that in a wire of half the diameter.

I would now attempt an explanation of how it happened that an actual retardation was observed in some of the experiments with the Atlantic cable when a conductor of enlarged sectional area was employed; and on this head I would again quote from my remarks on a former occasion:—

"In the experiments to ascertain whether any advantage would result from the use of an increased sectional area of metallic conductor, recourse was had to joining the cables side by side, the increased inductive surface which such an arrangement involved having possibly been overlooked. This will account not only for an increased speed not having been obtained, but for an actual retardation having been noticed. Electro-magnetic induction coils do not create electricity, they simply offer a ready means of converting electricity of low tension and considerable dynamic quantity into electricity of very high tension and small dynamic quantity. The quantity evolved by them is always smaller in proportion as the intensity is greater. Both cannot readily be obtained together and if a very high intensity is required, the quantity must be sacrificed, unless the size of the apparatus is immensely increased. This difficulty has evidently been appreciated, as the induction coils used by the Atlantic Telegraph Company are of large size and great length, so as to obtain high tension with an appreciable dynamic quantity. Nevertheless, there is little doubt but that the quantity evolved even by these machines, when compared with that generated from voltaic batteries, is small. This being the case, on giving the current a larger number of channels to rush into, there is not enough electricity to fill the wires, consequently the tension of the current will be very much lowered. The effect of this will be that a longer time will elapse before the tension of the wire will be raised sufficiently high at the further extremity to render itself apparent on the instrument. To obtain under such conditions, the same speed with four cables as would be obtained with one alone, it would be necessary to employ four of these induction coils, ranged side by side, and worked with four times the battery surface, so as to generate four times the dynamic quantity of electricity. When qualified with these conditions, under which, no doubt, the experiments were tried, the reasoning contained in the Atlantic Telegraph Company's pamphlet, giving in an earlier portion of this paper, is correct. It is precisely a case of having four Leyden arrangements to charge instead of one. A telegraph cable is, in fact, a Leyden arrangement, which has to be charged to a certain degree of saturation before signals are obtained. The degree to which it has to be charged, statically, depends upon the extent of inductive surface compared to the conductibility of the metallic core. In a circuit where the conductibility of the metallic core is very great, compared with the inductive surface of the insulating material, no high degree of statical charge can take place, and signals will pass quickly. The opposite effect will be noticed in a circuit where the inductive surface is very large compared with the conductibility of the metallic core. The wire will then have to be statically charged very highly, before a perceptible current will flow from the further extremity, and signals will be obtained proportionately more slowly."*

The reason why signals are found to pass when magneto-electric induced currents are employed in place of voltaic ones arises, I believe, not from any specific difference between them, but simply from the tension of the induced currents being very much greater than any voltaic ones which have been employed. On this head I will say nothing further here, but would refer those who may take an interest in it to my paper of a former occasion, where I have fully entered into this subject, and also attempted an explanation of how it has happened that in the experiments with voltaic currents, of varying intensities, no difference of speed has as yet been observed.

The amount of retardation which will be experienced in submarine circuits possessing conductors of varying resistance, and insulated with different thicknesses of insulating material, it appears to me can, comparatively speaking, be readily determined by actual experiment. I have for a long time been engaged in designing an apparatus for this purpose, and at the time I arranged to give this paper, I fully expected to have had the apparatus completed by this time, and to have been able to have laid it before you on this occasion; and, though I regret not being able to do this, yet I feel I have sufficiently advanced to warrant my explaining the principles of its construction. The principles upon which it is based are: that a body which offers the same resistance as another, without reference to its substance or length, may, as far as conducting power is concerned, be considered electrically the same. If we make use of a substance or metal of any inferior specific conducting capacity to that of the metal employed in submarine circuits, and also of greatly diminished sectional area, the same resistance as that offered by the very longest circuits can be obtained in a very small compass; and such an arrangement will, as far as simple conducting power is concerned, fairly represent a long submarine circuit.

The induction which manifests itself in submarine circuits can also be obtained

* *Vide*, "The Atlantic Telegraph."

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if the conditions for its development are as favourable as they are in submarine conductors.

The apparatus consists, 1st, of a series of resistances, the values of which are known. 2nd. Of a series of induction plates, the values of which, when compared with a given surface of a gutta percha coated wire, are also known. 3rd. A mechanical arrangement to accurately measure minute periods of time. By a combination of the resistances and the induction plates, a conductor, which will fairly represent a submarine circuit, will be obtained. The resistance can be diminished or increased, and the inductive surface can be doubled or halved at pleasure, and thus circuits with conductors of varying lengths and sectional area, and different thicknesses of insulating material be imitated, and the law which governs the retardation in the transmission of telegraphic signals determined by direct experiment.

It may be argued that as the inductive surface in a telegraphic circuit is uniformly spread throughout, a series of induction plates will not present the same conditions, but it is evident that they may be divided throughout also, and although they will not then precisely represent what is actually the case, the result will approximate very closely to those obtained from a submarine conductor. Perhaps it would have been prudent not to have called attention to an apparatus before its completion. I have done so, however, because I have felt it was due from me to endeavour at least to point out how some of the important problems involved in submarine telegraphic communication between distant stations may be resolved.

The chief deductions from what has been brought forward in this paper are:—1st. That the metallic core of a submarine cable should be composed of a conductor of the highest specific conducting capacity. 2nd. That a decrease in the retardation which is caused by the induction that takes place in submarine circuits, can only be obtained by increasing the thickness of the insulating material, but that it will be better to do this by enlarging the sectional area of the conductor as much as is practicable. In designing a cable there are many considerations besides these of its simple electrical qualifications which have to be entertained. The object to be obtained is the best result with the most economical investment of money. Are the proportions which were adopted in the Atlantic cable the best to insure this? The weight of the conducting coil in this cable is about 03 pounds to the mile, the value of which, speaking roughly, would, I suppose, be about as many shillings. When served with gutta percha its value was raised £40 per mile. The iron sheathing and getting the cable on board brought its value up to £100 per mile. The expenditure, however, did not cease here; there was the hire of ships, salaries of staff, &c., &c. In this cable, therefore, only 4 per cent. at the outside was invested in the conductor upon which the transmission of the messages depended. If the views which I have brought forward are correct, a conductor of double the diameter would only produce half the amount of retarding force of one of half the size. Such a conductor, at the very outside, would not cost more than £16 per mile, and the increased expenditure, in serving such a conductor with gutta percha, and giving it an iron sheathing, would not, comparatively speaking, be very large; the expenses of the staff and the hire of ships would be about the same in both cases; the latter would be, perhaps, increased slightly, but not to any material amount.

THE TAXES ON KNOWLEDGE.

WE request the attention of our readers to the following address of "The Association for Promoting the Repeal of the Taxes on Knowledge, to the Electors of the United Kingdom."—"Fellow countrymen,—The annual 'ministerial crisis' has brought public business to a stand. You will, therefore, shortly be called upon to elect a new House of Commons. No administration proposes to reduce the public burthens, or to relieve the producing classes from indirect taxation, which presses upon them in a ratio far exceeding the proportion of their income. Among these taxes one stands pre-eminent as the only remaining excise duty on a manufacture. It has been abundantly proved that the paper duty is a tax upon literature, an obstruction to education, an impediment to commerce, and a hindrance to production; that it interferes with the process of manufacture, represses industry, and injures the revenue. Pledge, therefore, every candidate to vote for its repeal. Signed by order of the committee and on their behalf.—RICHARD MOORE, Chairman, 25 Hart-street, Bloomsbury, C. D. COLLET, Secretary, 10 Ampton-place, Gray's-inn-road, London, April 6th, 1859."

THE ENFIELD RIFLE CARTRIDGE.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—The difficulty of loading the Enfield rifle arises from the surface of the leaden shot oxidysing, and thus increasing its diameter. If the shot is coated with thin tough paper pasted on its cylindrical body, and a little forward on its conoidal front, the lead cannot then oxydise, and the shot preserves its proper size in all climates. The oxyde of lead is a poison, and causes wounds to mortify. This fact ought to be made known generally, and without any delay.

April 4, 1859. J. NORTON.

CUNNINGHAM'S PATENT SELF-REEFING TOPSAILS.

THE judgment pronounced in the action brought by Mr. Cunningham against MM. Brouard and Son, in the Civil Court at Havre, for an infringement of the patent obtained by Mr. Cunningham on the 1st Sept., 1851, is so remarkable for its decision and completeness that English patentees should undoubtedly be put in possession of it. The following is a translation of it, as reported officially in the *Courrier du Havre*:—

1. "Whereas Cunningham obtained, September 1st, 1851, a patent of invention, which will expire November 30th, 1864, for a system of reefing sails, and asserts that Brouard and Son have introduced on board several ships, to wit the Guillaume le Conquérant, Captain Bigot, a system based on the same principle and producing the same effect; that there is consequently an infringement; and that he, therefore, claims that Brouard and Son should be bound, under a penalty of 5,000 francs, to give up to him the sails and rigging fitted on board the ship Guillaume le Conquérant; that they should be forbidden to fit similar sails, and condemned to substantial damages according to law;

"Whereas Brouard, jun. (son), pleaded in the first place that he was not a party to the suit, as having no share in the invention of Brouard, sen. (father), or in the patent taken out by him, and was not even the partner of Brouard, sen.:

"But whereas this last assertion is not correct, it being, in fact, proved by a copy of the extract deposited at the office of the Tribunal of Commerce of an act of the 22nd November, 1855, that a partnership had been entered into for five years between Brouard and Son for working the sail-making factory belonging to Brouard, father; that it matters little in whose name the patent of invention was taken out; that it is clearly Brouard and Son who work the patent, and who have made the infringement, if there has been one—Brouard, Jun., must consequently be a party to the suit:

"Whereas according to the 2nd article of the law of July 18th, 1844, the discovery of new means, or the new application of known means for obtaining a result, is to be considered as an invention; that this same law refers to the improvements which may be made in a patented system; that during the year, dating from the delivery of the patents of invention, none but the principal patentee can take out a patent for any improvement, alteration, or addition to the patented invention; that, at the expiration of the year, a second party may, on the other hand, take out a patent for any alteration, addition, or improvement, but cannot work it during the time of the first patent, and neither can the first inventor, on his side, use the improvement, so that if the first inventor wishes to add the improvement to his discovery he must apply to the second, and the second inventor must in like manner apply to the first for the system to which he wishes to adapt his new sort of improvement.

"Whereas, finally, the same law has declared the patent null, if the discovery, invention, or application be not new:—

2. "Whereas the Cunningham invention consists in a system by which the sails are reefed and unreefed by means of ropes or chains worked from the ship's deck, and the principle of which is, the rolling the sail on the yard, by means of the self-acting motion of the yard, which rolls on itself in consequence of the gravitation owing to its own weight, joined to that of the sail, and to the resistance given to the motion by a special apparatus:

"Whereas Brouard, father, maintains that the principle, the mother idea, of the Cunningham invention, has long been public property, in proof of which assertion he brings forward the blinds; but that this argument is faulty, as blinds do not work by gravitation, but by a mechanism which rolls the blind round a fixed rod; that Brouard, father, alleges, in addition, that in 1822 the Marquis Ducrest introduced at Havre a system for sails of which the Cunningham invention is only a copy; that he asks to be allowed to give proofs of this, but the facts produced do not appear pertinent; that it is not even alleged that in the Ducrest system the rotation of the yard producing the reefing of the sail was owing to a combination of gravitation with a certain resistance; that under every view, therefore, the Cunningham system is a new invention, or at least a new application of known means:

"Whereas the conduct of Brouard himself is contradictory to his first plea, as he did himself take out a patent of invention after Cunningham for a system which, as will be proved, is based upon the original idea of the Cunningham system:

"Whereas it is sufficient to examine the registered specification of the Brouard sail, the Cunningham patent, and the models placed before the Court to recognise that the principle of the Cunningham invention has been copied by Brouard; that the sail of the latter rolls round a yard in consequence of the gravitation due to its weight, which, combined with the resistance caused by the appliances for producing the motion, produces the rotation of the yard; that such is the original idea of the Cunningham invention; that it matters little that there is some difference in the execution, and that the Brouard sail is rolled on an auxiliary yard, and not on the yard itself, as in the Cunningham sail, and that the appliances for producing rotation are not fitted to some part of the yard; that these are matters of detail, not sufficient to prevent its being an infringement: neither can any weight be attached to the circumstance of the Cunningham sail being divided in the middle, for a part of its depth, while the Brouard sail is whole, the bosses for rolling being fitted to the ends of the yard; that this may possibly be an improvement, for which Brouard might perhaps have been able to take out a patent of improvement, but not to work it during the time of the Cunningham patent; that the infringement alleged by the said Cunningham is, therefore, established; that the patent of invention obtained by Brouard cannot be of any consideration in the suit; as far as giving damages, and the prohibition to use sails similar to those fitted on board the Guillaume le Conquérant, there can be no difficulty, but there is not sufficient evidence before the Court to determine the amount of damages:

"Whereas concerning the seizure of the sails of the Guillaume le Conquérant, where the infringement is proceeded against, correctionally, the confiscation of the pirated article is a punishment which can be inflicted on the person infringing the patent, but that in the civil court no punishment can be pronounced; that the Civil Court, satisfied as to the question of infringement, cannot properly order the confiscation of the article, it can only, by way of indemnity, order the pirated article to be given up to the inventor, under a penalty; that this must, therefore, be decreed in the Cunningham case, the tribunal not being able, however, for want of documents, to determine the amount of the penalty:

3. "For these reasons, the Court of Common Pleas in the first place refuses the plea of Brouard, jun., to be dismissed from the suit, and decrees that the sails fitted by Brouard and Son on board the Guillaume le Conquérant is an infringement of the system for which Cunningham took out a patent September 1st, 1851; declares Brouard and Son non-suited in their plea for the nullity of Cunningham's patent; prohibits them from fitting similar sails in future, during the time of the Cunningham patent; and condemns them to pay those damages to which the said Cunningham is entitled according to law; orders Brouard and Son to give up to Cunningham, under a penalty, which the Court will afterwards determine, the sails fitted on board the Guillaume le Conquérant, and condemns them besides in costs."

A NOVEL METHOD OF TELEGRAPHING.

Three gentlemen (S. Hoga, W. P. Piggott, and S. Beardmore) lately obtained provisional protection—which they subsequently abandoned—for a peculiar invention applicable to telegraphs communicating from land to land, through intervening water. They proposed to carry it out by wires, either insulated or uninsulated, and considered it capable of being applied to some of the present submarine telegraphs without interfering with existing arrangements. In such cases it was proposed if desirabe to transmit messages at the same time as others resulting from the current formed by existing batteries. The battery was to consist of one great cell, and they made "the sea or other water in combination with a negative and positive element at either end, one mighty battery." This they effected by placing in the sea, near each shore, one of the negative or positive elements. These two elements were connected by a wire or cable, either insulated or uninsulated. "When the wire," said they, "is in contact with one element only, there is no current of electricity between the negative and positive elements, but as soon as the wire is in contact with both, the curcuit is completed, viz., from the negative through the whole sea or water to the positive, and from this, through the wire, and back to the negative."

Mr. B. Jones, an ironfounder of York, has introduced a method of employing, as press wheel rollers or clod crushers, two or more external rollers, working in the same plane, and fitted with internal rollers to correspond, the external rollers being formed with blades or crushers of hammered iron. When the rollers are set in motion, the internal rollers fit into the space between the blades, and are carried round in a direction contrary to that of the external rollers, their operation in this respect being similar to that of ordinary spur wheels. The earth and other matter is thus prevented from adhering to the blades of the roller, which enables it to be used as well on wet as on dry soil. By employing hammered iron the efficiency of the implement is increased, and its weight is reduced, so that it only requires one horse to draw it. A similiar arrangement of rollers might be used for crushing or bruising roots or other substances.

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NOTICES.

In consequence of a large quantity of naval matter claiming a space in this number we have been compelled to defer the publication of our next article on "Laying Off."

Several letters and papers are likewise of necessity allowed to stand over for a week.

The Mechanics' Magazine will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of insertions less than 13; for 13 insertions, 4d. per line; and for 52 insertions, 3d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

Our Weekly Gossip.

The coinage of bronze one cent pieces for Canada, now nearly if not quite completed at H. M. Mint, has not, we think, obtained sufficient notice either in the scientific world or among the general public. It is in many respects remarkable, and might form a model upon which to base a new issue of money for home circulation. The artistic character of this coinage was described in our pages (and then transferred to the daily newspapers) a few weeks since, as was the composition of the metal used in it. But, as we have said, there are other points about it which call for remark. The new Canadian one cent is not only a representative of value, but of measure and weight. In value it is precisely the 100th part of the American dollar, or $\frac{1}{2}$th of the English shilling. Its weight is the 100th of a pound avoirdupois, and its diameter is exactly, mathematically, one inch, or $\frac{1}{12}$th of a foot. It is easy to see the value of these arrangements. On many occasions the coins might be used in lieu of avoirdupois weights, or as substitutes for the carpenters' rule and compasses, as well as for the circulating medium. It is perhaps the most scientifically contrived coinage, therefore, in existence. It is chaste in appearance, well engraved, and, being much harder than copper, will wear well. More praise than this could scarcely be given, but the one cent decimal piece for Canada deserves it all. Twenty tons of these unique coins have been, we believe, despatched to our flourishing colonies, Upper and Lower Canada, and it is to be wished that some arrangement might be come to for circulating in England as light, graceful, and convenient a metallic currency. Our inferior coinage of copper is heavy, ungraceful, and inconvenient; the reverse of that we have described. But we are slow in making improvements; and Lord Overstone by objecting with all the might of his authority to the introduction of the decimal system, as he has done very recently, may be said to have delayed improvement in this particular direction *sine die*. The Decimal Coinage Commission has done much to enlighten the public as to the practicability of the decimal system of weights, measures, and notation, but apparently much more remains to be done.

Mr. Henry Bradbury, of the well-known printing firm of Bradbury and Evans—a gentleman whose beautiful system of "nature printing" has charmed us all—has introduced a new method of producing printing surfaces from engraved plates. He describes it thus:—A composition is spread over an engraved plate in order to get a cast, and from such cast an electrotype plate is obtained. The composition consists of gutta percha and animal grease, or oil, or vegetable oil (by preference hard or olive oil is used). The gutta percha is combined with the grease or oil by means of heat. The composition is kneaded and washed in warm water, and then the water is completely pressed out. The composition is laid on a plate, and heat is applied to the under or back surface of the engraved plate, so that by melting the composition the whole of the engraved parts may be filled. The coating of composition thus applied is, when dry or set, to be removed, and from it an electrotype plate is to be produced, as is well understood, but in place of resorting to the ordinary means of preparing the surface of the cast taken from the engraved plate, it is prefered to wash the surface of the composition cast over with a solution of the nitrate of silver, and then to subject the same to the vapours or fumes produced from phosphorous and caustic potash.

A curious manufacture has been established in the Tyrol, namely, that of producing by mechanical means a powder of iron sufficiently fine to be used in medicine as a substitute for that obtained by the reduction of an oxide of iron by means of hydrogen. The mode of producing this powder is not published, but it is thought that it is made by very fine files. The value of this new iron powder in medicine is not yet ascertained; but it has this difference, as compared with the powder produced by means of hydrogen, that it will not burn spontaneously in air; but it will do so easily when suspended to the poles of a magnet. If the latter is plunged into the powder, and a lighted match be then applied to the powder adhering to the magnet, the iron will burn readily and brilliantly, and when the magnet is shaken the particles fall off in the form of beautiful sparks. This property is supposed to be peculiar to the Tyrol preparation.

At the last sitting of the Academy of Sciences, Paris, a letter was read from M. Christofle, the eminent silversmith, to M. Dumas, on the subject of a new alloy, which he calls aluminium-bronze. The composition of this alloy, discovered by M. St. Claire Deville, is not stated in the letter, but it is shown that its durability under continued friction is six times greater than that of common bronze; and that it may be most advantageously used for fire-arms of all descriptions. A pistol barrel was produced which had undergone numerous trials both at Paris and at the Exhibition of Dijon. M. Christofle concluded his letter by requesting the academy to give its support to an application addressed to the Minister of War for permission to cast at the applicant's own request, a piece of ordnance of any size best calculated to test the durability of this new bronze under the most trying circumstances. This alloy can be forged at a red head, and hammered like the best steel.

M. Dufour has sent in to the Academy of Science, Paris, a paper on the anatomy of a small hemipterous insect of the genus *Leptopus*, not more than four or five millimetres in length, which possesses an organisation as complete as any large vertebrated animal, comprising a nervous system, with a brain and ganglions, a vascular trachæan respiratory system, a digestive apparatus composed of a pair of salivary glands, a stomach with its pyloric valve, a chylific venticle, &c., &c. All the members of this insect are so minute and so fragile, that they defy the scalpel, pincers, or scissors; the dissection must, therefore, be effected with the point of a fine needle in a watch-glass filled with water, and it requires many specimens in order afterwards to be able to re-constitute the different fragments.

Sir Benjamin Brodie, as president of the Royal Society, received a very large party of eminent scientific and literary persons on Saturday evening, in Burlington-house. Various interesting objects were exhibited, and the fine collection of portraits belonging to the Society, which have been recently hung in the Society's meeting room, attracted much attention. Among those present were—His Royal Highness the Prince Consort, the Lord Chancellor, the Marquis of Lansdowne, Lord Campbell, Sir R. Murchison, the Chief Baron, Sir C. Lyell, Sir C. Fellows, Sir R. Vyvyan, President of the College of Physicians, Sir J. Rennie, General Sabine, Colonel Yorke, General Monteith, Professor Owen, the Master of the Mint, Dr. Webster, Professor Wheatstone, Sir E. Landseer, Sir G. Back, Mr. Babbage, Mr. Faraday, Mr. Rowland Hill, Dr. Tyndall, Mr. Yates, Mr. Brodie, Mr. Weld, Mr. Mylne, Mr. Parker, Mr. Spedding, Mr. Forster, Mr. James Dixon, Dr. Sharpey, Mr. Dilke, Mr. Brandt, Mr. Weigall, Mr. Tite, Mr. Claudet, Mr. Yorke, Mr. Pole, &c.

Captain Norton—to whose claims we have drawn attention in our leading columns—has brought out a new destructive missile, a kind of liquid-firebrand, as the *Times* military correspondent denominates it, for throwing into buildings and setting them on fire, blowing up powder magazines and ammunition waggons, and setting fire to the ships of an enemy. It is composed of a wooden tub charged with the liquid-fire. In ordinary shells the metals take no part in the conflagration, but in this new missile the shell as well as its charge becomes incendiary, and all is fire. There can be no doubt, after the success which attended the experiments made at Chatham this week with the new missile, that rifle shells charged with liquid-fire are far more efficient for blowing up ammunition waggons in the field than ordinary shells. Spherical wooden brands may be saturated with the liquid-fire, and then discharged from ordinary smooth bore cannon. On Wednesday, nearly the whole of the officers of the Royal Engineers now at head-quarters, Chatham, assembled on the practising-ground for the purpose of witnessing a trial of Captain Norton's missiles, in order that a report upon the inventions may be made to the Horse Guards by Colonel Sandham, Director of the Royal Engineer establishment. Captain Norton conducted the experiments, assisted by a sergeant of the Royal Engineers. All went off most successfully except the apparatus for submarine explosions, in which some derangement took place. At the close of the experiments Captain Norton expressed his willingness to repeat them before the officers of Engineers on another occasion.

Mr. William Chambers, of Glenormiston, one of the famed publishers of *Chambers' Journal*, &c., has just vested in the Magistrates and Town Council of Peebles, his native place, the property of an institution, to be called "The Chambers' Institution," in trust for the use of the inhabitants of the town and district. The building and fittings-up, including a public assembly hall, a museum and gallery of art, a reading room, and large library, will, it is said, cost about £30,000. The internal decoration of the building is superintended by Mr. James Ballantine, author of "Ilka blade of grass," "The wee raggit laddie," &c.

We cannot refrain from putting in a good word for the penny *London Journal* and its present managers. The last number (for April 16), now before us, merits the warmest applause. This is perfectly true of its literary features, but it is very remarkable in respect of its illustrations, every one of which is good, while some are truly beautiful specimens of the wood engraver's art. The fine views of Hampton Court deserve especial mention; but they fall short of the excellence of the opening picture of Prince John and the Jew, from Scott's Ivanhoe, drawn by Gilbert. It is no exaggeration to say that this is a magnificent picture, surpassing everything of the kind that we have seen of late. The whole number, when one remembers its price, is a marvel, containing, as it does, very nearly 180 square inches of wood engraving of a very superior kind; and all this, with a mass of good literature, for 1d.! Truly, the working classes are very well served by the press now-a-days. We may add the *London Journal* is now, we believe, what it was not a short time since, and that is—honest, for it acknowledges the sources of its information. This was not always the case. In times past we have very, very often had the pleasure—or the displeasure, which was it?—of observing our own remarks unacknowledged in its columns. We see we are credited with them now when they are quoted.

Nearly a column of the *Times* of Tuesday last was occupied by a most curious letter (paid for as an advertisement) from the rector of Barnet, the Rev. H. J. Newcome. He commences by saying the "good time" has come, for he has discovered a mode of saving three-fourths of all the fuel used in the world. For four months, with an apparatus costing £7, he has heated a church containing 200 people every Sunday to a summer temperature with less than 3d.-worth of wood. He has not submitted his apparatus to scientific men because God "does not confine his gifts" to them. He is going to make millions of money by the invention, and with them he intends first to suppress the Great Social Evil—buy it up, we presume—and, secondly, to furnish the Bishop of Newfoundland with a small steamer. After mentioning these proposals, he states that he is about to charge 10s. the first week, 5s. the second, and so on, to persons who inspect the apparatus (which is patented, he says, in all countries), and concludes by observing that he should be ashamed to sit in the House of Commons if he had first to promise how he would vote when he got there, and calls upon electors throughout the country to go individually to "the most religious—the most charitable man they know," and ask him to go to Parliament unshackled. We lately heard, if we mistake not, that the dissenting chapels of Barnet were flourishing, while the Church was in a sad state of decline. If this be so, we can readily guess the cause. We would suggest to the rev. gentleman whether he would not do well to go to a certain large edifice at Hanwell, and carry on his experiments there for the future.

It is stated that one of Boydell's traction engines, in a trial a few days since at Manchester, described a circle of 80 feet in diameter, steered clear of a crane, and was driven between gate-posts in a satisfactory manner. The engine had a train of four waggons attached. It was built by Mr. Burrell, of Thetford, Norfolk, and is to be sent to Venezuela, South America. The train has been worked between Manchester and the colliery of Messrs. Gibson, Little Halton.

M. Latry, of Greenoble, has invented, says the *Bulletin*, a singular method of making artificial wood hard, solid, heavy, susceptible of the highest polish, and of a dark colour like ebony. It is made by mixing sawdust with bullocks' blood, and then subjecting the composition to a very heavy pressure by means of the hydraulic press. With the material thus formed all kinds of furniture and ornamental work may be made—in short, it can be used for all the purposes to which hard woods are applied.

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Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated March 1, 1859.

536. E. J. Hughes, of Chancery-lane. Improvements in preserving animal food, poultry, game, fish, fruit, and other similar substances. A communication from E. Gorges, of Paris.

Dated March 12, 1859.

634. J. Palmer, of Sutton Coldfield. Warwick, Edge Tool Maker. A new or improved trap for catching animals, birds and fishes.

Dated March 16, 1859.

650. I. Ash, of Great Bridport-st., Blandford-sq., Locksmith. Improvements in the construction of locks and latches.

664. W. Avery, of Birmingham, Engineer. Improvements in machinery for the manufacture of screws.

668. J. Clark, of Newton Heath, near Manchester. Improvements in the manufacture of fabrics in which compounds containing india rubber are used.

670. H. Bessemer, of Queen-st.-place, New Cannon-st. Improvements in the manufacture of crank axles.

Dated March 17, 1859.

672 C. Defries, of Hounsditch. Improvements in lamps.

674. J. H. Johnson, of Lincoln's-inn-fields. Improvements in machinery or apparatus for folding and stitching sheets of paper. A communication.

678. A. G. Hutchinson, of West Derby, Lancaster, Builder. Improvements for counteracting damp in buildings.

Dated March 18, 1859.

684. W. B. Taylor, of Ballymena, Antrim, Gentleman. Certain improvements in or applicable to looms for weaving.

690. R. Mushet, of Coleford, Metallurgist. A new or improved metallic alloy.

692. A. L. Thirion, Pastor, of Asche en Refail, Belgium. Improvements in water, wind, steam, and hand mills.

694. J. W. Duncan, of St. John's-wood, and J. E. A. Gwynne, of Regent's-park, Gentleman. Improvements in, or connected with, apparatus for the generation, application, and condensation of steam, part of which apparatus or arrangements is applicable to other purposes.

Dated March 19, 1859.

696. W. B. Gingell, of Bristol, Architect. Improvements in the form of metal bars used for the stiles, rails, heads, and sills of window sashes, casements, and other lights.

698. S. Stein, of Chapel-place, Poultry. Manufacturing a resinous carton or pasteboard from vegetable matter, an improvement for roofing, ship sheathing, lining walls to prevent dampness, and other uses. A communication from A. M. Chevalier.

702. J. Howden and A. Morton, of Glasgow, Engineers. Improvements in apparatus for obtaining and regulating motive power.

704. W. and S. Pickstone, of Radcliff-bridge, near Manchester, Cotton Spinners. An improvement in stiffening, sizing, filling, or weighting textile fabrics.

706. W. C. Cambridge, of Bristol, Agricultural Implement maker. An improved construction of chain harrow.

Dated March 21, 1859.

708. A. Baucq, Sugar Manufacturer, of Marchiennes, France. Maintaining graters mechanically.

710. R. Whittaker, of Lennox Mill, Stirling, Millwright. Improvements in the manufacture or construction of metallic rollers or cylinders and mandrills for printing.

712. J. Roberts, of Staley Bridge, Engineer. Improvements in packings for pistons.

714. J. Bickerton, of Oldham, Machinist. Improvements in opening and securing window sashes.

716. W. Warne, J. A. Fanshawe, J. A. Jaques, and T. Galpin, of Tottenham, India Rubber Manufacturers. An improved compound or preparation of materials for, and mode of covering and insulating wires or conductors used for telegraphic or electrical purposes.

Dated March 22, 1859.

718. G. P. A. Lutz, of Paris, Manufacturer. An improvement in veils.

720. P. Tagliacozzo, of Broad-st.-buildings. An improvement in metallic pens.

724. J. T. Pitman, of Gracechurch-st. Improvements in springs for railroad cars and for other purposes. A communication from J. J. Fields, of Brooklyn.

726. S. Newington, of Ridgway Ticehurst, Sussex, M.D. Improvements in apparatus for distributing seeds and manure.

728. W. P. Wilkins, of Ipswich, Engineer. Improvements in the arrangements of valves, and in their application to steam-engines.

732. J. Tyssen, of Rotterdam, Mariner. An improved apparatus for indicating the speed of ships and other vessels.

Dated March 23, 1859.

735. S. Oram, of Fleet-st. Improvements in pipes or tubes for generating and superheating steam.

736. W. Adamson, of Newcastle-on-Tyne. Improvements in apparatus for propelling vessels.

737. S. Clarke, of Albany-st., Regent's-park. Improvements in the manufacture of candles.

738. W. Middleship, of Mile-end, Officer of her Majesty's Customs. Improvements in propelling vessels.

739. J. Evans, of Nash Mills, Hertford, Paper Maker. Improvements in the manufacture of paper.

741. J. V. Hielakker, of Brussels, Civil Engineer. Improved apparatus for pressing or moulding artificial or patent fuel, fire-bricks, and similar articles.

742. G. Neal, Gas Chandelier Maker, of Birmingham. Certain improvements in apparatus or fittings connected with the burning of gas for regulating and economising its consumption.

743. W. Delany, of Norfolk-st., Strand, Gentleman. Improvements in ploughs for tilling land. A communication from L. D. Phillips, of Chicago.

744. J. H. Johnson, of Lincoln's-inn-fields. Improvements in machinery or apparatus for the manufacture of sheet tin. A communication from M. Masson, of Paris.

745. P. P. Bell, of Paris, Gentleman, and H. Reger, of Cologne, Gentleman. Improvements in steam boiler and other furnaces. A communication from A. Speich, of Strasbourg.

746. F. Tillett, of Banner-st., St. Luke's, Splint Cutter. Improvements in machinery for cutting splints for matches.

Dated March 24, 1859.

747. W. and J. Garforth, of Dukinfield, Engineers. A certain improvement in metallic pistons.

748. W. E. Wiley, of Birmingham, Pen Manufacturer. Improvements in the manufacture of boxes or cases used for holding needles, pens, matches, pencils, and for other like purposes.

749. W. E. Wiley, of Birmingham, Pen Manufacturer. New or improved instruments to be used in burning and supporting candles.

750. F. E. Sharp, of Blackheath. Improvements in machinery for corking bottles.

751. E. S. Tebbutt, of Leicester, Elastic Web Manufacturer. Improvements in the manufacture of elastic fabrics.

752. C. Sanderson, of Sheffield, Merchant. Improvements in preparing, tempering, and covering, or coating thin strips, or sheets of steel.

753. W. Clark, of Chancery-lane. A machine for separating oats from their husks or chaff. A communication from L. J. E. Dupont, of Paris.

Dated March 25, 1859.

754. H. Rigby, of Salford, Engineer. Improvements in machinery or apparatus for obtaining motive power, applicable to hoists, and all other purposes to which motive power can be applied.

755. C. Cowper, of Southampton-buildings. Improvements in telegraphic cables. A communication from R. J. Bingham, of Paris.

756. R. Baker, of Liverpool, Watch Maker. Improvements in chronometers, watches, and other time-keepers.

757. J. H. Johnson, of Lincoln's-inn-fields. Improvements in fire-arms. A communication from F. H. Bell, of Washington.

758. W. E. Newton, of Chancery-lane. Improvements in ovens for baking bread and other substances. A communication from T. Russell, of New York.

759. C. Hill, of the Chippenham Station, Great Western Railway. Improvements in the permanent way of railways.

760. H. Humphreys, sen., of Buckingham, Gentleman. An improvement in unhairing hides and skins, and in the manufacture of leather.

Dated March 26, 1859.

761. G. Haseltine, Gentleman, of Washington. Improvements in the manufacture of small metallic chains. A communication from E. H. Perry, of Rhode Island.

763. E. Steane, of Brixton, Widow. An improved means or apparatus for preventing candles dropping or guttering.

765. M. Firth, of Sheffield, Steel Manufacturer and Merchant. Improvements in machinery for grinding saws and flat plates of steel. A communication from E. T. Jones, of Montreal.

766. G. Naylor, of Stonehouse, Devon, Lieut. An apparatus for measuring and indicating the distance passed over or travelled by the same.

767. J. C. Evans and P. Soames, of East Greenwich, Engineers. Improvements in apparatus for superheating steam.

768. M. A. Muir and J. McIlwham, of Glasgow, Machinists. Improvements in moulding or shaping metals.

769. E. Dowling, of Little Queen-st., Holborn, Scale Maker. Improvements in weights.

770. B. and C. L. Smith, of Spitalfields, Manufacturing Chemists. Improvements in the preparation of certain colouring matter, applicable for dyeing and printing.

771. J. Buckley, of Horwich, Lancaster, Calico Printer, O. Greenhalgh, of the same place, Manager, and R. Hutchinson, of the same place, Mechanic. Improvements in machinery or apparatus for printing woven fabrics.

Dated March 28, 1859.

772. C. J. Richardson, of Kensington-sq. Improvements in apparatus to be applied to chimneys or flues of buildings, for preventing downdraught or return smoke, for their insuring upward ventilation, and for reducing the quantity of smoke or the blacks from the smoke passing into the atmosphere.

773. C. F. Vasserot, of Essex-st., Strand. An improved diving apparatus. A communication from P. Biggard, of Lyons.

774. J. Buckingham, of Walworth-common, Civil Engineer. Improvements in machinery or apparatus employed in drawing fibrous substances.

775. A. V. Newton, of Chancery-lane. An improved construction of furnace for reheating steel, preparatory to the hardening, tempering, or annealing process. A communication from P. G. Gardiner, of New York.

776. A. Turner, of Leicester, Elastic Web Manufacturer. Improvements in the manufacture of elastic fabrics.

777. A. V. Newton, of Chancery-lane. Improved apparatus for retaining the oil or other fluid used for annealing, tempering, and hardening steel at an equable low temperature. A communication from abroad by P. G. Gardiner, of New York.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

814. F. P. A. Auburtin, of Paris. An improved preparation of food for herbivorous animals. Dated April 1, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, April* 12, 1859.)

2707. G. Oates. Scissors. A communication.
2725. J. Luis. Rail-road. A communication.
2733. J. Colyer. Casks.
2744. H. Adcock. Annealing wire.
2745. F. Warner, J. Derbyshire, and A. Mann. Cocks.
2747. H. Bessemer. Wheels and tyres.
2748. S. Newington. Agricultural implements.
2749. A. E. Davis and R. Wright. Colouring matter.
2759. J. Baillie. Railway wheels.
2765. S. Peters. Pipes and tubes.
2771. J. Cameron. Sugar.
2772. R. Legg. Tobacco.
2794. R. A. Brooman. Gloves. A communication.
2796. E. W. Scale. Railway breaks.
2807. S. W. Pugh. Purifying oils and spirits.
2820. J. Barrow, jun. Coal gas tar.
2822. J. Eccles. Bricks, tiles, &c.
2827. T. Allen. Bedsteads.
2828. J. Wilson. Cultivating land.
2849. A. Rollason. Waterproof tissues.
2855. R. A. Brooman. Threads, &c. A communication.
2863. G. W. Baker. Manger fastening.
2864. R. A. Brooman. Transmitting telegraph signals. A communication.
2869. H. Bridges. Working breaks.
2872. A. V. Newton. Condensing. A communication.
2873. J. Bullough. Looms.
2880. R. Wilson and R. Wilson, jun. Leather.
2961. C. M. A. Marion. Case for photographic paper.
2972. W. Haworth and W. Barker. Spinning.
2977. T. Pickford. Manure.
55. G. K. Geyelin. Gas burners.
64. F. Versmann and A. Oppenheim. Rendering substances non-inflammable.
80. C. M. Kernot. Paraffine.
88. F. Versmann and A. Oppenheim. Rendering substances non-inflammable.
222. H. Owen. Stockings.
518. F. Weekes. Alcoholic products.
644. D. Joy. Hydraulic engines.
645. C. H. Hurst. Wrench or spanner.
694. J. W. Duncan and J. E. A. Gwynne. Generation of steam.
707. W. Haggett. Treating metals.
710. R. Whittaker. Printing.
716. W. Warne, J. A. Fanshawe, J. A. Jaques, and T. Galpin. Insulating wires.
737. S. Clarke. Candles.
747. W. and J. Garforth. Metallic pistons.
761. G. Haseltine. Metallic chains. A communication.
780. W. Mossman. Cutting presses.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed April 8, 1859.

2236. E. V. Rippingille.
2238. J. and H. Mitchell and T. England.
2240. A. Nicholls and T. Walker.
2247. F. W. Gerhard.
2256. J. Holroyd.
2257. C. F. Vasserot.
2259. J. Beattie.
2260. R. Cowen, jun.
2261. J. L. and F. L. Hancock.
2266. T. Riddell.
2270. L. Wray.
2287. L. Cowell.
2289. A. Gordon.
2294. H. Martin.
2312. J. P. Gillard.
2335. W. E. Newton.
2369. R. Bodmer.
2377. F. Fowke.
2404. C. Pooley.
2533. A. V. Newton.
2717. J. H. Johnson.
2978. H. Hutchinson.
2980. A. V. Newton.
250. H. Brecknell and J. Dyer.
355. J. Aspinall.
406. W. E. Newton.
422. J. T. Jones.

Sealed April 12, 1859.

2274. G. Beadon.
2275. J. A. Gasse.
2283. A. Benda.
2285. J. C. Ollerenshaw.
2288. C. Cowper.
2293. S. Perkes.
2295. G. Baxter.
2297. S. Diggle.
2300. R. R. Jackson.
2302. G. Davies.
2309. F. J. Coulon and S. G. Giraud.
2316. A. Dunn.
2378. J. Robb.
2385. A. V. Newton.
2750. F. Pincham.
95. J. Gibbons.
280. J. Grimond.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

814. R. Halliwell.
830. A. Morton.
842. A. Morton.
843. W. Terry.
852. W. J. Curtis.
860. G. F. Morrell.
874. J. Mash.
884. R. Richardson.
888. J. Barrans.
892. L. Kaberry and A. Horsefield.
948. J. Nasmyth and H. Minton.
973. W. P. Savage.

LIST OF SPECIFICATIONS, &c.

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ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietor of this Magazine. Other papers are hereby warned not to produce them without acknowledgement :—

STEAM ENGINES, &c., 1928, 1937, 1969.

BOILERS AND THEIR FURNACES, 1950.

ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1948, 1971.

SHIPS AND BOATS, including their fittings, 1941, 1954, 1958.

CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 1953.

FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 1849, 1956.

FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1926, 1929, 1945, 1947, 1952, 1957, 1962, 1968, 1975, 1976.

BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c. *None.*

LIGHTING, HEATING, AND VENTILATING, 1935, 1940, 1942, 1943, 1944

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1925, 1938, 1939, 1951, 1955, 1960, 1963, 1974.

METALS, including apparatus for their manufacture, 1927.

CHEMISTRY AND PHOTOGRAPHY. *None.*

ELECTRICAL APPARATUS, 1924, 1935, 1965, 2013.

WARFARE, 1966.

LETTER PRESS PRINTING &c. *None.*

MISCELLANEOUS, 1922, 1923, 1928, 1930, 1931, 1933, 1934, 1946, 1959, 1961, 1964, 1967, 1970. 1972, 1973.

1922. J. HINE and A. ABRAHAMS. *Improvements in book-slides or holders.* Dated Aug. 24, 1858.

This consists in the application of elastic webbing to the sliding part of the tray, whereby it has a constant tendency to contract and grip the books held in the tray or holder. *Patent abandoned.*

1923. H. WILSON. *Improvements in the mounting of band saws.* Dated August 24, 1858.

This invention was described and illustrated at page 173, No. 11, of the MECHANICS' MAGAZINE (NEW Series). *Patent completed.*

1924. J. MACINTOSH. *Improvements in insulating telegraphic wires or conductors, and in apparatus employed therein, part of which apparatus is applicable to the manufacture of tubes from india-rubber.* Dated August 24, 1858.

The present inventor patented certain grooved rollers on the 14th May, 1858, for coating telegraph conductors with india-rubber. He now places other rollers in contact with the grooved rollers, one at each of the points where the india-rubber is fed into the grooves, and on these secondary rollers are formed beads adjusted so as to fall exactly in the middle of the grooves of the principal rollers, so that they form indentations in the india-rubber suitable to receive the wire or conductor. With soft india-rubber, he mixes an equal weight of shellac ground fine, and without any solvent, by means of crushing rollers. In some cases, after having coated the wires with insulating material, he again covers them with gutta percha, or other material, with which unspun fibre is intimately mixed. Sometimes it is desired to cover conductors with insulating material, and at the same time to combine yarns with, or imbed them in, the covering. For this purpose he employs a cylinder closed at the ends, with a screw just fitting within it, mounted on a hollow axis passing through the ends of the cylinder. Through this axis the yarns and the wire or conductor to be covered pass, and the bobbins from which the yarns are drawn are mounted on a frame fixed on the end of the same axis. The cylinder has an opening in its side near the end at which the yarns enter for feeding in the gutta percha. When the axis is caused to rotate, the gutta percha is pressed out at the end of the cylinder, and passes into a small box furnished with a die, and so that the yarns become imbedded in the covering. When employing more than one coating to a conductor he causes a current of cold air to impinge on the covered wire after the first coating, so as to bring it rapidly to such a consistency that the second coating may be applied without injuring the first. *Patent completed.*

1925. J. BIGGS. *Improvements in the manufacture of caps, resembling in form the Turkish fez.* Dated August 24, 1858.

Here a cap is knitted by machinery, or by hand, to the requisite shape. The cap is then milled so as to give it a felted texture and appearance. By this means a seamless cap is formed resembling the Turkish fez. *Patent completed.*

1926. H. B. BARLOW. *Certain improvements in machinery for preparing flax, wool, and other fibrous materials.* Dated Aug. 25, 1858.

Here a heckle drum covered with card-teeth is employed, and the fibrous material is supplied to this drum through a trumpet spout or between rollers. A pair of drawing rollers is applied to draw the fibrous material over the heckle drum and through the teeth, and the upper roller is fluted, while the lower one is covered with leather. This heckle drum may be applied to the drawing head of a carding engine. *Patent abandoned.*

1927. T. HILL. *Improvements in machinery or apparatus for punching and shearing metals.* Dated Aug. 25, 1858.

These consist in a framework of two sides, so that the plates may pass between them, and also on the outside, when desired. Motion is given to a shaft carrying eccentrics or cams, which rise and fall by connecting-rods. There is a cross-bar or slide in the inside, and also slides on the out-side, to which slides the punches and shears are attached. The plates rest upon dies and cutters connected with the framework, and also upon a travelling table or dividing apparatus. *Patent completed.*

1928. J. DREDGE. *Improvements in condensers for steam engines, and in pumps for working such condensers, or for lifting water from deep mines, and for any other use to which pumps are applicable.* Dated Aug. 25, 1858.

The patentee employs cold water cisterns which are not exposed to atmospheric pressure, and he constructs them respectively in the condenser around or in connection with a chamber in which the steam is condensed in the passage from the steam cylinder of the engine. He injects cold water into condensers by certain double and fourfold acting force pumps ; and he fixes the condensers with either of the pumps in connection with the cylinder of a steam engine. *Patent completed.*

1929. R. A. BROOMAN. *Improvements in the treatment of vegetable substances in order to convert the fibrous portions thereof into pulp.* (A communication.) Dated August 25, 1858.

This consists in submitting the vegetable substances to the action of steam, which steam, before entering the vessel containing the vegetable substances, passes through a vessel containing salts of soda or carbonate of soda. During the steaming the gummy matter is allowed to escape, and, the steaming over, bleaching liquid (*eau de javelle*) is applied. Water, slightly acidulated, is then poured upon the fibres, and the fibres are finally washed in clean water. *Patent completed.*

1930. W. EVANS. *Improvements in machinery or apparatus for manufacturing saw backs.* Dated August 26, 1858.

The inventor makes use of a draw bench, and in conjunction with it a die of a peculiar formation, through which the material of which the saw back is formed, is forced to pass by being attached to the draw bench. This die is so shaped that at the side where the metal enters it is sufficiently large to admit it in the unbent state, whilst at the opposite end it is gradually contracted to the dimensions of the saw back in its complete form. *Patent abandoned.*

1931. J. H. JOHNSON. *Improvements in bellows.* (A communication.) Dated Aug. 26, 1858.

Here two levers are used, one moveable and the other stationary. At the extremity of the lower or stationary lever is attached a nozzle containing a valve which is free to open outwards. The upper lever is connected to the lower one near to this nozzle by a hinged joint, allowing of free motion in a vertical direction. The blowing apparatus consists of two discs of wood fastened to the upper and lower levers respectively. The peripheries of these discs are united by leather. The passages for the air blast are formed in the lower lever and thence lead to the nozzle. It is proposed to use flexible skins in combination with the leather. *Patent completed.*

1932. C. C. CAVALLI. *Improvements in the manufacture of starch.* Dated August 26, 1858.

This invention refers to a previous patent of the inventor, and consists in using ascetic acid or chlorhydric acid, either separately or combined with rennet, pepsine, gasterase (a substance recently discovered or prepared by the French chemist Payen), or with an infusion of the bladders of animals mixed with the required quantity of water. *Patent abandoned.*

1933. J. BLACK. *An improved mode or means of obtaining, applying, and transmitting motive power.* Dated August 26, 1858.

The patentee claims a revolving face plate or disc, with curved pathways, in which acts a roller or pulley connected to a lever, forming a mechanical motion which is applicable to various instruments or machinery, so as to effect the obtaining, applying, and transmission of motive power. The application, adaptation, and combination of the aforesaid mechanical motion or revolving face plate with curved paths, in which acts a roller or pulley connected to a lever, to and with mincing machinery, pumps, and other apparatus in which reciprocating motion is required ; and to and with printing and other machinery in which rotatory motion is required, and for moving carriages, and propelling and otherwise for transmitting and applying motive power. The application and combination of the aforesaid mechanical motion with a water-wheel and pumps as set forth, for obtaining and applying motive power. *Patent completed.*

1934. J. COATES. *Improvements in apparatus or machinery for obtaining and applying motive power.* Dated August 26, 1858.

This invention, as developed in one mode of constructing engines, consists of a framework having one solid and one hollow central pillar, carrying a working beam made hollow half its length. The hollow portion is connected to the hollow pillar by joints with glands to make the same water-tight, as is also the tubular end of the beam, being attached thereby to a tubular connecting rod affixed vertically to a horizontal cylinder, which cylinder has well-fitting and packed covers at each end, through which pass the ends of the piston, which is bored to admit a shaft carrying a fly-wheel, and on which shaft the cylinder oscillates. The central external portion of the cylinder for half its upper diameter has a water channel formed upon it, equal to and communicating with the upper tubular connecting rod, which operates alternately on the valves while the piston is performing each stroke. The piston at one or both ends may be provided with one or more waste water cocks, to discharge any water that might pass the piston. There are other arrangements which we cannot give in detail. *Patent completed.*

1935. S. N. RODIER. *Improvements in apparatus for regulating gas.* Dated August 26, 1858.

When this apparatus is to be applied to each burner, there is introduced a small chamber below or near the burner. The gas is supplied to this chamber by a pipe, the exterior of which should be largest at its upper end, and tapering downwards. At the upper part of this supply pipe there are openings for the gas to pass through. The supply pipe is a light hollow cap, the interior of which corresponds in form with the exterior of the supply pipe, but so much larger in diameter as to admit of the gas flowing freely down between the interior of the cap and the exterior of the supply pipe when the cap is resting on the top of the supply pipe. The lower part of the cap is so formed that when lifted by the pressure of the gas the lower edge of the cap comes nearer and nearer as the cap is more and more lifted to the supply pipe, and thus reduces the size of the passage or space which is between the interior of the cap and the exterior of the supply pipe. *Patent completed.*

1936. G. M. SAUTTER. *Improvements in telegraphs.* (A communication.) Dated August 26, 1858.

Here a wire is employed which passes over pulleys from one place to another, and to each end of the wire a weight is attached which slides in a slot in a vertical fixed plate. On one side of the slot in each plate are marked the letters of the alphabet and figures, and on the other side of the slot a number of phrases most likely to be required. To each weight two pointers are attached, one of which points to the letters and figures, and the other to the phrases. The letters and phrases on one plate are marked in the inverse order to those on the other plate, and the length of the wire is adjusted so that when one pointer points to a letter or phrase on one plate the other pointer points to the same letter or phrase on the other plate. *Patent abandoned.*

1937. D. GRAHAM-HOPE. *Improvement of locomotive and other steam engines.* Dated August 27, 1858.

The bearing springs of a locomotive are composed of a series of steel plates piled upon each other, and are held together by a pin passing through the centre of each plate. Now, the present invention consists in raising on the under side of each plate a cup-shaped projection, which is punched or forced out of the body of the plate. The invention also relates to pistons, and consists in a solid wrought or cast iron body, which may or may not be formed solid with the piston rod. In a groove turned into this body he places a single packing ring, split into two separate parts, which he keeps open as the ring wears, by two V-pieces, which alone are acted upon by the steam pressure within the cylinder. *Patent abandoned.*

1938. T. TROTMAN. *Improvements in hair pins.* Dated August 27, 1858.

This consists in corrugating or undulating the limbs of those articles so that the corrugations are in a direction at right angles or nearly so to the plane of the two limbs of the pins. *Patent completed.*

1939. J. ELLISDON. *Improvements applicable to reading chairs and other articles used to sit or recline upon.* Dated August 27, 1858.

This consists in applying a reading desk, or a writing desk, or both, to easy chairs, sofas, couches, the arms of railway carriages, &c., in such a way that when not in use they can be folded up and stowed away out of sight. *Patent completed.*

1940. F. MATLEY. *Certain improvements in apparatus for regulating the flow of gas, and for improving its illuminating power.* Dated August 27, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

1941. W. S. CLARK. *Improvements in reefing or furling sails from the deck of vessels.* (A communication.) Dated August 27, 1858.

Here no extra weight or additional spar is requisite, as the sail is rolled around the usual spar employed in the common rig, while the studding sail booms are made to subserve the additional purpose of a chafing bar in protecting the reefed sail from chafe on the shrouds. The invention is not described in detail from the drawings. *Patent abandoned.*

1942. W. ESSON. *Improvements in wet gas meters.* Dated August 27, 1858.

Here the upper part of the meter has an air-tight water-supply tank, which communicates with the measuring chamber by a feed or supply pipe so disposed as to be always sealed. The supply tank has an air pipe, the lower mouth or orifice of which coincides with the proper water level, and a float is contained therein connected with the ordinary gas valve for shutting off the gas when the tank is empty, or the water therein too low. The water is supplied to the tank by a supply pipe which is kept sealed. When the water in the meter descends below its proper level, by reason of evaporation or other loss, it leaves exposed the lower orifice of the air pipe, and allows the gas to ascend therethrough, and the water in the upper tank to descend through a pipe until the air pipe is sealed again by the water in the meter regaining its proper level. *atent completed.*

1943. H. W. HART. *Improvements in the application of gas to chandeliers.* Dated August 27, 1858.

This relates to an arrangement of parts by which the hydraulic joint of the ordinary hydraulic double or treble tube telescop chandeliers may be dispensed with, as also the stuffing-box joint of the ordinary double tube dry telescopic gas pendants or chandeliers, by substituting parts arranged according to this invention, which is simple, and whereby all liability to leakage is prevented. It consists in connecting the upper tube or service by a flexible pipe with the body of the chandelier. *Patent completed.*

1944. F. J. EVANS. *An improvement applicable to gas purifying.* Dated August 27, 1858.

The patentee takes turnings, borings, and filings of iron, or scrap, or small pieces of iron, in the form of shot, for example, and exposes the same to gases or liquids, either at ordinary or elevated temperatures that will ensure their

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rapid oxidation. When the surfaces of the pieces of metal are completely coated with oxide or rust, the metal thus oxidised is ready for use in the dry gas purifiers, where it is to be employed in the manner usually practised when purifying gas with the oxides. *Patent completed.*

1945. A. V. NEWTON. *Improved machinery for sorting silk or other thread, according to its size or thickness.* (A communication.) Dated August 27, 1858.

This relates to means whereby threads of silk, &c., are so directed on to a bobbin that it will be distributed upon different parts of the said bobbin according to its size or thickness. It also relates to means of controlling the winding of the threads on a series of bobbins or spools from the main bobbin or winding apparatus, on the several parts of which it has been distributed according to its size or thickness, so that all of one thickness will be wound upon one bobbin or spool. *Patent completed.*

1946. W. E. NEWTON. *Improvements applicable to vessels employed in the manufacture of glass, or the melting of citreous.* Dated August 27, 1858.

This consists in running off the fused materials through an orifice at the lower part of the oven, pot, or vessel. The inventor closes these orifices by stoppers made of earthy materials, or by metallic stoppers. *Patent completed.*

1947. W. KEMPE. *Improvements in apparatus used for winding woollen and other fabrics on rollers, in order to such fabrics being boiled or faced when on the rollers.* Dated August 27, 1858.

This consists partly in applying apparatus for holding and for giving motion to a roller at each of its ends. By these means the ends of a roller, when having a fabric wound thereon, will be held at each of its ends by suitable friction, or holding surfaces or instruments, which instruments will have power applied in order simultaneously to give rotary motion to them and to the roller held by them. And part of the invention consists in driving at one end only of a roller by applying friction surfaces at both ends, and applying the driving power at one end only. *Patent completed.*

1948. J. FOWLER, jun., and R. BURTON. *Improvements in the construction and arrangement of locomotive and other carriages, to facilitate their movement on common roads, and other surfaces.* Dated August 27, 1858.

Here the axle or axles of the carriage is or are supported at the ends by frames, and these frames are supported on wheels which run upon rails laid by the carriage in its progress. *Patent completed.*

1949. R. KNIGHT. *Improvements in apparatus for aerating liquids.* Dated August 27, 1858.

The lower vessel of the two which the patentee employs in an apparatus previously patented by him is made in two parts of tin, and soldered together, there being an inclined shelf formed on the interior which (excepting near the front) forms a partition which divides the vessel into two compartments, there being an opening near the front between the two compartments. In the lower vessel there are two openings, which are, when in use, closed by screw plugs, and it is by these two openings when the apparatus is placed in a horizontal position that the materials for producing the gas are introduced. Both the vessels should have spherical ends. *Patent completed.*

1950. J. IRELAND. *Improvements in cupola furnaces.* Dated August 28, 1858.

The patentee applies to blast furnaces one or more air-pipes or tuyeres, placed above the ordinary tuyeres, for bringing the metal into a fused state in a higher part of the furnace than it is by the use of the ordinary tuyeres alone, thereby melting the metal with less fuel, and also purifying it as it falls to the lower ordinary tuyeres. *Patent completed.*

1951. G. WHITE. *Ambulatory furniture for apartments.* (A communication.) Dated Aug. 28, 1858.

This consists of certain arrangements of furniture, allowing of being taken to pieces, and flapped or slid together, so as to be considerably reduced in bulk, for permitting them to be easily removed from one place to another, thereby dispensing with any particular package, and so as to form what is called an ambulatory furnished apartment. The arrangements are not described apart from the drawings. *Patent completed.*

1952. W. FOSTER. *Improvements in the manufacture or production of fabrics known as fancy moreens.* Dated Aug. 28, 1858.

This consists in combining cotton or alpaca with the worsted whilst spinning. The fabric may be then woven in the usual way, and dyed in the piece, after which it will be found that the cotton or alpaca, not taking the same colour as the worsted, the fabric will present a peculiar mottled or spotted appearance. *Patent abandoned.*

1953. G. CODDE. *Improvements in the adjustment of hose in machines for distributing liquid manure and other liquids over land, also for an improved method of, and apparatus for, manufacturing the hose to be used with such machines or otherwise, and for gathering and puckering canvas, linen, leather, and other textile and membranous substances.* Dated Aug. 28, 1858.

This relates to a method of uniting the coiled hose (described in a previous patent granted to the patentee), and consists mainly in uniting the hose by means of a bayonet joint, whereby two or more boxes and reels can be used alternately, and in succession, with the same distributor. *Patent abandoned.*

1954. J. D. BRABAZON. *Improvements in giving motion by sails to screw and other propellers of ships and vessels.* Dated Aug. 28, 1858.

Here a shaft or axis is used, running fore and aft the ship; this shaft is supported in bearings above the deck. To a boss on the shaft are applied a series of radial arms, according to the largest number of sails used. To each of these arms a sail may be applied. Each sail is kept extended when in use by a spar, and by cords and tackle such sails are kept more or less inclined, to suit the direction of the wind. The shaft gives motion to the propeller by a chain and chain wheels, or by an upright shaft. *Patent completed.*

1955. G. WEBDON and D. W. RICH. *An improved knife and fork cleaning machine, part of which is applicable to other purposes.* Dated Aug. 28, 1858.

This consists in keeping the knives flat on the cleaning board by a lever, the front end of which projects. This lever is T shaped, and has a tongue at each end of the cross piece, one tongue advancing as the other recedes. By putting the lever from the left or right, the cross piece comes down upon the knife handles and keeps the blades flat on the board. *Patent completed.*

1956. F. BRIGNOLES. *Improvements in apparatus for the disinfection and rectification of bad-tasted alcohols, by the separation of the essential oils from the alcoholic exhalations.* (A communication.) Dated Aug. 30, 1858.

This operation is accomplished by condensing the alcoholic exhalations at different degrees of temperature and in separate tubes surrounded by water, the temperature of each being marked by degrees. *Patent abandoned.*

1957. J. PLATT and E. HARTLEY. *Improvements in certain parts of machinery for preparing and spinning cotton and other fibrous materials.* Dated Aug. 30, 1858.

This relates to the top rollers of drawing rollers, and consists in making use of loose bushes fitted on a parallel spindle, which spindle has a collar at one end, and a loose nut or bush at the other. The bushes, collar, and nut support the bosses, which are covered with flannel and leather, and prevent them moving laterally. *Patent abandoned.*

1958. E. MASSEY. *Improvements in ships' logs.* Dated Aug. 30, 1858.

This consists, 1, in prolonging the body or case containing the train of wheels, so as to enclose within it the universal joint by which the rotator is connected; 2. In the method of fixing the cord of the rotator to the tail-piece of the universal joint; and, 3, In the use of a thumb screw to securing the guard plate which retains the ring of the rope by which the log is dragged. *Patent completed.*

1959. J. BRAZIL and J. MCKINNELL. *An improved method of indigo blue dyeing.* (A communication.) Dated August 30, 1858.

This consists in dipping two pieces of fabric (placed back to back) into the dyeing liquid, so that the two back surfaces of the cloth may be in close contact, and unexposed to the atmosphere, allowing only the two outside or face surfaces to be exposed to the oxygen of the atmosphere, which causes the outer or face surfaces to absorb a greater quantity of indigo or dye than the back or inner surfaces by which the face sides of the cloth will present a dark blue, and the back sides a light blue colour. *Patent completed.*

1960. G. DAVIES. *Improvements in billiard tables and cues.* Dated August 30, 1858.

Here the frame of the table is of an annular form and has three or more legs. The inner part of the frame has three or more vertical grooves, in each of which slides on mountings a small pulley or wheel, capable of being raised or lowered by an adjusting screw. Upon these pulleys or wheels rests the top of the table. To the centre of the table underneath is fixed a rod or pin which slides in a hole formed in a transverse piece attached to the annular frame. This rod or pin serves to centre the table, and to maintain it in its position on the pulleys or wheels. To adjust this table it is merely necessary to raise or lower the several wheels by three screws, according to the indications of a spirit level which is let into the frame. The cues are made of a rod sliding in a tube, and projected forwards by a spring. The rod is forced inwards, compressing the spring and is held by a catch. The cue being placed and held firm opposite the ball, the catch is released by the finger, and the rod being projected forwards by the spring strikes the ball. *Patent completed.*

1961. J. BRAZIL and J. MCKINNELL. *An improved method of indigo blue dyeing.* Dated August 30, 1858.

This consists in printing or covering the face side of the fabric with certain chemical substances to draw the indigo in the dye not more to the face side than to the back of the fabric, so that when finished the face side shall present a dark blue and the back a light blue colour. The patentees employ a salt of manganese, preferring the sulphate or muriate of manganese. *Patent completed.*

1962. B. HANSON, *Improvements in means and apparatus for sizing and drying woollen yarns or warps* Dated August 30, 1858.

This consists in the use of a series of tiers of heated pipes so arranged that woollen yarns can be traversed at a suitable distance from them betwixt pairs of rollers which keep them steady and detached or separate from each other. Also in the use of fans for producing a current of air which is heated in passing the hot pipes or hot surfaces. *Patent abandoned.*

1963. J. OXLEY. *Improvements in baths.* Dated August 30, 1858.

This consists in constructing a bath somewhat in the form of the ordinary hip bath, and fitting the same with a moveable seat containing a recess for receiving a moveable tray, pool or bidet, or the pool or bidet may be formed in such moveable seat, and of any convenient form, with a plug for permitting the escape of the water. *Patent completed.*

1964. G. JONES. *Securing joints in slate ridge roll.* Dated August 30, 1858.

Here the patentee fastens under the flange at the joint of ridge a piece of metal in a separate piece under one flange, or in a piece of sufficient length to cross the breadth of the two flanges, and connects them together. Upon the upper angle of ridge is laid a roll, the ends of which he connects together by inserting in a slot a tongue of metal laid in oil cement. The ends of the said roll break joint with or overlap the joint in the ridge. *Patent completed.*

1965. J. L. CLARK, F. BRAITHWAITE, and G. E. PREECE. *Improvements in telegraph cables.* Dated August 30, 1858.

This refers to a patent granted to Josiah Latimer Clark, 20th Dec., 1853, for the use of asphalte &c., around electric telegraph wires, and consists, in more effectually applying and supporting the said non-inductive coating. The wire or wires already insulated with gutta percha, &c., are covered with a coating of hemp which has been highly dessiccated and deprived of all moisture, and then saturated with a hot mixture of turpentine, rosin, pitch, tar, asphalte, oil, &c., such saturation being completed by passing the said materials through air-tight vessels, from which the air is exhausted before the admission of the non-conducting mixture, and into which the air or the mixture can afterwards be injected under pressure. The insulated wires are surrounded with this mixture of fibrous material, which may either be laid on in a mass or strands coiled around the wires. The cable thus formed is again saturated with the mixture. It consists, 2, in preserving cables from decay, by surrounding the wires with a compound of pitch, tar, asphalte, &c., retained upon the cable by strands or flat bands of hemp saturated with the above mentioned mixture and plaited or braided round the cable. It consists, 3, in preserving iron cables from decay by intermingling among them wires of zinc. It consists, 4, of methods of joining the iron wires and the conducting wires of submarine and other telegraphs. The patentees form a right-handed thread or screw on the end of one of the wires, and a left-handed thread on the end of the other wire to be united to it; the two ends are then inserted in a screw ferrule or collar, cut with corresponding right and left threads, and by screwing it up the two ends are drawn into contact and form a secure joint. It consists, 5, in forming the conducting wires of submarine cables by building up a solid conducting wire in segments so that any defect or breakage in a single segment will not endanger the continuity of the whole cable. *Patent completed.*

1966. E. LINDNER. *Improvements in breech-loading fire-arms and ordnance, and in cartridges.* Dated Aug. 30, 1858.

This consists in constructing breech-loading arms so that the breech is closed in one case by turning the barrel, and in the other by turning a nut or screwed collar upon the barrel. *Patent completed.*

1967. L. WIART. *An improved mode of generating steam, or heating water or liquids.* Dated August 30, 1858.

This consists in the introduction into boilers, steam generators, or evaporating vessels of strips, bands, or frames, made of thin copper, and which strips, bands, or frames, when suitably adapted and arranged, will conduct and transmit the heat to the water or other liquid, and will thereby greatly facilitate the generation of the steam or heating of the water or liquids. *Patent completed.*

1968. T. R. HARDING. *Improvements in the method of making straight or circular combs for flax, wool, or silk machinery.* Dated August 30, 1858.

This consists, 1, in using a description of morticing head, or the drilling spindle and the head itself, connected with the dividing head or other dividing apparatus, so that the morticing tool shall exactly coincide with the holes previously made by the drill and the dividing head, so that by pressure the holes may be formed of the shape of the pins, which may be flat or otherwise. 2, In driving such pins into circular or other combs so that the combs shall retain their primitive shape. *Patent abandoned.*

1969. J. H. JOHNSON. *Improvements in the construction of governors or regulators for steam engines.* (A communication.) Dated August 30, 1858.

This relates to rendering the action of the governor more sudden, sensitive, and powerful than that of the ordinary description, whilst the governor itself will work equally well in a horizontal, vertical, or oblique position. *Patent completed.*

1970. E. SPARY. *Improvements in fumigators.* Dated August 31, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1971. M. A. F. MENNONS. *Improvements in the supports of rails for railways.* (A communication.) Dated Aug., 31, 1858.

A complete specification of this invention was filed with the application, and an abridgment of it was published at page 621, No. 1846, of the MECHANICS' MAGAZINE (Old Series). *Patent completed.*

1972. M. A. F. MENNONS. *Improvements in apparatus for the elevation of liquids.* (A communication.) Dated August 31, 1858.

A continuous flow of liquid to any desired elevation is here obtained by the superposition of any required number of syphons. *Patent abandoned.*

1973. M. A. F. MENNONS. *An improved apparatus for mounting the driving bands of machinery in movement.* Dated August 31, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1974. F. AYCKBOURN. *Improvements in the construction of beds and other articles for sitting or reclining upon.* Dated August 31, 1858.

The inventor divides the case into numerous independent cells, each closed at one end and open at the other, having one long flap, which covers all the orifices, and is to be secured underneath. He places in each cell a long bag made of india-rubber, &c., for holding water or air, furnished with a mouth-piece, the dimensions of which bag exceed that of the cell by about one-fifth, which prevents the bag bursting. *Patent abandoned.*

1975. J. STONEHAM. *Improvements in cleaning and treating cotton and woollen waste or other fibrous materials, and in extracting oils or grease therefrom.* Dated August 31, 1858.

Here the waste is sorted, and placed in vessels containing water. The waste is then drained and put into any spirituous liquid, such as naptha, benzole, benzine, oil of turpentine, &c. After this the spirit and grease are pressed out of the waste, and the latter placed in a wash-wheel and afterwards wrung and dried in stoves. *Patent abandoned.*

1976. D. and J. HEYWORTH. *Certain improvements in looms for weaving.* Dated August 31, 1858.

This consists, 1, of certain means of preventing the shuttle from "flying out." 2. In breaking the force of the blow of the picker when it has discharged the shuttle. 3. In preventing the rebound of the shuttle. 4. In preventing the bottom shafts of the healds from coming in contact with each other. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, APRIL 22, 1859.

THE GOVERNMENT CONE TELEGRAPH SYSTEM.

The Government have lately secured to themselves the use of an improved system of telegraph signalling patented by Mr. Redl, and have introduced it both in the Royal Navy and in the War Departments. It is known as "Redl's Cone Telegraph" system, and is so well and simply devised that it will doubtless prove of very great benefit to the services. We will not mention the sum which the Admiralty paid for it; we will only say they got it for very little. On another page of this Number we have given a very full illustrated description of it, and with the view of attracting to it the attention of persons interested in our mercantile navy, we propose to say a few words in reference to it here.

Instead of the various and numerous flags hitherto used on board ship for telegraphic signalling, Mr. Redl employs simply a set of collapsible cones, which may be expanded separately or together as may be desired. They are formed in pairs, base to base; they are closed by india-rubber springs, and expanded by the pulling of a line or cord. The *notation* of the old flag system only is done away with; the *code* remains unaltered.

The new system has many advantages. For example, a flag cannot be seen except it is "spread" by the wind, and in wet, still weather it is often most difficult to spread them; but the cones are expanded with certainty in an instant. Again, when a flag is spread its colour has to be detected; but the colour of the cones has nothing to do with their signalling. Again, atmospheric conditions often interfere seriously with the "reading" of flags; but from these the cone signals suffer but little, if at all. In evidence before a committee of officers, Captain Jermingham, R.N., said:—"A signal was flying three hours from the Victory in Portsmouth Harbour to the Bellisle at St. Helen's, in consequence of easterly mirage, during which time a constant communication was being kept up with the 'cones' from the Blenheim in Portsmouth Harbour to a cutter at Calshott Castle; three conspicuous flags were hoisted in the cutter, which were not seen on board the Blenheim, nor the circumstance known till the next day." Again, the Redl system admits of greater rapidity in working than the flag system—a point of immense importance under some circumstances. And, yet again, while the new system admits of more numerous combinations than the old, it is also learnt with greater ease. On this last point, Captain Egerton, R.N., stated:—"A boy belonging to H.M.S. Neptune, aged sixteen, learnt the cone system under my instruction in a week; he had been for six months under the signalman of the Neptune learning the naval signals; but by the signalman's account he did not know them one-half as well as he did the cones after his week's instruction under me." In respect of cost, *twenty-five* sets of cones may be purchased at the price of *one* set of flags! If we compare the cone telegraph with the semaphore telegraph used for naval and military purposes on shore, we shall find the new system has the advantage in that comparison likewise. Thus both on land and by sea the new system proves itself best. It may, therefore, be used in both cases with benefit, and with the further advantage of rendering the one telegraph system common to the army and navy, and of thus facilitating the co-operation of the two services.

We have but hastily and imperfectly sketched the merits of Mr. Redl's invention; but we have said sufficient, we hope, to urge the reader to acquaint himself with it more closely. The Admiralty, as we have said, have, after some years' of hesitation, adopted it. We hope the merchant service will not delay the use of it. On this head we will content ourselves with repeating what the *Daily News* said a short time since, viz.:—"Every mercantile sailor should be as able to read the cones or interpret the dual system, as he is able to box his compass. Then, either with or without a code, either with or without a set of cones, two ships when in sight or hearing could communicate any message whatever to one another. It is impossible to exaggerate the value of such a system to the mercantile marine. The Trinity-house should see to this; our shipowners should bestir themselves. No ship should put to sea without a set of cones, nor any captain be allowed to navigate her who cannot use them."

THE WAGES OF MECHANICS IN H.M. DOCKYARDS.

Considerable dissatisfaction having lately been expressed by the mechanics employed in H.M. Dockyards, in consequence of what they deem the injustice of the present system of regulating their wages, a few explanatory statements upon the subject will be of value just now.

The value of the work performed by the mechanics of the Government Dockyards is now estimated according to a scale of prices upon the compilation of which great care has been bestowed, and the week's work of every gang of men is required to reach a fixed amount. But while the men are mulcted if their labour falls short of the standard, they receive no extra pay, however much the standard may be exceeded. This is the ground of their dissatisfaction: and, viewed superficially, it certainly seems a very unfair arrangement. But if examined more closely it appears less objectionable. For, the standard amount of labour demanded is not, of course, an absolute quantity; nor was the scale of prices by which the wages are adjusted framed according to the intrinsic worth of particular pieces of work. Mechanical operations have, of course, no fixed absolute value. A scale of prices has been fixed, giving to each "job" such a value that when the men are allowed to earn unlimited wages their earning shall fall somewhat short of those of men working similarly in private dockyards. The Admiralty, therefore, virtually say to the men (shipwrights, for instance), "When you exert yourselves to the utmost, you are able to earn six or seven shillings per day in the usual working hours under a given scale; and in order that you may at all times exert yourselves moderately we require you to earn at least 4s. 6d. per day under the same scale. You cannot earn less without idling, and we shall mulct you if you do."

Now, the Admiralty are unquestionably at perfect liberty to hire labour on these terms if they please, and that without any show of injustice. But labour can only be estimated by averages; and it is manifestly essential to the fair operation of such a system that the period over which the average extends shall be sufficiently long to allow the necessary imperfections of the price-list to balance each other. The period now selected is a week, which is much too short. We believe a month should, in fairness to the men, be fixed upon. Until this is done, a sense of injustice will exist.

The remedy which a correspondent of the *Times* lately suggested for the supposed evil is a very curious one—"a second superintendent in each of our dockyards." Another superintendent naval officer to keep mechanics and mechanical officers moving on! This gentleman knows but very little of the internal working of our dockyards. A superintendent naval officer in "his office" may be, and often is, a very useful functionary; but a superintendent naval officer "constantly on the alert, visiting the different works, building slips," &c., has often proved one of the greatest evils that ever operated against the public interest in our dockyards.

THE CORT CASE.

A few weeks since we drew attention to the condition and claims of the Cort family. Since that time a memorial has been addressed to the Prime Minister on their behalf, bearing the signatures of a very large number of the most influential engineers, manufacturers, and commercial men in the kingdom. This is gratifying; but we fear the political activity and anxiety of the members of the Government will be so absorbing for the next few weeks that they will make no opportunity for doing the justice that is due to the surviving son and daughters of Henry Cort. Something should, therefore, be done without delay to meet the immediate necessities of the case; and we have hope that something will be done. The son, Mr. Richard Cort, has been invited, we understand, to the ensuing meeting of the South Wales Institute of Engineers, at a former meeting of which he was received with much generosity and kindness. Of this Institution Mr. Ebenezer Rogers is the highly-respected president, and as he is supported by a band of gentlemen who have, we believe, both the knowledge necessary to a just appreciation of the case, and the liberality to act upon that knowledge, we doubt not they will inaugurate some moderate but useful plan of present relief. Once begun by them, the system would be imitated by other societies, and much good would be effected. The men of South Wales are the fittest to lead in this matter. None understand the iron manufacture better than they, and therefore none are better acquainted than they with the merit of Cort's inventions. We will only add two suggestions. We think there are two classes who might do good service in this movement. We allude, first, to the few chief iron-masters—three or four firms which we need not particularize—who, in the nature of things, must have benefited most largely by the labours and losses of Cort; they might each contribute some handsome sum to the fund. We allude, secondly, to the working iron-makers—puddlers and others. What could possibly be more fitting or more honourable in them than a general "penny subscription" on behalf of the Cort family? If the working men will take up this suggestion, they will experience no difficulty in giving it effect.

THE ARMSTONG GUN.

We this week propose to bring together a mass of information respecting the Armstrong gun, according to the announcement made in our last number. We will commence with the following highly-important paper which was communicated by Captain Younghusband, R.A., F.R.S., to the Royal Artillery Institution in 1856. There can be no doubt as to the perfect authenticity and accuracy of the following description of the Armstrong gun as then made:—

* Mr. Armstrong was authorised by the Duke of Newcastle to construct one or more guns not exceeding six in number, on the plan he had suggested in an interview with his Grace, and to make the necessary experiments in connection with the subject, at the Government expense. Mr. Armstrong, acting upon this authority, has confined himself, up to the

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present time, in the production of a single gun; to make that one gun a test, not only of the principle he had recommended, but also of the feasibility of loading a field-piece at the breech; and likewise of applying certain mechanical arrangements to counteract recoil, and facilitate the laying and pointing. Careful consideration was first given to the tensile strength of the various materials suitable for the construction of a gun, and some experiments were made on the strength of cylinders of wrought iron, forged in the requisite form, and afterwards bored; the result of these experiments showed great uncertainty in the strength of the material, rendering it impossible to define the thickness necessary to resist a given charge of powder. Mr. Armstrong then decided upon, and ultimately completed a gun of which the following is a description:—A core, or internal lining for the gun, was formed of cast steel, to which the requisite strength was given by encircling it with twisted cylinders of wrought-iron, made in a similar manner to gun barrels, and tightly contracted upon the steel core by the usual process of cooling after previous expansion by heat; the parts are then in that state of initial tension which is necessary to bring their entire strength into operation. Considerable difficulties were encountered in carrying this plan into practice. The arrangement for loading at the breech consists of a powerful screw having a hole through the centre in the prolonged line of the bore, through which hole the bullet and charge are delivered into the gun. A 'breech piece,' with a mitred face fitting a similar face at the end of the bore is dropped into a recess, and by the action of the screw pressed tightly into its seat, so as effectually to close the bore. The fitting surfaces which close the bore were at first made of unhardened steel—this failed; hardened steel was next used, but this yielded to the action of the powder more rapidly than before; copper was then tried, and no further difficulty was experienced. The breech piece contains the vent. The bore of the gun which was made, is 1¾ inches in diameter, and contains 8 spiral grooves, having an inclination of one turn in 12 feet; these grooves terminate at a distance of 14 inches from the breech, and the bore then gradually expands in a length of 3 inches, from 1¾ inches to 1⅞ths in diameter. The bullet, in the process of loading, passes freely through the widened space; but its diameter being a little in excess of the bore, it lodges in the tapered contraction of the commencement of the grooves. The weight of the gun by itself is about 5 cwt., including the carriage the weight is about 15 cwt., which is nearly identical with that of the light six-pounder brass gun and carriage of the service. The weight of the projectile (composed of lead, hardened with antimony and tin), is three pounds. A long course of experiments was made to determine upon the best form of bullet; numerous forms were tried, and Mr. Armstrong was of opinion that experiments required to be still prolonged, in order to arrive at the greatest attainable perfection. The form last used was a cylinder pointed in front, with a conical end behind. The charge was 14 ounces of fine blasting powder. There is an ingenious arrangement by which the recoil is absorbed, and another by which the pointing and elevating is expeditiously and correctly performed. Mr. Armstrong considers that rifled guns of this construction will be especially valuable as guns of position, where a long range is required, and proposes them as *adjuncts to*, and not *substitutes for*, the present description of field ordnance. The objects he believes to have attained are strength, durability, long range, and accuracy. Respecting the construction of heavy ordnance by the process of twisting wrought iron bars into cylinders, and combining them in the manner described, he believes no difficulty would be experienced if proper apparatus were provided for the purpose; but he does not recommend the breech-loading principle to be applied in such cases, because, in heavy ordnance, the moveable parts would be too cumbrous to be conveniently handled. The gun described above was brought to Woolwich to be inspected, and was then sent to Shoeburyness for experiment. Mr. Armstrong stated that 800 rounds had already been fired from it. At Shoeburyness 100 rounds were fired at elevations varying from ¼° to 7°. A very long range was obtained; though it was not always uniform, the direction was extremely accurate. The shot did not proceed point foremost after the first graze. All the shots that were recovered showed marks of their having completely taken the rifle grooves. A considerable escape of gas took place at the breech; the gun was loaded with great facility, and pointed quickly and accurately; the recoil was checked, but not entirely absorbed by the action of the slide on which the gun is mounted. After the completion of these experiments, Mr. Armstrong, believing the gun to be stronger than necessary, suggested its being returned to him to have it re-bored for a heavier projectile, and also to make some alteration in the rifling, by which he expected to obtain increased accuracy of fire. The gun was accordingly sent back to Newcastle."

The next authentic paper which we have to publish, or more properly to re-publish, is the following letter which was addressed by Sir William Armstrong himself to the *Times*, before he emerged into the sunshine from that "cold shade" in which so many excellent men and able inventors still lie. There cannot, of course, be any doubt about the correctness of so much of the description of Sir William's improvements as is here given:—

"Sir,—In the latter part of 1854 I submitted to the Duke of Newcastle, then Minister at War, a proposal for a gun which I anticipated would possess great superiority over the common forms of light artillery, and I undertook, with his Grace's authority, to construct a field-piece in conformity with the plan I had suggested. The gun was accordingly soon afterwards made, and has since, during a period of nearly two years, been the subject of numerous experiments, partly upon the Ordnance firing ground at Shoeburyness, but principally under my own direction in this neighbourhood. I have hitherto avoided publicity in reference to these experiments; but, as matured results of much interest and importance have now been arrived at, and as other names are already before the public in connection with gun experiments made during the same period, I feel that I may now, without impropriety, give some information on the subject. With a view to strength and durability the gun is composed internally of steel and externally of wrought iron, applied in a twisted or spiral form, as in a musket or fowling-piece. The bore is nearly two inches in diameter, and is rifled. The projectile is a pointed cylinder 6½ inches long, and its weight is five pounds. It is made of cast-iron coated with lead, and is fired from the gun with a charge of 10 ounces of powder; it contains a small cavity in the centre, and may be used either as a shot or a shell. When applied as a shell the cavity is filled with powder, and a detonating fuze is inserted in front, so as to fire the powder in the centre on striking an object. When used as a shot the powder is omitted, and an iron point, which favours penetration, is substituted for the fuze. The gun is constructed to load at the breech, the object being not only to obviate the disadvantages of sponging and loading from the front, but also to allow the projectile to be larger in diameter than would enter at the muzzle, and thus to ensure its taking the impress of the grooves and completely filling the bore. The piece weighs five cwt., and is mounted upon a carriage which bears a general resemblance to that of an ordinary 6-pounder field gun, but which embraces a pivot-frame and recoil slide. A screw is also applied, not only for elevating and depressing the gun, but also for moving it horizontally, by which means great delicacy of aim is effected. The recoil slide has an upward inclination, which enables the gun, after running back, to recover its position by gravity; and its use is to relieve the pivot-frame and adjusting screws from injurious concussion. I shall now give some particulars of the experiments recently made with this gun on the coast of Northumberland, near the village of Whitley, under the official inspection of Colonel Wilmot. Fourteen shots were, in the first instance, fired from a distance of 1,500 yards at a timber butt 5 feet wide and 7½ feet high. Six of these were expended in finding the elevation proper for the distance, but after that was determined every succeeding shot hit the object without previous graze. The final elevation of the gun was 4° 26′, and the mean lateral distance of the shot marks, from a vertical line through the centre of the butt, was only 11½ inches. Persons who are conversant with artillery practice will be able to appreciate the accuracy of this firing; but for the information of those who are unacquainted with the subject, I may state that the ordinary 6-pounder field-piece, which, in point of weight, forms the nearest approach to the present gun, is perfectly useless at a distance of 1,500 yards, and is very uncertain even at 1,000 yards. It is only, therefore, with heavy artillery that a comparison can be drawn, and it will be sufficient to state that in tabulating the practice made with such ordnance, the deflections are invariably recorded in yards, whereas with this rifled gun they can only be properly given in inches. With respect to penetration, the following particulars will be regarded as equally remarkable, considering the small weight of the shot and the length of the range. The butt was three feet thick, and composed of six layers of rock elm bolted together, so as to form a solid block. One shot passed entirely through; another struck near the edge and glanced; and the remaining six penetrated within a few inches of the opposite side. Shell firing was next tried, at a distance of 1,500 yards, the gun being fired at the same elevation and with the same charge as in previous practice at the butt. In this case, two targets were erected, one behind the other, so as to appear as one object when viewed from the gun, and a space of 30 feet was left between them. The front target was intended to exhibit the perforations of the shells before bursting, and the back one to show the effects of the fragments resulting from explosion. After some preliminary experiments, 22 shells were fired at the front target, and of these only one missed the object of aim. The following are the particulars: seventeen hit the first target direct, and burst behind it; the fragments penetrating the second one; three grazed and burst immediately in front of the first target, and perforated both with the pieces; one hit the bottom of the first target and exploded in the ground, and the remaining one missed entirely and burst on some rocks nearly in line beyond. A strong side wind was blowing at the time, and accounted for the deviation of this single shell. Four shells and three shot were then fired at an elevation of six degrees, from a distance of 2,000, or, more accurately, 1,964 yards. All these struck within the breadth of the target; but, the elevation being scarcely sufficient, they all fell a little short except one shell, which, ranging somewhat further than the others, hit the target and burst as usual. The results of this shell-firing were as follow: the front target contained 51 holes and the back one 164, while the ground between and adjacent to the targets exhibited about 70 perforations by fragments of shells, the greater portion of which were afterwards recovered by digging. With respect to ranges exceeding 2,000 yards, I may state that on previous occasions the gun had been tried up to 3,000 yards—a distance that was reached with an elevation of 11 degrees, and the usual charge of 10 ounces of powder, or ⅓th the weight of the projectile. By augmenting the charge the range is increased, but the accuracy is impaired, and I therefore adhere to the 10-ounce charge, which gives ample penetration, as the experiments at the butt will testify. I may also observe that the ranges obtained with this charge bear a favourable comparison with those of the heaviest round-shot guns fired with a much larger proportion of powder. It is a curious fact, and one which greatly increases the efficiency of the shells, that owing to the bursting charge requiring a minute space of time to mature its ignition after the firing of the fuse by impact, the shell is enabled to travel four or five feet after striking an object before disruption takes place. Hence, therefore, it acts as a shot before it bursts as a shell. When it perforates a target, the explosion may be seen to take place a few feet beyond, and when it grazes it has time to rise, and may be observed to burst after clearing the ground. If, therefore, it were fired against a ship, it would first penetrate the side in its entirety, and then, bursting, traverse the decks in fragments; or, if directed against troops, it would pierce the front line as a bullet, and operate like grape shot beyond. The shells explode with equal certainty whether the first substance struck be hard or soft, and, in fact, they even burst on the surface of water, providing the elevation of the gun be not too great. The bursting-charge is very small, but it suffices to break the shell into about 30 pieces, which pursue their forward course without too much dispersion. It is impossible to contemplate the results obtained with this gun without being impressed with the important part it is calculated to perform in warfare. Opposed to any ordinary field piece, it would be like the Minié rifle against the old musket, and no gun could be worked at an embrazure if a fire of shells were directed against it by one of these rifled pieces placed within the distance of a mile. In naval operations, also, guns of this description, but of larger size, might apparently be applied with great effect, more especially as a system of breech-loading, combined with a self-recovering recoil action, would be peculiarly advantageous in firing from port-holes. Even light 5-pounders, sending their shells from great distances through the sides of a ship and sweeping the decks with fragments of lead and iron, would produce very destructive effects, and a small swift steamer carrying a few such guns might prove a very troublesome opponent to a large ship of war. But if the dimensions of the gun were increased so as to adapt it for shells of 20 lbs. or 30 lbs., still more terrible injury could be inflicted at greater distances, and the powerful artillery now used at sea would be of little service when opposed to the accurate and long-ran

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firing of such rifled shell guns. It now only remains to be stated, that in the course of the long series of experiments made with this gun it has been fired nearly 1,300 times without sustaining any permanent injury either in the breech-loading arrangement or otherwise. The only parts exposed to wear (and none are seriously so) are separable from the gun, and can with great facility be renewed.

"I am, Sir, your obedient servant,
"W. G. ARMSTRONG.

"Elswick Engine Works, Newcastle-upon-Tyne."

There is one feature of the Armstrong gun upon which a few words must be said before we proceed further. In Capt. Younghusband's paper we read :—"The arrangement for loading "at the breech consists of a powerful screw, "having a hole through the centre in the pro- "longed line of the bore, *through which hole the "bullet and charge are delivered* into the gun." Now, in the elaborate description of the new weapon which we gave in a recent number, no mention was made of the hole through the screw, but in the succeeding number we repaired the omission, and gave an explanation exactly corresponding with the words of Captain Younghusband just quoted. We have now, however, to state that the practice of Sir William Armstrong in regard to this feature of his gun is not uniform. The gun with which his best results were lately attained at Shoeburyness was loaded, not through the screw, but through the aperture in the breech, precisely as was described in our article; the only additional fact which needs to be mentioned in this connection being this—that the screw in the breech has a passage through it for admitting a bolt or ramrod by which the charge is forced forward into its place before the moveable breech piece is returned to its position in the gun. The cause of the slight variations of statement which we have fallen into upon this point is to be found solely in the fact that some of Sir William Armstrong's guns have been charged through the screw (like that tried at Shoeburyness in 1856, and described by Captain Younghusband) and others through the chamber in the upper side of the gun (like that tried at Shoeburyness recently, and described in our former article).

If the Armstrong gun be examined like any other invention, and the novelty of its principal features be tested by the same process as the novelty of other patented contrivances, viz., by a reference to the records of what has before been accomplished by others, we shall find very little originality in it to admire—in so far, that is, as its parts taken separately are concerned. In order to illustrate this we will not go to the Halls of the United Service Institution, or to the Tower of London, or to the British Museum, to drag to light the half-forgotten devices of other nations and ages, although we know perfectly well that some, at least, of the characteristic features of the new weapon are to be found there without difficulty. We will content ourselves with simply glancing back over the fire-arms which have been patented in England during the last century or so, and observing in which of them the improvements of Sir William Armstrong have been anticipated. Let us take, first, the prolongation of the bore through the breech, which he in some cases resorts to, and what do we find? One hundred and eighteen years ago (June 4, 1741) a Mr. Gilbert Hadley obtained a patent for a piece of ordnance or cannon of which we read (in the official abridgement of the specifications of patents for fire-arms), "the piece is breech "loading and is made of brass, or ordinary gun "metal, *and the bore goes quite through from "muzzle to breech*." Again, thirty years ago (Sept. 9, 1829), John Tucker patented an improved cannon in which not only did the bore pass out through the breech, but through a conical plug in breech, the plug corresponding of course to the screw of the Armstrong gun; the words are, "the bore is made through the "cannon, and in the breech end is inserted a "conical plug which is pierced with a hole "corresponding with the bore." Again, nine years ago (October 6, 1850) Alexander Melville and Edward Callow patented a cannon with the self-same feature, for a "plug" is used "per- "forated with a hole corresponding with the "bore." And yet again, seven years ago (April 24, 1852), Messrs. Church, Goddard, and Middleton patented, not the passage through the cannon only, but that in combination with another feature of Sir William's gun—the "slot" for the breech piece—for they claimed "the use of a clear passage extending from end "to end of the cannon, in common with a "vertical, horizontal, or other slot made across "the bore or passage, and in which slot are "fitted filling pieces with inclined surfaces, "whereby the passage through the cannon may "be opened or closed when required." If we pass to another most important feature of the new arm, viz., the use of an expanding facet of copper for closing the breech, we meet with facts of the same kind. Forty-three years since (May 14, 1816), Samuel Jean Pauly obtained a patent, from the specification of which we extract the following words :—"The "difficulty of producing an air-tight or perfect "closure between the moveable breech and the "body or remainder of the gun in breech- "loading fire-arms is obviated by using a plug "which is so placed in the gun as to come "between the charge of gunpowder and the "moveable breeching in all cases, and is "formed of lead, *copper*, or such other ductile "materials as will give way to the explosive "force of the charge, and will so cover and "close up the joint." Again, nine years since (Jan. 11, 1850) Matthew Urlwin Sears patented a cannon "on the front of the breech" of which was "a ring or washer of soft brass or "*copper*, to improve the shutting and make a "fast joint;" if we come to later times we could multiply such instances. But we turn to a third, and still more important feature. "With "a view to strength and durability," said Sir William, in his letter to the *Times*, "the gun "[his own gun] is composed internally of steel, "and externally of wrought iron, applied in a "twisted or spiral form," the twists or spirals being laid, as we know, in opposite directions. Now, whatever the object of Sir William in adopting this mode of construction may have been, the mode itself was by no means novel, for in 1854—to go no further—Mr. John Simon Holland patented it; he made "barrels of small guns" by "twisting wire round a central core in right and left-handed spirals," and cannon "by similarly twisting larger rods." But there is more in this feature than appears on the surface. Captain Younghusband, in his paper on the Armstrong gun, tells us that twisted cylinders of wrought iron," made in a similar manner to gun-barrels, were "tightly contracted upon the steel core by the usual process of cooling after previous expansion by heat," and "that *the parts are then in that state of initial tension which is necessary to bring their entire strength into operation*." Now, here we have a system of construction of very great importance—a system which appears to be slowly becoming indispensable in all modern ordnance. But to whom is its invention due? Not to Sir William Armstrong, but to Captain Blakely. For some years past that officer has been urging its adoption upon the War Department, and bringing to bear upon its advocacy not only the costly examples of guns constructed at his own expense, but mathematical investigations of a high and refined nature likewise. We are the more anxious to express ourselves strongly upon this point because, in our former article on the Armstrong gun, we neglected to do Captain Blakely justice in reference to it. And beside Captain Blakely there is another gentleman who, at about the same time as he, devised this system of construction, and went to great expense in bringing it before the public. We allude to Mr. Robert Mallet, the inventor of the monster mortars in which Lord Palmerston has taken so warm an interest. Mr. Mallet, with the aid of Dr. Hart of Dublin, published a most valuable treatise on this and some other important and kindred subjects, two or three years ago. It is but doing simple justice to these gentlemen to give them the credit of having independently invented this promising improvement. If we turn to the projectiles used by Sir William Armstrong we find as great a want of novelty as we have already found in his gun. The coating of a cast-iron shot with lead or other soft metal was patented as long ago as 1808, by a Mr. George Richards, who tells us that, according to his invention, for rifled cannon cast-iron shot are used "coated with pure tin and iron, with a proper quantity of lead to suit the chambers and to give way to the pressure of the rifles." Later, in 1852, Mr James Lawrence patented an invention in which "projectiles were cast of two or more metals combined, one being hard for striking an object the other soft so that it may be made to expand and fit the bore of the barrel." The same plan has often been resorted to since that period. If, finally, we consider the percussion fuse of Sir William Armstrong, we shall see in it even a more manifest resemblance to other inventions, if that be possible, than any yet adduced. In order to put the case simply and intelligibly we will place the official descriptions of the two preceding inventions by the side of Sir William's in parallel columns, and in the order of their dates :—

John Tucker's Patent, 1829.	C. Lancaster's Patent, 1851.	Sir W. Armstrong's Patent, 1858.
"The shell contains a hollow tube in which slides a loose bar or striker. At one end of the tube is the fulminating powder communicating with the bursting charge. When the shell is fired the striker is at the end of the tube not primed; when it strikes against an object the momentum causes the striker to impinge against the fulminating powder, and causes it to explode." (*Abrig. Spec.*)	"Shells may be exploded on striking against an object by fitting in the centre of the breech end a screwed tube; in this tube is a loose cylindrical weight of lead carrying on its head or fore-part a percussion cap. The tube is thus enclosed in the powder in the axis of the shell; it is taper at the breech end, and has a nipple at fore end. When the shell is fired the weight is thrown to the breech end of the tube, but when the shell strikes an object it is thrown forward to the other end, and the fore part strikes its percussion cap against the nipple, and explodes the shell. (*Abrig. Spec.*)	"In a cylindrical case within the shell Mr. Armstrong fixes a weight or striker, by means of a pin passing through it and the sides of the case. This pin is cut or broken by the shock which the projectile receives in the gun at the instant of firing, and the striker, being thus liberated, recedes to the near end of the case, and there remains, until the velocity of the shell is checked by coming into contact with some object. When this takes place, the striker, not participating in the retardation of the shell, advances in the case, and causes a patch of detonating composition to be carried suddenly against a fixed point, which fires the composition and ignites the bursting charge in the shell. (Mechanics' Magazine Feb., 25, 1859, p. 141.

We have now, we presume, shown with sufficient clearness and fulness that the principal features of the Armstrong gun and projectile are by no means new. There remains, however, much to be said in their favour, notwithstanding all this.

Viewed as a combination of various well-known parts, and as an instrument for projecting shot and shell over great ranges with pre-

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cision, under favourable circumstances, the Armstrong gun is both a beautiful and a wonderful production. Nothing like the firing made with this gun at Shoeburyness has ever before been seen. To the artillerist it is a most pleasant sight to witness Sir William peering through his class at a target 1000 yards distant, and as the shot strikes exclaiming with perfect coolness, "Too low by three inches," or words equally indicative of nicety. But this, be it remembered, is on the practising ground, with carefully constructed sights, and other delicate appliances—not on board a ship in a seaway, nor in the field of battle. How will it work there? is the question. Now, we must say, although not without regret, that we have but little ground for expecting much of this gun as an instrument of actual warfare, either on board ship or in the field, notwithstanding all that we have heard respecting it. Nor, in saying this, are we in the least unmindful of what has been done, and is still doing, by the Government to introduce its manufacture. The Government have done something, and mean to do much more in this respect, but we doubt if the laws of nature will permit them to carry out their designs. It is easy for the Government—and especially for the Government acting under a "certain influence"—to knight an engineer, to build new factories, to construct breech-loading guns of the kind they are pleased to prefer, and to promise great results to the nation. But can Government prevent moisture rusting metal, or rust choking up screw-threads, or lead clinging to rifle grooves, or any other of the evils to which guns of this kind are liable? It is only by a bountiful supply of water during the firing that the new gun is kept in good condition; but has field artillery never to be used where water is scarce? It is only by the most careful attention, as every engineer knows, that screw-threads and other close fitting surfaces can be kept in good order when exposed to the weather; but are ships at sea never so beset by gales and storms for days together as to render it impracticable for men to unscrew and grease all the guns on board of them? It has been the habit of men in office to consider these matters important; it is fashionable now, for the moment, to ignore them; but warm lead will cling to grooved iron, whatever our whim may be, and oxygen will not lose its appetite for any fashion of ours. We mention these things as checks and warnings only, and not with a desire to detract from the real merits of Sir William Armstrong's invention. Under some circumstances the light long-range cannon will doubtless prove very useful to us, and it is possible that the principles of its construction may prove applicable to guns of far greater power than the small experimental cannons which alone have hitherto been tested. But let us not indulge in extravagant expectations, or suppose for a single moment that Mr. Whitworth and other improvers of our artillery have any cause whatever to halt in their patriotic labours.

Mr. F. Trevithick, of Penzance, has patented a curious pair of improvements in the "sails and keels of vessels." He constructs the sails of strips or narrow bands of thin sheet metal, which he combines together by means of chains or wire ropes stretched between yards or booms, and for fore and aft sails the strips or narrow bands may be arranged in an upright position, and connected by means of chains or wire ropes, so as to wind round a revolving mast. In applying keels, fixed tubes are used at intervals, parallel with the centre of flat bottomed boats or vessels. Through these tubes chains are passed to which the keels are attached, and other chains pass over the sides of the vessels, which are also attached to the keels, and by which the kneels may either be lifted into the vessel or be brought to act as lee boards.

THE ESTIMATES OF THE ENGLISH AND FRENCH NAVIES.

(Continued from p. 249.)

The third branch of the inquiry is at once the most confidential and the most difficult, namely, the state of preparation of France, in respect of powerful screw-steamers, and the expenditure which has taken place, and is still going on, in her dockyards, as compared with our own. There are many difficulties in instituting the comparison with certainty and accuracy. Whilst the reporters have been fully informed, through the officers of the Admiralty, with regard to the number, armament, condition, capabilities, and even defects of every ship in Her Majesty's service, their knowledge of the condition and effectiveness of French ships-of-war is imperfect; the returns which they have received from the confidential communications made to the Admiralty, may be relied upon as accurate with regard to the tonnage, guns, and horse-power of the French navy; but with regard to fitness for sea, durability, and general efficiency as ships of war, they are deficient in the information and critical knowledge respecting each ship of the French navy, which the responsible officers of France can alone be supposed to possess.

At the outbreak of the French revolutionary war, England possessed 115 sail of the line, France 77. These comparative numbers were reduced in 1850 to 86 England, and 45 France. At this latter period, the effective strength of the two navies in line-of-battle ships exclusively, and almost exclusively in frigates, consisted of sailing-vessels; but the French, having subsequently decided on, and nearly carried out, the conversion of all their sailing-ships that were fit for it into steam-ships, as sailing-ships could not be opposed to steam-ships with any chance of success, the latter must now be considered as the only ships really effective for purposes of war, and the following is at present the relative strength of the two navies in steam line-of-battle ships and frigates, including ships building and converting:

	Line-of-Battle Ships.		Frigates.	
	English.	French.	English.	French.
December, 1858: Complete, Hull and Machinery	29	29	Scr. 17 / Pad. 9 = 26	Scr. 15 / Pad. 19 = 34
Receiving Engns.	4	2	2	3
Converting	7	4	0	1
Building	10	5	6	8
TOTAL.....	50	40	34	46
Iron-plated Ships Building		4		

It will be seen from the foregoing statement, that England and France have at present precisely the same number of steam line-of-battle ships complete, that France has eight more steam-frigates complete, that, on the completion of the ships now in progress, England will have 10 steam line-of-battle ships more than France, and France 12 steam-frigates more than England; and it is to be observed with reference to the line-of-battle ships "building," that the five French are in a much more forward state, and represent more work actually executed than the 10 English; the quantity of work executed on the former being $\frac{3}{4}$ths; whereas, on the 10 building in England, it is only a fraction more than $\frac{1}{2}$ths. It is, however, to be observed, that of the 10 English ships building, three are three-deckers, of which class the French are not building any. France will also have four iron-sided ships, with engines of 800 or 900 horse-power. It is stated, that these iron-sided ships, of which two are more than half completed, will be substituted for line-of-battle ships; their timbers are of the scantling of a three-decker; they are to have 36 heavy guns, most of them rifled 50-pounders, which will throw an 80 lb. hollow percussion shot; they will be cased with iron; and so convinced do naval men seem to be in France of the irresistible qualities of these ships, that they are of opinion that no more ships of the line will be laid down, and that in 10 years that class of vessels will have become obsolete. In addition to the 50 steam line-of-battle ships (English) above enumerated as "built," "building," and "converting," there are six sailing line-of-battle ships proposed to be converted into steam-ships. These six would raise the number of English screw-ships of the line to 56; and if the estimates for artificers, and the purchase of ship-building materials, as proposed by the Surveyor of the Navy, be assented to, the whole could be completed by the year 1861. At the present rate and mode of expenditure in the dockyards, it is estimated that 43 only would be ready by 1861; and according to the present scheme of work, the French would then possess 40 screw line-of-battle ships, and four iron-sided ships. With the existing establishment of shipwrights and scheme of work, the number of our screw line-of-battle ships could not be raised to 56 before the year 1863, and it may be inferred that, in the interval between 1861 and 1863, still further additions will have been made to the French steam navy. In addition to the 40 steam line-of-battle ships, and four iron-sided ships (French) built, building, and converting, the Hercule and Jemmappes are supposed to be in a fit state for conversion, but it is doubtful whether they are to be converted as line-of-battle ships, or to be cut down and plated with iron. Two more iron-sided ships are to be built as the reporters are informed. These, with the two line-of-battle ships, if converted, would raise the number to 48 in 1861, as compared with the 56 English before referred to.

It was calculated last year, by the commission of naval officers appointed by the Emperor to revise the organisation of the navy, that the French would have, by the year 1860, a steam-fleet which, with a proportion of large transports, would enable them to carry an army of 60,000 men, with all its horses, provisions, and materials for one month; and that they may have ready by 1860, 40 steam line-of-battle ships, six iron-plated frigates, 30 screw frigates, 19 paddle-wheel frigates, and 26 steam-transports.

The following is a comparison between the force of English and French steam line-of-battle ships and frigates at present built, building, and converting, in respect of guns and horse-power:—

	No.	Total.	Guns.	Total.	Horse-power.	Total.
ENGLISH.						
Line-of-battle Ships: Afloat	33	50	3,089	4735	17,550	29,050
Building, &c.	17		1,646		11,500	
Frigates. Afloat	28	34	993	1239	15,090	18,690
Building, &c.	6		256		3,600	
Total Line-of-battle Ships and Frigates	...	84	...	5974	.....	47,740
FRENCH.						
Line-of-battle Ships: Afloat	32	40	2,878	3636	20,790	20,590
Building, &c.	8		758		5,500	
Frigates: Afloat	37	46	1,216	1658	17,000	20,800
Building, &c.	9		442		3,300	
Total Line-of-battle Ships and Frigates	...	86	...	5294	.....	46,890

In addition,—

France has four iron-sided ships building, to carry 26 guns each, with 800 or 900 horse-power.

England has nine block-ships afloat, each carrying 60 guns, with from 200 to 450 horse-power.

It is necessary to observe that nine of the English line-of-battle ships, carrying collectively 720 guns, and engines of 3,600 horse-power, are 80-gun converted ships, and reported to be inferior

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to the French ships of the same class. On the other hand, England has 15 ships of 100 guns and upwards, carrying collectively 1,694 guns, and engines of 10,800 horse-power; while France has only six ships of 100 guns and upwards, with 700 guns, and 3,590 horse-power.

In 1852, the horse-power of the engines belonging to the English navy was 44,482; to the French navy, 27,240. Since that year, England and France have advanced *pari passu* in the increase of the horse-power of their steam navies, and, consequently, England has not at present the same relative superiority over France which she then possessed. Since 1852, 55,030 horse-power has been added to the English navy; 54,804 to the French, including, in both cases, the engines in course of construction, and which may be ready by the end of this year; showing a difference of only 226 horse-power increase within this period in favour of England; 18,700 horse-power of the increase to the English navy has been on account of line-of-battle ships; to the French navy 24,640 and 3,600 for the iron-sided frigates, equal to 28,240, or nearly 10,000 horse-power more than the increase to the English Navy as respects this description of vessels: 7,793 has been added to the horse-power of engines for frigates and block-ships (English), 13,100 for frigates (French), total addition to the horse-power of engines for line-of-battle ships and frigates since 1852:—

England	26,493
France	41,340
Difference in favour of France in the period	14,847

It will thus be seen that since 1852, France has added considerably more than England to the horse-power of engines of the more powerful classes of vessels. On the other hand England has added 15,073 in excess of France to the horse-power of engines for vessels below the rank of frigates, viz:—

England (including 8,690 for gunboats) ...	28,537
France (including 2,240 for gunboats)	13,464
Difference in favour of England in the period	15,073

The aggregate horse-power of the English Navy, at the end of this year, will be 99,512; of the French, 82,044.

We shall now proceed to state the result of our inquiries as regards ships of all classes, dockyards, stores, and expenditure in the French Navy, comparing the state of that navy in 1852 and 1858, and with our own at the same periods. In the year 1852, the comparative numbers of British and French ships of war will be seen from the following Tables:—

STEAM-VESSELS (1852).

Classes.	England. Afloat.	England. Buildg.	England. Total.	France. Afloat.	France. Buildg.	France. Total.
Ships of the Line	5	12	17	2	4	6
Block Ships	4	...	4	...	...	...
Frigates (including 7 since reduced to Corvettes)	24	5	29	21	...	21
Corvettes and Sloops	56	3	59	28	3	31
Gun-vessels, Brigs, Despatch, and smaller vessels	66	1	67	62	2	64
TOTAL	155	21	176*	113	9	122

SAILING-VESSELS (1852).

Classes.	England. Afloat.	England. Buildg.	England. Total.	France. Afloat.	France. Buildg.	France. Total.
Line-of-Battle Ships	66	7	73	25	20	45
Frigates	88	7	95	36	18	54
Corvettes and Sloops	84	2	86	28	5	33
Brigs, small vessels, and transports	45	...	45	122	4	126
TOTAL	283	16	299	211	47	258

In the year 1858, the comparative numbers and condition of British and French ships-of-war will also be seen from the following Tables:—

* "Royal Frederick," building as a sailing-ship, not included.

STEAM-VESSELS (1858).

—	England. Complete.	England. Receiving Engines.	England. Converting.	England. Building.	England. Total.	France. Complete.	France. Receiving Engines.	France. Converting.	France. Building.	France. Total.
Line-of-bat. ships, scr.	29	4	7	10	50	29	2	4	5	40
Frigates, iron-plated	...	...	...	...	...	...	...	...	4	4
Block-ships, screw	9	...	...	...	9	...	...	...	...	...
Frigates { screw	17	2	...	6	25	15	3	1	8	27
Frigates { paddle	9	...	...	...	9	19	...	...	...	19
Mortar-ships	4	...	...	...	4	...	...	...	...	...
Corvettes and { screw	38	...	...	9	47	9	...	...	4	13
Sloops { paddle	35	...	...	...	35	9	...	...	...	9
	141	6	7	25	179	81	5	5	21	112
Gun, Despatch, and small vessels { scr.	29	...	...	...	29	17	...	...	10	27
Gun, Despatch, and small vessels { pad.	24	...	...	...	24	66	...	...	...	66
Floating-batteries, scr.	8	...	...	...	8	5	...	...	...	5
	202	6	7	25	240	169	5	5	31	210
Gun-boats, screw	161	...	...	1	162	28	...	...	...	28
Troop-ships and Store-ships, steam	15	...	...	...	15	22	...	...	4	26
Yachts, Tenders, Tugs, &c., steam	47	...	...	...	47	...	...	...	...	...
	425	6	7	26	464	219	5	5	35	264

SAILING-VESSELS (1858).

—	England. Afloat.	England. Buildg.	England. Total.	France. Afloat.	France. Buildg.	France. Total.
Line-of-Battle Ships	35	...	...	10	...	
Frigates	70	...	...	28	4	
Corvettes and Sloops	43	...	...	11	2	
Brigs and Despatch Vessels	15	...	248	26	2	86
Mortar-Vessels	45	...	...	3	...	
Mortar-Floats, towed	40	...	...	...	...	
Schooners, Cutters, &c.	48	...	48	32	...	32
Transports	...	...	...	26	...	26
	296	...	296	136	8	144

Note on the foregoing Table.—The number of English vessels is founded upon returns furnished by the Surveyor of the Navy, and the comparison has been made in the presence of that officer, and a list is appended of the sailing ships which he considers as effective. The number of French vessels is based upon the latest information received at the Admiralty. Of the 35 British sailing line-of-battle ships, the Surveyor of the Navy proposes to convert 6 of them into screw line-of-battle ships as soon as possible; and he is now considering whether others may not be converted into screw-frigates. Of the 10 French sailing line-of-battle ships, it is stated that all but two are too old to be converted. No line-of-battle ship has been laid down since 1855, in France, and there has not been a single three-decker on the stocks since that year. Of the line-of-battle ships now building in the English dockyards, one was laid down in 1855, two in 1856, one in 1857, and four in 1858.

(To be concluded in our next.)

THE LANCASTER AND ENFIELD RIFLES.

WE desire to strengthen the article which appeared in this Magazine on Friday last on the Lancaster and Enfield rifles by reproducing the following remarks which appeared in the *Times* of the next day:—

"The important disclosures which have recently been made public relative to the alleged defects in the Enfield rifle used by the British troops in India have been the means of directing the attention of the authorities to the vast superiority, as a weapon in the hands of troops, of the Lancaster rifled carbines, with which the corps of Royal Engineers is now armed. From the reports which have recently been received by the authorities at the Horse Guards from the officers now serving with the Royal Engineers in India, there can be no doubt that the Lancaster rifle is in every respect superior to any small arm in the service, repeated proofs of which were given during the conflicts with the mutineers in India. Four companies of the Royal Engineers have been employed in India during the rebellion, all armed with the Lancaster carbine, and the same tests which applied to the Enfield rifle proved it to be defective have resulted in the Lancaster rifle maintaining its efficiency. The officers report that there has not been a single complaint of fouling, difficulty of loading, or want of accuracy and power, brought against it; but, on the contrary, it has proved, in every respect, superior to the Enfield rifle. During the frequent conflicts with the mutineers in which the men of the Royal Engineers and the troops of the line have been engaged together, with the same amount of ammunition issued to all the troops engaged, the men of the line regiments have been compelled to cease firing for the purpose of wiping out the barrels of their Enfield rifles after firing from 10 to 20 rounds, whereas the Royal Engineers, with the Lancaster rifle, have continued their fire, loading their carbines with perfect ease. On the 21st February, in last year, the 4th company of Royal Engineers, consisting of about 100 non-commissioned officers and men, was stationed at Fort Jellalabad, before Lucknow. The enemy attacked the fort in great numbers, and went close to the walls. They were, however, repulsed by the Royal Engineers with great loss, no less than 90 men being left dead on the ground, the whole being killed by the Lancaster rifles. No idea could be formed of the number of killed and wounded carried off, but no doubt it was considerable. The Royal Engineers sustained no loss; not a man was even wounded. This fact is most important, not so much as showing the accuracy of the arm, but from the circumstance that during the six hours the Royal Engineers were engaged with the rebels until relieved by Sir J. Outram's force, each man fired on an average at least 60 rounds, and yet not the least difficulty was experienced during the whole of that time in loading the carbines. The only thing observable was, that with some the bullet became a little tighter than usual as it approached the breech when rammed down the barrel, and with others that there was an increased recoil. If the defects pointed out in the Enfield rifle and the difficulty with which it is loaded after several rounds have been fired from it, resulted from the expansive action of the barrel against the bands, or against the bayonet socket and its ring, causing an indentation of its outer surface, and consequent contraction of the bore at those places, the defect would be permanent, and nothing but a mandril or cutting tool forced into the barrel could remove it. It is, however, well known that after an Enfield rifle has been wiped out with a wet or greasy rag it loads as easily and fires as well as when first used, thus proving that the defect alluded to is not a permanent one produced in the metal of the barrel by expansion, but a temporary one resulting from the peculiarity of bore retaining the maximum amount of deposit from the powder charge. On the other hand, the peculiarity of the Lancaster bore, judging from its performance under the same circumstances, and with the same ammunition, appears to be such that it retains only the minimum amount of deposit, while at the same time its range and accuracy are greater. In the last-mentioned qualities it has been frequently proved to excel the Enfield rifle in England as well as India. Both rifles may now be considered to have had a fair trial in the very best school for testing their respective merits—namely, actual warfare, and from the unanimous testimony of officers and men, both in India and elsewhere, there can be no doubt that as a weapon in the hands of troops engaged in war the Lancaster is in every respect superior to the Enfield rifle."

We may add that during Monday and Tuesday last, large parties of non-commissioned officers and men of the Royal Engineers, belonging to the survey companies stationed in various parts of the country, arrived at head-quarters, Brompton-barracks, Chatham, for the purpose of being put through a course of instruction with the Lancaster rifle.

A SIMPLE MEANS OF DEMONSTRATING THE WORKING OF LIQUID-FIRE SHELLS.—The bisulphide of carbon is first poured into the shell, and then small bits of phosphorous are dropped in; the mouth of the shell is then closed with a cork, partly projecting, like the cork in a wine-bottle. The shell may then be laid on canvas, or other combustible matter; and in about ten minutes, the fermentation of the mixture will force its way through the pores of the cork, and, meeting the oxygen of the atmosphere, will become ignited; the cork acting like the wick of a candle, and the liquor underneath feeding it. A leaden shell thus charged, and adapted to the Lancaster military rifle, will continue to burn for ten minutes with an intense flame, which cannot be extinguished by water.—J. NORTON. [Mr. Macintosh has a patent for such shells?—Ed. *M. M.*]

Some Fijian paper has just been received by the Manchester Cotton Supply Association. It is made from the inner bark of the mulberry tree, and is an article of barter among the natives of Fiji. It is thought that the fibrous materials of the mulberry-tree might be rendered available for writing, printing, and other papers.

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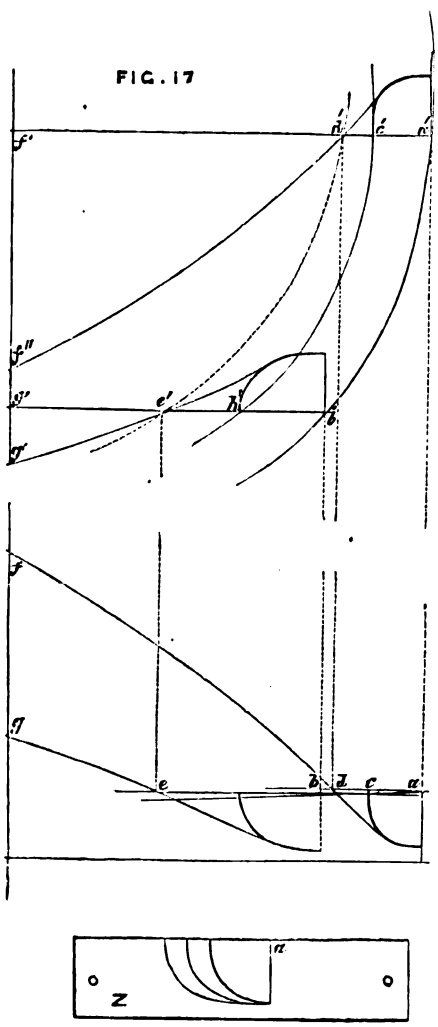
LAYING-OFF;
OR,
THE GEOMETRY OF SHIP-BUILDING.
No. V. *

THERE is one way in which the foremost extremities of the sections of a ship might be correctly ended, which will probably strike some of our readers, and that is, to draw planes perpendicular to the fore edge of rabbet of stem, and to *rabat* them on the sheer plan. The sections of the ship made by these planes will end on the backs of circles, swept with a radius equal to the thickness of the planking—the points in which the curved lines touch the circles being points in the middle of the rabbet. We shall not make the construction for this mode of solution, but shall leave our readers to do it for themselves. It will be seen that it differs from Stalkartt's method only in this—that the section made according to him is square to the vertical longitudinal plane and inclined to the horizontal plane, while that which we propose is inclined to both these planes, and may be called a double-cant section. There is, however, another mode of ending the half-breadth lines and getting the bearding, which, though but little known, commends itself to our judgment. It will be seen that if the fore edge of rabbet of stem, Fig. 15, page 186, represented the axis of a curved cylinder—if we may be allowed to use the term—the radius of which was equal to the thickness of the plank, the side of such a cylinder, or rather, series of cylinders, would be in contact with the surface of the timbers all down the stem, whatever might be the obliquity of the fore-edge of the rabbet or the taper of the stem. Now, any level plane would cut this cylinder obliquely, and the section in which it would cut it would be an ellipse, from which we see that the line in which the level plane cuts the surface of the timbers should be ended in the half-breadth plan on the back of an ellipse such as we have described. Diagonal lines and water-lines would be ended in a similar manner.

FIG. 17.



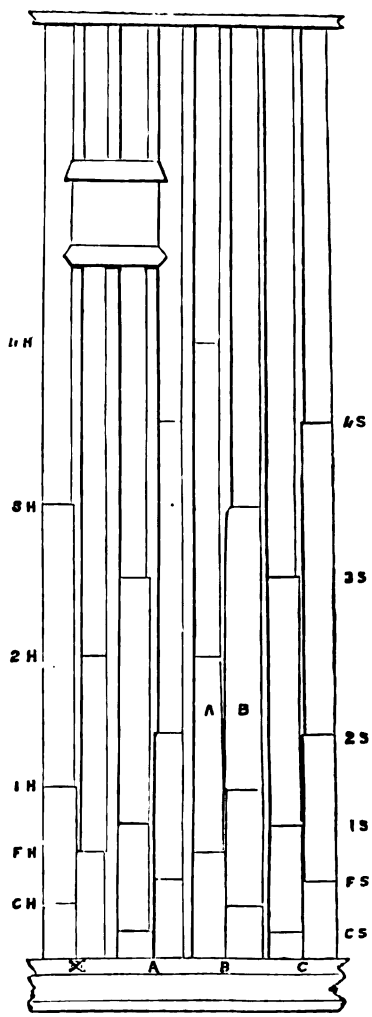
From these considerations we may obtain the bearding line more easily than by the use of Stalkartt's bow-sections, and with the same amount of precision, the only error in both cases being that the stem is assumed to be sided parallel.

To end the level lines, and obtain points in the bearding line, observe that if $a'\,b'$, Fig. 17, is the fore-edge of rabbet, and the axis of the cylinder of which we have spoken, then $c'\,h'$, drawn parallel to $a'\,b'$, and at a distance from it equal to the thickness of the planking, is the side of the cylinder. The longer semi-diameter of the elliptical section of this cylinder, made by the level plane $a'\,c'\,f'$, is $a'\,c'$, and the shorter the radius of the cylinder. And the longer semi-diameter, or the semi-major axis of the section made by the level plane $b'\,h'\,g'$ is $b'\,h'$, while the shorter is as before the radius of the cylinder or the thickness of the plank. To end the line $f\,d'$ or $f'd$ we have then to construct a segment $a\,c\,o$ of the ellipse, and end the line as shown; then d', obtained by squaring up the point d where the line cuts the side of the stem, is a point in the bearding line. The line $g\,e$, being ended in a similar way, another point e' is found in the bearding line, and so on for any number of points which may be required. We have shown the same construction in the sheer plan for the sake of illustration, by rabatting both the section of the ship and the section of the cylinder about a straight line through the point in the fore edge of rabbet and parallel to both the planes of projection, the level line $d'\,f'$ becoming $d'\,f''$, and $e'\,g'$ becoming $e'\,g''$. It must not be supposed that we should propose to construct the required ellipse at each of the endings in the half-breadth; we are quite sure no draftsman would receive such a proposition with favour; the matter might be managed very simply by drawing on a *brass plate* or piece of thin board Z, Fig. 17; a number of elliptic quadrants for the same thickness of plank, increasing the semi-major axes gradually by perhaps half-an-inch at a time from the thickness of the plank up to the greatest distance which would be practically required. Having a set of these curves for each thickness of plank, take the one which will suit the particular ship in hand, and at each level line, $b'\,g'$, for example, mark on the board or plate Z from a the distance $b'\,h'$, the point h' being found by setting off the thickness of the plank from the fore edge of rabbet in the sheer square to the curve. Then nail the plate Z upon the floor with its edge fore and aft, and the point a at the point in the fore edge of rabbet in the half-breadth plan, and let the penning batten pass over the plate, and touch the curve next within the point we have marked upon it from h'. In this way the endings of all the lines may be easily obtained, and the bearding line got in. It would require a complicated construction to determine the exact points in which the lines touched the ellipses in order to discover the middle of rabbet, but if we can get in the bearding line correctly nothing more is needed. We may observe, in passing, that the foci of the ellipse are found from the axes, by sweeping from the extremity of the shorter axis with a radius equal to half the longer, an arc of a circle, cutting the longer axis in two points. These two points are the foci from which the ellipse may be swept in. The ellipses for ending level lines when the taper of the stem is considered, and for ending the diagonal lines, cannot be determined with sufficient simplicity for practice, because the major axis does not lie in a fore and aft plane, and, therefore, cannot be measured at once on the sheer.

Having thus shown how the various sections of the surface of a ship may be got in, and ended we must now show, in detail, how some of the principal parts of the ship are laid-off.

Throughout the greater portion of the ship the sides of the ribs or frames lie in vertical transverse planes, and the shapes of their outer edges are shown by the sections of the surface of the ship inside the planking made by such planes and projected on the body plan. Each frame consists of short pieces of timber, called cross-pieces, floors, half-floors, and futtocks, according to their positions—which pieces are arranged in two series, one piece rising above another, as shown in Fig. 18:—

FIG. 18.



C S, cross-sirmark; *C H*, cross-head; *F S*, floor-sirmark; *F H*, floor-head; *1 S*, first-sirmark; *1 H*, first-head, &c.

The adjacent sides of the lower pieces in each frame touch each other, but between those of the upper pieces there is an interval of a few inches. There is, however, an imaginary surface of contact from the bottom to the top of the frame in continuation of that formed by the lower pieces—this imaginary surface is called the *joint* of the frame. The distance between two joints, which is a few inches greater than twice the size of the lower pieces in the frame, is called the *room and space*, or timber and space. At every joint a vertical transverse section of the ship is taken, and it is these sections which are delineated on the floor, as shown in Fig. 19.

To each section moulds of thin wood are made, which extend from the keel to the gunwale, and indicate to the workmen the form of the *joint-edge* of each of the pieces in the frame—the distance between the joint and the edge of the timber being so small as to cause no appreciable difference in the form. But the side farther from the joint in each of these pieces, called the *bevelling-edge*, being a foot or more before or

* N.B.—Page 186, first column, line 25 from the bottom—for *level* read *expanded*.

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abaft the joint, will have a somewhat different form, and will require a separate determination.

FIG. 19.

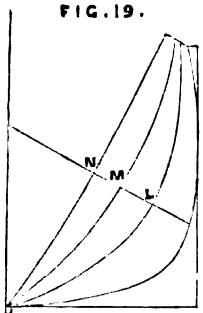
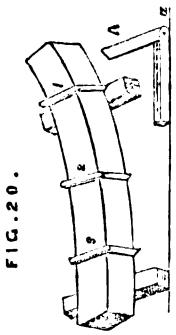


FIG. 20.



For this purpose it is not necessary to find on the floor the shape of a complete section of the ship at this new position; we are content to discover a few points in the curve, its general character being determined by that of the joint. Let us suppose that the workman has trimmed to shape the joint-edges of the timbers marked *A B*, in (Fig. 18), and that he wishes to know the form of the bevelling edges. Now, if we can give him, by means of the *bevel A* (Fig. 20), consisting of two pieces of wood pivoted at *a*—if we can give him, by means of this instrument, the angle between the two arms of the bevel when it is applied at several fixed points along the timber, one arm being held square to the side of the piece and the other to the joint edge, he will then be able to tell how much he must cut from the face of the timber at these positions, and will thus find points in the curve of the opposite edge, if he joins these by the mould for the joint edge, he will have the entire bevelling-edge. It remains, then, to find these angles or bevellings for the timbers *A* and *B* at the several diagonals.

Let *M* (Fig. 19) be the joint-edge of *A* and *B*, or of two timbers similarly situated to *A* and *B* in any frame, and let *N* and *L* be the adjacent joints. Then, if it be required to find the bevelling at *M*, draw through this point a line, *N L*, square to the curve at *M*. Now, the real distance from *M* to *N* is the hypothenuse of a right-angled triangle, the base of which is the length *M N*, and the perpendicular the distance between the transverse planes containing *M* and *N*—*i.e.*, the *room and space*. If, then, we set off from the edge of a table (Fig. 21) a line square to its side equal to the

FIG. 21.

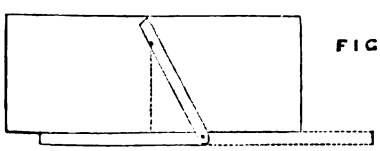
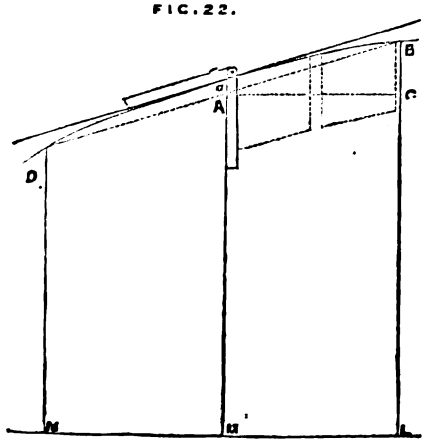


FIG. 22.



room and space, and from it measure along the edge of the table a distance equal to *M N*—then the bevel set as shown will give the angle between the side and the face of the timber at *M* in a plane at right angles to the joint-edge. See Fig. 22.

If *M L* be set off in the same manner, instead of *M N*, we should get the bevelling at the point *M* of the timber on the other side the joint. But it is not usual to get both these bevellings, it being assumed that the side of the ship is straight for a little distance before and abaft the joint, and that the two bevellings will therefore be equal to two right angles. To obtain the second bevelling, the stock of the bevel is turned round, as shown by the dotted lines in (Fig. 21). But as the distances *M N* and *M L* are generally unequal, it is evident that neither of them can give the correct bevelling for both; it has therefore been proposed to take half the distance between *L* and *N* for the base of the triangle, instead of taking either *M N* or *M L*; by this means we obtain the angle *A B C*, Fig. 22, because *A C* is the room and space, and *B C* is half the distance between *L* and *N*; the curve *B D* being the expanded diagonal, at the height at which we are bevelling. This angle will generally be the same as that made by a line *touching* the curve at the point *a*, because *a* being generally the highest point in the curve, a tangent at it will be parallel to *D B*, and it is the direction of this tangent which is really required.

CANT TIMBERS.

If the sides of the frames at the extremities of the ship where her sides make a considerable angle with the transverse plane still lay in transverse planes, the sections of the timbers would be acute-angled parallelograms, requiring very large timber for their conversion, and would be besides ill-adapted to receive bolts driven in square to the surface. On this account a change is made in the direction of the sides of the timber when the sides of the ship begin to turn inwards considerably. The planes in which they lie are still vertical planes, or perpendicular to the horizontal plane, but they are no longer parallel to the plane of the body. Their inclination to this plane increases gradually as we advance towards the extremity of the ship, and the plane of the foremost one is nearly fore-and-aft. By this means the sides of these timbers are made nearly square to the curvature of the bottom, and the inconveniences mentioned above are avoided. All the timbers in these oblique sections are called *cants*, or cant timbers, and the frames which they compose, *cant frames*.

HARPINS.

Harpins are wooden bands running round the outer surface of the timbers at the heads of the different futtocks, or portions of the ribs. They are cut out of elm plank about six inches thick, and are made up in several lengths scarphed together. They are intended to indicate the form of the body of the ship, and to determine the position of the timbers; they are therefore made strong enough to prevent them from bending when they are fastened to the stem or sternpost at one end, and to a frame or rib at a considerable distance from it on the other, receiving support from shores in intermediate positions. As the different timbers, or frames, are brought into place, they are supported by these harpins, and are secured to them by screws. They are distinguished by the names of the heads of the futtocks at which they are placed, as floor harpin, first-head harpin, second-head harpin, portsill harpin, topbreadth harpin, &c. The upper surface of each of the harpins at the heads of the timbers, lies in the diagonal plane which, as we have already pointed out, determines the position of the heads. It will be seen by Fig. 18, that there are rows of timber heads called sirmarks between those marked heads. No harpins are made to these, although the diagonal curves are got in upon the floor. The original use of these intermediate diagonals was to assign the positions of the bevelling stations on the timbers, not to mark the heads of futtocks; but by the introduction of "filling frames," made up with pieces of a different length from those employed in the regular frames, the sirmarks have become heads. They still, however, answer the end for which they were originally designed.

RIBBANDS.

Throughout all the midship portion of the ship these bands consist only of fir quartering from four to six inches square, *bent* round the timbers, and secured to them by screws as a means of regulating them, rather than of fixing their proper positions, as that is done with sufficient precision by the cross-spalls, &c. This quartering is called *ribband*; its *upper* side makes a continuous line with the *under* side of the harpins, and is therefore about six inches below the plane of the diagonal. Moulds are made to the harpins only, not to the ribbands.

Proceedings of Societies.

INSTITUTION OF ENGINEERS IN SCOTLAND.

On Wednesday evening, 13th April, a meeting of this Society was held in the Philosophical Society's Hall, Dr. W. J. Macquorn Rankine, President, in the Chair. The meeting, being the concluding one of the session, was principally for the purpose of electing officer-bearers for the ensuing year. The treasurer's report showed the financial condition of the Society to be very prosperous. An interesting communication was read by Mr. Neilson, relative to the structure and arrangements of American river steamers, as compared with those of the Clyde, which in proportion to their size, are much heavier and clumsier than the "wooden palaces" which float on the rivers of the "Far West." Some of the members expressed a fear that steamers constructed on the American plan would not be strong enough to bear the rough weather to which the Clyde vessels are often exposed in the estuaries; but Mr. Neilson said that many of the American pleasure steamers had to encounter the force of the Atlantic's waves during a portion of their voyages; and he had no doubt that if shipbuilders took into consideration the proposal of building vessels for river navigation on a similar plan to that adopted in America, it would be found to be an improvement, both in point of speed and passenger accommodation. Several gentlemen expressed their belief that the subject ought to be taken up by shipbuilders. A model, showing an improved construction of rudder, the invention of Mr. Chaplin, specially adapted for vessels intended to navigate shallow rivers, was exhibited, and was very generally approved of by the meeting. Mr. Chaplin said that Government had ordered the plan to be applied to six vessels intended for the navigation of the Ganges. Messrs. R. Napier and Sons presented to the Institution the tabulated results of 300 experiments on the strength of numerous varieties of plates and bars of wrought iron and of steel. Dr. Rankine communicated and explained a useful formula for estimating the evaporative efficiency of different kinds of boilers with different kinds of coal. The anniversary dinner of the Society will take place in about a fortnight.

SOCIETY OF ARTS.

April 13.—The nineteenth ordinary meeting of the one hundred and fifth session was held on Wednesday, Wm. Fothergill Cooke, Esq., in the Chair.

The following candidates were ballotted for and duly elected members of the Society:—John Norton, William Henry Weeks, Cromwell Fleetwood Varley.

The following Institution has been taken into Union since the last announcement:—The British Horological Institute.

The paper read was:—"On Professor Hughes' System of Type-Printing Telegraphs and Methods of Insulation, with Special Reference to Submarine Cables. By Mr. H. Hyde.

GEOLOGICAL SOCIETY OF LONDON.

April 6.—Prof. J. Phillips, President, in the Chair J. Phillips, Esq., Claremont Lodge, Brixton-road: C. Gould, Esq., Geol. Survey Great Britain; J. E. Lee, Esq., Priory, Caerleon, Monmouthshire; and J. Leckenby, Esq., Scarborough, were elected Fellows.

The following communication was read:—"On the Subdivisions of the Inferior Oolite in the South of England, compared with the Equivalent Beds of the same Formation on the Yorkshire Coast." By Thomas Wright, M.D., F.R.S.E. (Communicated by T. H. Huxley, Esq., Secretary G.S.) With a note on Dundry Hill, by E. Etheridge, Esq., F.G.S.

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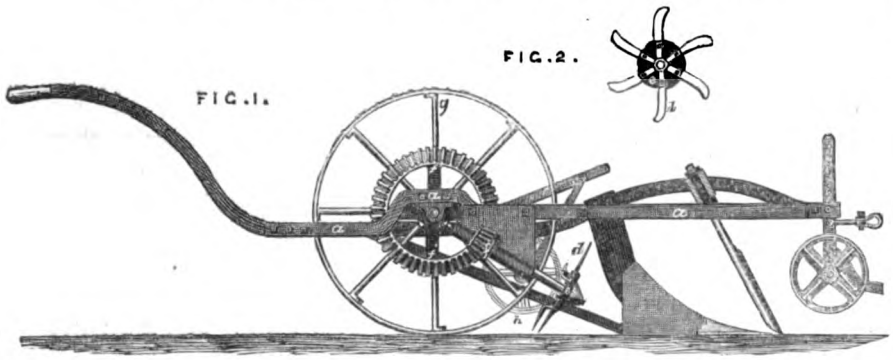
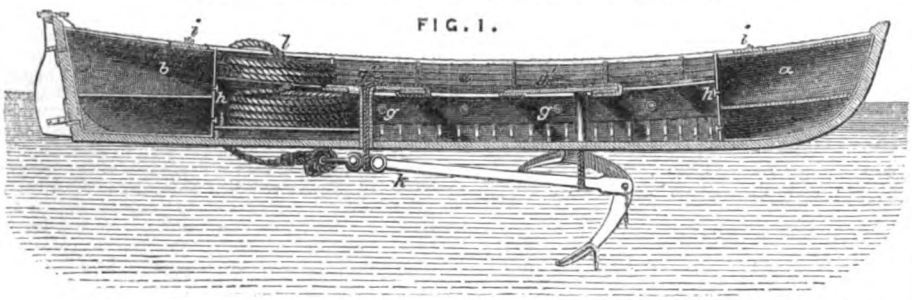
HARKE'S PLOUGH AND PULVERIZER.

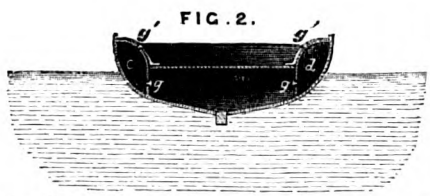


MR. WILLIAM HARKES, agricultural implement maker of Lostock Gralam, Chester, has patented an improved plough, or pulverizer, which he describes as follows:—

"The improvement consists in arranging or placing a series of cutters supported in a circular frame directly behind the ploughshare, and at right angles to it, so that as the soil leaves the ploughshare, it is delivered on to the knives, cutters, or pulverizers, which are caused to revolve rapidly by means of suitable gearing in connection with the supporting wheels of the plough, so that as the plough progresses, the knives rotate, and cut or pulverize the earth as required. The apparatus may also be employed for digging up potatoes, &c., for which purpose a series of forks may be substituted for the knives." . . . "Fig. 1 is a side view of the improved plough, showing the position of the pulverizer immediately behind the ploughshare; and Fig. 2 is a detached front view of the series of knives in a circular frame forming the pulverizer. In Fig. 1, *a a* is the frame of the plough; *b* the ploughshare, and *c* the colter; *d d* are the knives contained in the framing *e*, every alternate knife being double or fork-like, and all supplied with cutting edges, for cutting, breaking up, or pulverizing the soil as it is turned up, and leaves the ploughshare; the framing carrying the knives is mounted upon a shaft, upon which is a bevel wheel *f*, gearing into the bevel wheel *f'*, by which means motion is communicated to the knives from the bearing or driving wheels *g*, *g*, which support the central portion of the plough; *h* is an extra wheel placed on the left-hand side of the plough to assist in turning it. The ploughshare *f* is furnished with hinges, so that when required a "mould board" may be attached, and the plough may be used without the pulverizer, and as a plough only."

LAMB AND WHITE'S LIFE-BOATS.





WE alluded in our gossip columns a few weeks since to certain improvements in life-boats which had recently been introduced by Mr. Andrew Lamb, of Southampton, and Mr. John White, of Cowes. We now furnish illustrations of their invention. In the accompanying engravings, Fig. 1 is a longitudinal section of a life-boat constructed according to this invention, Fig. 2 being a cross section, Fig. 1, showing the position of the two delivery tubes, through which the anchor, which is shown as hung beneath the boat, is slung by means of rope lashings passed through the tubes (these tubes being placed a short distance from the middle line, on opposite sides of it), the lashings being so secured as to be within reach and under the command of the crew; *a* and *b* are water-tight compartments at the head and stern of the boat; *c* and *d* are water compartments or air-cases running longitudinally along the sides of the boat, and carried up to the gunwale; *e* and *f* are delivery tubes, as before described, for the purpose of freeing the boat from water, should it rise above the external level, which tubes are intended to be fitted with valves which are removeable when the boat has to be used for carrying out an anchor, and they can be replaced in a few moments when the lashings are removed; *g*, *g* are the water-plugs fitted at the lower part of the air-cases or longitudinal water-tight compartments, which in practice may be placed lower than where shown in Fig. 1; and *g'*, *g'* are the screw plugs at the top of the longitudinal air-cases or water-tight compartments, which plugs are unscrewed or removed when the boat is out of use, for the purpose of producing a circulation of air within the longitudinal air-tight cases, so as to perfectly dry and preserve the interior thereof; *h*, *h* are screw plugs fitted to the water-tight head and stern compartments, and *i*, *i* are hand-hole covers fitted on the decking or top side of each of the compartments *a* and *b*, and by the removal of which food, stores, or other articles may be deposited in safety, and kept dry; *k*, the anchor, which is slung below the boat, but at an angle with the line of the keel; *l*, *l*, the cable attached to the anchor, and coiled as shown in Fig. 1.

"Life boats, thus constructed," say the inventors, "combine lightness with great strength, which enables them to be hauled up and suspended to the ship's davits, without risk of straining or injuring the boat; the disposition of the longitudinal air-cases and head and stern compartments, gives greatly increased safety over every other construction of life-boat heretofore in use, and renders it impossible for the boat to be sunk when filled with persons, or when carrying out the heaviest anchors, suspended or slung in manner described. By the introduction of the delivery tubes the boat may be made available for carrying out safely the largest anchor from the ship in the event of her going on a lee shore, or under other circumstances, whilst, by the addition of valves, fitted to the delivery tubes, and construted to open downward for the discharge of water from within, after shipping a sea; or, when from any other cause, the water may rise above the external level, the boat is freed therefrom by permitting its escape through the delivery tubes; and by the introduction of screw plugs in the top side of the longitudinal air-cases, in addition to the water plugs at the lower part of the air cases; they may be preserved in a perfectly sound condition; thus we have combined within the same boat advantages not heretofore possessed by any other construction of life-boats."

GUN-MAKING AT WOOLWICH ARSENAL.

Of the innumerable experiments tried during the last two years at Woolwich Arsenal for the purpose of ascertaining the best way to make large guns, *one* good thing has come, at all events—the authorities and ourselves know the proper kinds of iron to use for the purpose. Failures there may have been in the subsequent stages of manipulation, but many guns were certainly cast of the best possible admixture of metal for the purpose. So long back as 1858 iron-masters and others were invited by public advertisement to send to that establishment samples of the iron they could confidently recommend for this particular branch of manufacture. Fifty samples came on this invitation. These were subjected to tests chemical and mechanical in the first instance, and selections were made from them. The result of these primary experiments demonstrated what has subsequently been completely confirmed—that English cold blast pig iron is quite equal in purity and strength to the bulk of foreign iron. Northerton and Parkhead were found in these early trials indeed to be far superior to East Indian or Nova Scotian. Swedish grey occasionally proved of very superior character, but generally it seemed extremely hard, and it could not be used therefore safely in the composition of guns. The impurities sought for in the chemical testing of the iron were silicon, sulphur, and phosphorous, and if these existed in quantities larger than 1·5 per cent. of the first; ·05 of the second; or ·5 of the third, the iron was uniformly registered. The mechanical tests were applied to ascertain the tensile and transverse strength of the material when cast into bars. Its specific gravity was also taken into account. Without going further into detail, however, upon this interesting subject at present, it may be stated—and there is some satisfaction, in a patriotic sense, in doing so—that the irons peculiarly adapted by nature for the manufacture of large guns are English, and these stand in the following order:—Northerton and Parkhead, Staffordshire; Bowling, Yorkshire; and Blaenavon, Shropshire. The cost of these averages from £6 to £6 10s. per ton, against £8 15s. to £10 per ton for foreign. The charge of metal necessary for the casting of a 68-pound gun, with the "dead heads"—the latter is used, however, in the charge for the next gun to be cast—is 8 tons or thereabouts, and the conveniency of using English irons with the certainty that they are the best becomes thus apparent. Whether the Arsenal will yet be able to *finish* these weapons in a style equal to that of certain contractors is, we believe, a problem yet to be solved.

Railway enterprises in the Eastern Counties have proved singularly unsuccessful this year. The preamble of the Bedford, Potten, and Cambridge scheme has just been declared not proved; and the London and Bury St. Edmund's and Colne Valley extension schemes have been withdrawn. Tuesday, however, witnessed the opening of the Grantham and Sleaford extension to Boston.

Messrs. Reiss and Co., the lithographers, of Dusseldorf, have lately discovered a mode of transferring pen drawings immediately from the paper to the stone in such perfection that the finest lines are rendered as successfully in the impression as the deepest shadows. In a few minutes after the delivery of the drawing, the stone is ready for the press.—*Bulletin.*

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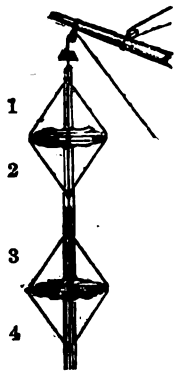
REDL'S CONE TELEGRAPH FOR THE NAVY AND WAR DEPARTMENTS.

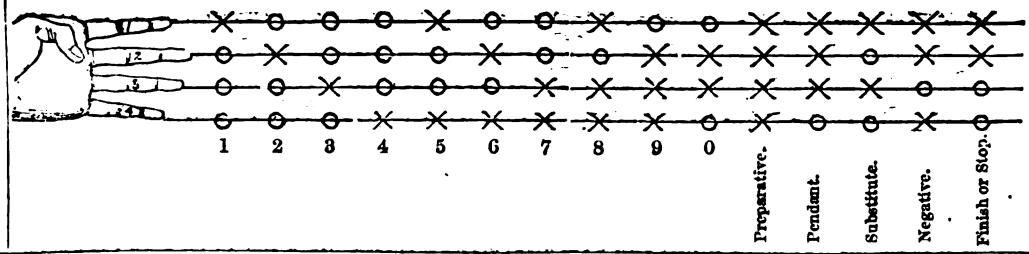


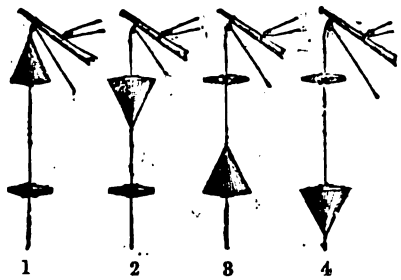
The Cone Telegraph is made by means of four collapsing cones joined in pairs at their bases, and suspended vertically under each other. These being opened or closed at will, present in every direction fifteen changes of figure. These fifteen different changes are used to represent the ten numerals, and five other auxiliary signs.

These changes may be rendered easily intelligible by considering the four fingers of one hand as the four cones, of which—

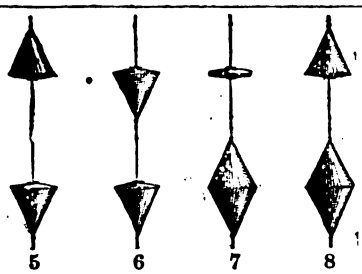
The fore finger will represent the first or upper cone.
" second ..... second cone.
" third ..... third cone.
" little ..... fourth cone.

Then if we mark a finger or cone being open by a X, and a finger or cone being closed by an O, we have

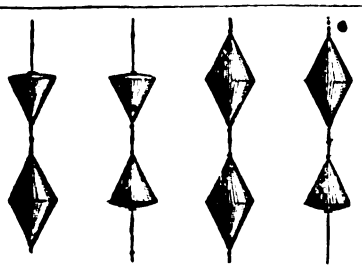




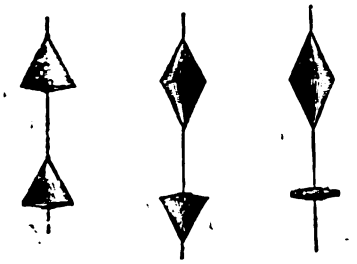
The 1st or upper cone only being *open* represents figure 1
" 2nd or next 2
" 3rd 3
" 4th or lower cone 4



The 1st and 4th cones being *open* together 5
" 2nd and 4th 6
" 3rd and 4th 7
" 1st, 3rd, and 4th 8



The 2nd, 3rd, and 4th 9
" 2nd and 3rd 0
" 1st, 2nd, 3rd, and 4th ..... Preparative.
" 1st, 2nd, and 3rd ..... Pendant.

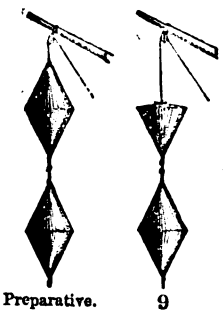


The 1st and 3rd ..... Substitute.
" 1st, 2nd, and 4th ..... Negative.
" 1st and 2nd ..... Finish or Stop.

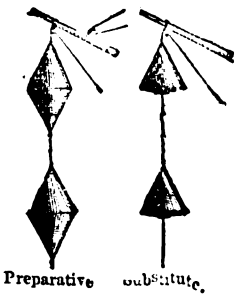
EXAMPLES.

The "*Preparative*" or all the cones open, may be used to attract attention before commencing a signal, but this use of it is not necessary under ordinary circumstances.

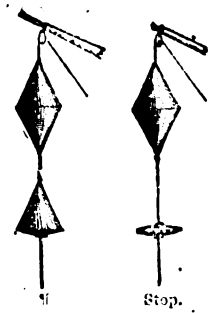
If whilst Telegraphing, either party make a mistake in the message, the "*Preparative*" should be immediately shown, and the signal is then to be repeated from the last "stop."



If after any message is received one of the signals* should on deciphering appear to have been erroneous, then the "*Prepasative*" and the number of that signal as it stands in numerical order is to be made, when that signal is to be repeated.



The "*Preparative*" followed by the "substitute" signifies that the whole message is misunderstood.

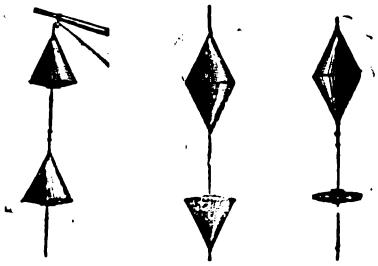


(*List of the Navy.*)

"*Pendant*" with a "stop" or figure after it, specifies the Table or Code to which the signal following refers, thus—

¶ Pendants.
(¶stop) { Union Jack or List of the Navy.
(¶ 0) Numeral.
(¶ 1) General Signal.
(¶ 2) Telegraph.
(¶ 3) Alphabetical.
(¶ 4) Geographical.
(¶ 5) Latitude and Longitude.
(¶ 6) Military.
(¶ 7) Horary.
(¶ 8) Interrogative.
(¶ 9) Compass.

* By a *signal* is meant all the figures or letters between two successive "stops."



Substitute. "*Substitute*" is made use of as the duplicate of the preceding hoist, and an affirmative answer to a question asked.

Negative. "*Negative*" is made use of as an "annul" to the preceding message, and a negative answer to a question asked.

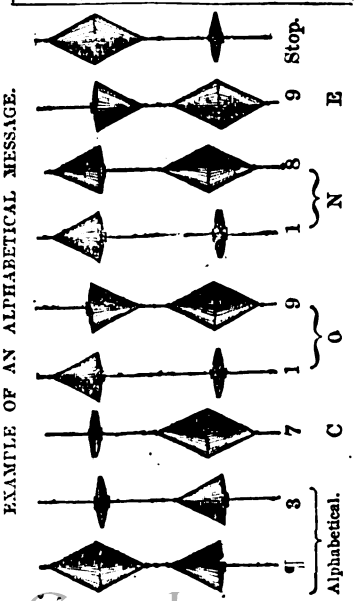
Stop. "*Finish*" or "*Stop*" is used to separate the different numbers, words, or parts of a message, and when shown *twice* it signifies the completion of the message.

N.B. When accuracy is of importance, each hoist may be repeated.

For Alphabetical purposes, the following numbers when shown after the proper "Pendant," are used to designate the different letters of the alphabet.

		A 5		
B 6	C 7	D 8	E 9	F 10
G 11	H 12	I 13	J 14	K 15
L 16	M 17	N 18	O 19	P 20
Q 21	R 22	S 23	T 24	U 25
V 26	W 27	X 28	Y 29	Z 30

EXAMPLE OF AN ALPHABETICAL MESSAGE.



(*To be concluded in our next.*)

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UNACCOUNTABLE EXPLOSIONS.

The following letter has been received from a gentleman whose authority to speak on this subject is known to our readers:—

Gentlemen,—In the article upon Gunpowder Manufactories in a late number several illustrations are given of a curious and important fact, viz., the variation in the stability of explosive compounds. The paragraph I allude to is the following:

"We have had enough of these accidents to convince us that gunpowder is a chemical combination of an extremely treacherous nature. Although not so uncertain as gun-cotton and fulminating silver, it is, from the difficulty of defining to what length it may be trusted, of the same coquetish family. Gun-cotton, it has been proved in the making of rockets, may be rammed by a succession of gentle taps, or by the whole force of hydraulic pressure, some nine thousand nine hundred and ninety-nine times with perfect impunity, and then a child shall drop a mere rod upon it and cause the loss of many lives. Fulminating silver may be stirred with impunity two or three times a day in a wooden bowl with a wooden stick for a period of some ten or fifteen years, and yet this simple act shall at some other time scatter into space a large factory, spread dismay throughout Bond-street and Piccadilly, and strike the ingenious inventor of wire-cartridges a corpse."

So far as regards gun-cotton and the fulminates of silver and of mercury, the fact of extraordinary instability, under certain circumstances at present unknown, cannot be denied, and it may, therefore, be sought to account for it. And if the terrible, and, apparently, unaccountable accidents which have sometimes occurred with gunpowder are sufficient to warrant our placing it in the same category, the question assumes an importance which cannot easily be overrated. But another compound exists of a far more capricious character even than the fulminates, and on which, therefore, the causes of instability may be more readily studied. This body is formed when iodine is placed in a solution of ammonia; and, if we assume that the ammonia is decomposed to form hydriodic acid, its designation would be the *iodide of amidogen*, and its formula $NH_2\,HI$. When dry, it sometimes explodes spontaneously, sometimes by the smallest concussion of the air, or the slightest touch, while occasionally it may be moved or gently handled with impunity. Once or twice, when wishing to exhibit the extraordinary explosive nature of this compound, I have been unable to cause its decomposition by anything short of a slight tap with a tolerably hard substance—a circumstance but ill-accounted for by the usual unsatisfactory explanation that it *ought* to have exploded with much greater facility. A more logical reason may probably be found in the condition of the atmosphere, as we will attempt to prove.

Let us briefly consider the action which occurs in the explosion of this compound, and the chemical affinities by which it may be occasioned. We find that the result of the explosion of $NH_2\,HI$, *i. e.*, its combination with the oxygen of the air, are:—

Iodine
Water
Nitrogen

Thus the hydrogen of our compound combines to form water. But it is by no means certain that the affinity of the hydrogen for the oxygen of the air is the primary cause of explosion; though the fact of *water* being the only compound produced might at first lead to this conclusion. There exists a body, the mere presence of which is sufficient to effect a combination with iodine, which combination is attended with some degree of heat. This is ozone, *i.e.*, oxygen in an allotropic state, having its chemical affinities exalted in a very high degree.

The following facts, therefore, enable us to come to a rational conjecture respecting the first cause of a decomposition which is attended with so great a degree of uncertainty. They are extracted from Dr. Thomson's "Cyclopædia of Chemistry":—

1. The presence of *ozone* with moisture, converts iodine into *iodic acid*.

2. Oxygen is evolved *when iodic acid is heated*, and the iodine is set free.

The *origin* of the decomposition would, therefore, be the oxidation of the iodine rather than that of hydrogen.

It remains to verify by experiment whether the affinity between iodine and oxygen in this peculiar condition facilitates the explosion of iodide of amidogen in ozonised air.

The imperfect experiments I have hitherto been able to make in connection with this investigation, appear to strengthen the view that ozone exerts a decomposing influence upon this compound, an influence which may be counteracted by a body, such as oxygenated water, containing *antozone*.

But my object in thus somewhat prematurely introducing the subject to your notice is to enable those of your scientific readers who may have greater facilities and more leisure for the prosecution of the inquiry than I myself possess, to enter upon a subject the elucidation of which might be of great practical benefit. It would be for them to trace whether there exists any connection between the condition of the atmosphere with regard to ozone, and the amount of apparent stability in such compounds as the fulminates and gunpowder.

This investigation might possibly furnish us with the means of guarding against the fearful consequences of chemical action in explosive or highly combustible bodies. The recurrence of fearful casualties in connection with gunpowder is a subject of common observation. Bearing in mind that the combustion of gunpowder is simply a series of chemical combinations, any one of which is sufficient to occasion the others, and the extraordinary energy with which ozone acts upon oxidisable bodies, it becomes more than probable that the existence in the atmosphere of any considerable amount of ozone would greatly facilitate chemical action in the powder, thus occasioning its explosion under circumstances in which it would generally be harmless.

Desmond G. Fitzgerald.

27 Upper Berkeley Street, Portman Square.

INCENDIARY SHELLS FOR WARFARE.

(From the *Sun* of April 16.)

Some efforts having been recently made to deprive Captain Norton of the credit of being the author of the improvements which have been lately made in gunnery projectiles, we think it due to the gallant gentleman to publish the enclosed letter addressed to him by the son of General Sir William Napier, the celebrated historian of the Peninsular War, in his father's name:—

"Scinde House, Clapham, April 3, 1859.

"Dear Sir,—My father has been for more than a year now unable to walk, entirely confined to two rooms. He is only able to be lifted from one bed to the other, and continually suffering. In November and December he was seized with very dangerous illness, from which he only recovered so far as the immediate danger was concerned. For the last three weeks he has again been very ill indeed, and he is unable to move even a limb without assistance, and quite unable to write or attend to any business. But for this, he desires me to tell you, he should have written to you long ago to congratulate you, as he now does through me, on your merits being at last acknowledged, and on your being now generally allowed to be the real originator and inventor of the great improvements in gunnery projectiles. My father says, had this been acknowledged, and your inventions acted on years ago, much of the misfortunes in the Crimean war would have been avoided. It is with serious uneasiness he now considers that there are no men to use these improvements. Often has my father spoken of you and your invention to men, and they have answered slightingly until now that the tide has turned in your favour; yet five years ago, he says, they were as valuable as they are now.

"I remain, dear Sir, yours truly,

"Captain Norton. C. J. Napier."

(From the *Sun* of April 19.)

Sir,—In justice to Mr. Macintosh, I beg to correct an error which I perceive you made in your number of yesterday; and having given so prominent a notice to a letter sent to you relative to Captain Norton being congratulated by the son of General Sir William Napier (sent to Captain Norton at Sir William's request), "as being now generally allowed to be *the real originator and inventor* of the great improvements in gunnery projectiles," &c., I beg to state, in explanation, that although Captain Norton has amused himself (for some time past) by experimenting at Chatham with shells filled with liquid and other incendiary materials, he has done so *well knowing* that the inflammable materials he was using were not compositions of his own invention, but were those of Mr. John Macintosh, of Northbank, Regent's-park. Although Captain Norton was "*fully aware*" that he was experimenting with materials patented and invented by another inventor, he has not had the courtesy of explaining this fact, nor has he yet requested any of the periodicals or newspapers to correct the error they have all invariably committed, in ascribing the invention of the compositions he experiments on, when using incendiary shells, to him, whereas Mr. John Macintosh is the true and real inventor. I beg to add that both the "War and Admiralty Departments" have been fully cognisant, since 1853, prior to the last Russian war, and have made several official experiments with Mr. Macintosh's incendiary compositions for filling shells, which, although satisfactory, have not yet been adopted into the service, for reasons which the late Secretary of State for War, Lord Panmure, can best explain; he having, as you are already aware, "officially sealed-up" Mr. Macintosh's patent, No. 1774, during the continuance of the last Russian war, and then allowed Mr. Macintosh to obtain his patent "*after*" the war was concluded, and then refused to either purchase it or adequately remunerate him for this illegal seizure. The application for the "New Patent Law" sufficiently explains this fact, and further, that this "New Patent Law" has entirely originated from the result of Mr. Macintosh's ingenious and laborious inventions.

Trusting you will kindly give equal publicity to this statement,—I am, Sir, &c.,

April 17. Justice.

N.B.—Mr. Macintosh's specification, No. 1774, can be inspected at the Great Patent Seal Office, 25 Southampton-buildings, Chancery-lane.

SERGEANT WARRY'S IMPROVED GUN AND PROJECTILES.

The improved breech-loading cannon, invented by Mr. Warry, the armourer of the 3rd battalion at Chatham garrison, having been submitted, from time to time, to a series of trials, with the view of testing its efficacy, all with the most satisfactory results, the authorities have been communicated with in order to enable the inventor to ascertain whether it is the intention of the Government to take up the invention, and appoint a commission to superintend a succession of trials with the gun, in order that its superiority over all other breech-loading cannons now in use may be determined. Since the former accounts of the performances of this new weapon appeared in *The Times*, the inventor has effected another important improvement in it, which has the result of making the discharges even more rapid than before, the gun being now capable of discharging, with ease, 20 rounds per minute. This improvement is effected by a beautifully-contrived lever, placed on the side of the breech, which by one simple movement raises the cock of the gun, and opens the breech: the reverse movement entirely closing the breech, cutting the cartridge used, priming the nipple, and firing the gun all instantaneously—the effect of which is, that the cannon may now be discharged as rapidly as the charges can be inserted in the breech, as two simple movements are now all that is necessary to prepare the gun for being fired, and actually discharging it. The inventor has also effected an improvement in the balls used for breech-loading guns, for which he has applied for a patent. This improvement consists in the manner of coating the balls, the present lead and tin coating with which balls have hitherto been covered leaving a deposit in the gun which necessitates that the bore should be cleaned out after every few rounds have been fired, the Armstrong gun, for instance, requiring sponging after about every dozen rounds, and occasionally more frequently. To obviate this Mr. Warry has invented a chemical composition which he applies to the spherical balls used by him, and which answers its purpose so satisfactorily that after 50 rounds were fired the other day with these balls so coated, not the slightest fouling the gun could be detected, the breech, in consequence of the current of air admitted each time it was loaded, remaining as cool as at the commencement, while no expansion could be perceived. The inventor also states that by using his method a dozen balls can be coated for the expense now incurred in coating one on the old principle. Should the Government consent to take up the invention, Mr. Warry is prepared to apply his breech-loading principle to any of the metal guns now in use, which, at a comparatively small outlay, can be so adapted. It is a remarkable circumstance in connection with this invention that shortly after the account of this new weapon first appeared in *The Times*, the inventor was waited on by the agent of a foreign Government, and offered the most handsome terms to transfer his invention to that Government, or part with the model of his gun, both of which offers Mr. Warry, for obvious reasons, declined, not even allowing an inspection of his model.—*Times*.

Mr. J. Robertson has been reading a paper to the Manchester Statistical Society on the insalubrity of the deep Cornish mines and the physical degeneracy of the mining population. The Rev. E. Trollope has also delivered an interesting lecture at Stamford on the fens and submarine forests of Lincolnshire.

Belgian papers announce that a means of uniting steel and iron has been discovered, and that some rails have been made at the ironworks of Montigny-sur-Saumbre, of which the flange is in steel, and the body in iron.

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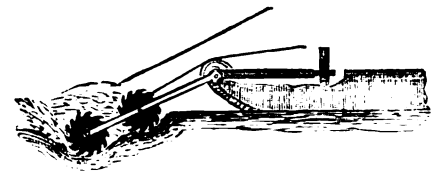
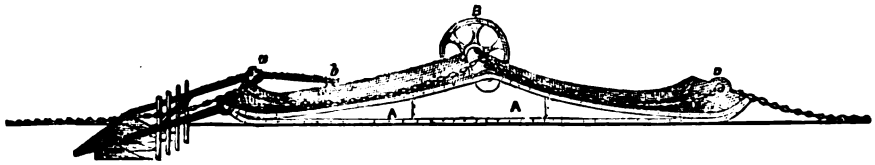
STEAM PLOUGHING.

By Captain J. H. Selwyn, R.N.

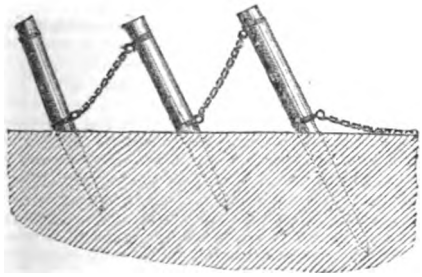
[We think it desirable, in view of certain movements now in progress, to publish the following letter, written two or three years since by Captain Selwyn.]

The novelty which it is believed is possessed by this invention chiefly consists in the placing of the motive power on a large flat surface of iron, which slides over the ground, drawn by a rope or chain, which, being fixed at either end or any part of the ground to be ploughed, passes over or round a windlass or roller, which roller being itself fastened to the bed or platform of iron, is set in motion by the steam-engine upon the platform.



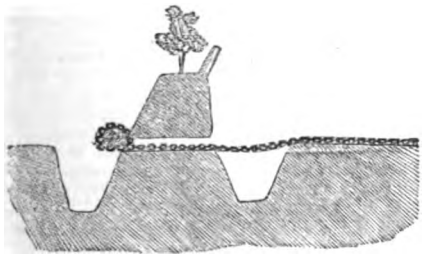


The ploughs or other means employed for disturbing the ground are fastened in a frame *a*, which projects over the hind part of the platform or boat, pressed into the ground by springs or other means at *b b*. The chain is fixed at both ends of the ground, but slack, so that a turn may be taken round the windlass (if it be not found preferrable to use a bedded wheel, as in the steam bridges) before replacing it, after the engine is "embarked." The mode of fastening the chain, and which is, I believe, new as regards its application, is by stakes or posts driven in as under. By this means any



resisting power required is easily obtained, at a far less expense and trouble than with anchors, *i.e.*, where trees or other natural fixed points do not present themselves.

Another mode by which this may be effected, where the contiguous fields are in the same occupation, is by making holes at given distances through the bank. A piece of timber used as a "toggle" may then be easily applied.



As soon as the chain becomes slack *behind* the engine the posts or other means of attachment at that end may be shifted to the next "land," and on the engine arriving at the end of the field it will be turned, by unshackling the chain and passing it in again through the hole in front Some guide or pivot forced into the ground must also here be used to cause the machine to turn short on to the next "land."

It is also proposed, as part of this invention, to use, in light soils or wherever practicable, a totally different means of disturbing the soil.

This is done by the use of two or more cylinders set with teeth or claws, which are set in the frame instead of the ploughshares, and which will then, on being set in rapid motion, scratch out the soil and throw it behind. The lower cylinder (neither of which should have a *diam* of more than six or eight inches) being driven at the highest velocity, and consequently throwing the subsoil to the top. Probably in this a means (as revolving brushes) of clearing the teeth from stubble, &c., would be necessary.

J. H. Selwyn.

Note.—No objectionable pressure on the land need be anticipated. The sledge would be about 12 ft. by 8, or 96 square feet; and, taking the weight at 3 tons, there would be only about 70 lb. on each square foot. A man walking over the ground, say weighing 160 lb., would give considerably more.

MR. VARLEY'S PAPER ON THE TELEGRAPH.

Gentlemen,—In the published report of my paper read before the Society of Arts, "On the Practical Bearing of the Theory of Electricity in Submarine Telegraphy," a few errors have occurred—most of them, however, are of minor importance. Perhaps you would be kind enough to correct the following; as, if uncorrected, it may lead some of your readers into error. The weight of the conducting core of the Atlantic cable is stated in the report to have been 63 lb. to the mile—it should have been 93 lb.; and the rough estimate of the value of a conductor of twice the diameter should be £19, not £16.—I am, Sir, your obedient servant,

S. Alfred Varley.

7 York Place, Kentish Town, April 18, 1859.

THE REPEAL OF THE PAPER DUTY.

Those of our readers who enjoy and benefit by the press of this country will, we trust, give proper heed to the following earnest appeal:—"To the Electors of the United Kingdom."—

"Gentlemen,—Your suffrages are being solicited by candidates for the honour of representing you in Parliament. Let us urge you to press upon them at the hustings, the question of the Repeal of the Paper Duty. The tax on paper shuts out light from the minds of working men, and bears, therefore, on the question of Reform; it weighs on all classes of manufactures; as a source of revenue it is a delusion; it aggravates pauperism, and tends, by narrowing the area of productive labour, to cripple legitimate consumption, and to retard social progress; it hinders the spread of a wholesome literature among the people, and absorbs a considerable portion of the money contributed to the great publishing societies established to secure the diffusion of religious and useful knowledge.

"The House of Commons condemned it, last June, as an *impolitic tax*, and it would be the duty of Parliament to make up for any *temporary* deficit that might result from its immediate abolition.

"The Committee of the Newspaper and Periodical Press Association for obtaining the Repeal of the Paper Duty, urge you to secure pledges from candidates, that, in the event of their being elected, they will give their votes for the repeal of this most injurious impost. Signed, on behalf of the Committee.—John Cassell, Chairman, Henry Vizetelly, Hon. Sec. Peele's Coffee House, Fleet Street, London, April 14, 1859."

NOTICES.

The Mechanics' Magazine will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of insertions less than 13; for 13 insertions, 4d. per line; and or 52 insertions, 3d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

The demand for Mr. E. J. Reed's paper—

On the Modifications which the Ships of the Royal Navy have Undergone during the Present Century, in respect of Dimensions, Form, Means of Propulsion, and Power of Attack and Defence,"

has been so great that the Journal of the Society of Arts, the Mechanics' Magazine, and all other Scientific Journals in which it appeared in December last, are now out of print. The demand still continuing, it has been deemed desirable to reprint it in a separate form. An 8vo. edition of it, in large type, and on fine paper, has, therefore, been prepared, and may now be had at the Office of this Magazine, price 1s.

LIST OF NEW BOOKS.

Acland and Ruskin's the Oxford Museum, 2s. 6d.
Burn's (R. S.) Model Designs, Architecture, &c., No. I., 2s. 6d.
Johnston's Chemistry of Common Life, new edit., 2 vols., 11s. 6d.
Scoffern's Projectile Weapons of War, with New Resources of Warfare, 2s. 6d.
Weale's Rudimentary Treatises: On Carpentry and Joinery of Roofs, 1s. 6d.
W. Richardson's Instructions in Modelling in Architecture, 1s. 6d.
White's (A.) Instructive Picture-book, Vol. I.: Animal Kingdom, 3rd edit., 10s. 6d.
Wood's (Rev. J. G.) Animal Life, 5th edit., 3s. 6d.

Law Cases.

Equity Court, April 16.—(*Before Vice-Chancellor Sir W. P. Wood.*)

HART v. DACOSTA.

This case came on upon a motion to restrain the defendant from vending a gas regulator alleged to be an infringement of a patented article invented by the plaintiff. The plaintiff's regulator consists of a small conical chamber about an inch and a half in length and half an inch wide at its widest part. This chamber is attached to the gas pipe, and into it is secured the ordinary steel pipe or burner from which the gas issues. In the interior of the chamber there is a small apparatus, consisting of two round pieces of perforated metal, held parallel to each other, but not fixed by a small bolt of wire, and enclosing between them two or three layers of felted wool. At the top of this piece of apparatus a piece of loose wool is inserted in the chamber. The action of the invention is this—when the gas enters the chamber in order to pass out at the burner it must force its way through the bottom perforated plate, then through the felted wool, next through the top plate, and finally through the loose wool. The greater the pressure of gas at the main the greater will be the force with which the lower perforated plate presses the felted wool against the upper plate, and so the more difficulty will there be in the gas escaping at the burner. It will be seen, therefore, that if the regulator is properly adjusted, whatever may be the pressure at the main, the force with which the gas escapes from the burner will always be the same. The loose valve is to act as a purifier only. The defendant's invention consists of a conical chamber like the plaintiff's, but in the interior of the chamber there are no perforated plates or wool, but shreds of steel or iron only. In its action it operated somewhat in the same way as the plaintiff's. The plaintiff was willing now to take the usual order for the motion to stand over, with liberty to bring his action.

Mr. Rolt and Mr. H. Palmer were for the plantiff; Mr. Hallett was for the defendant.

The Vice-Chancellor thought that there was certainly a case to go to trial, and directed the motion to stand over accordingly.

Court of Queen's Bench, Westminster, April 16.—(*Sittings in Banco, before Lord Campbell and Justices Erle, Crompton, and Hill.*)

BETTS v. MENZIES.

This was an action brought to recover damages for the infringement of the plaintiff's patent for the manufacture of what is termed "Betts's Metal." The trial took place before Mr. Justice Erle, at Westminster, at the sittings after last term, and after occupying several days resulted in a verdict for the plaintiff.

Mr. Mellor, Q.C., now moved for a rule for a new trial, upon the ground that the verdict was against the weight of the evidence. There were also several points of law reserved for the opinion of the Court.

Lord Campbell said the learned counsel might take a rule to show cause.

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NALDER *v.* CLAYTON AND ANOTHER.

Mr. Knowles, Q.C., moved for a rule calling upon the plaintiff to show cause why the verdict found for the plaintiff should not be set aside, and entered for the defendant, pursuant to leave reserved. The action was brought to recover damages for the infringement of the plaintiff's patent, for improvements in machinery for winnowing and dressing corn; and the question to be determined turned entirely on the models, with the specification and description. The learned counsel, therefore, asked the Court to hear the description of the models in their lordships' private room.

Lord Campbell said he should heartily concur in that suggestion, if no objection was made on the other side.—Rule *nisi* granted.

Our Weekly Gossip.

We took the trouble to go to 55 Piccadilly on Monday last to inspect the wonderful heating apparatus of the Rev. H. J. Newcome, mentioned in our "Gossip" of last week. The whole mystery consists in the employment of a number of thin metal flues or casings, through which the products of combustion have to pass before they escape by the chimneys. That is all!

Mr. Clifford's boat-lowering apparatus did good service last week. A serious collision took place off Lizard, by Her Majesty's steamship Perseverance coming in contact with the British barque Ava, Captain Graham, from Cardiff, for Gibraltar, which almost immediately foundered. The crew of fifteen were saved by the boats of the Perseverance, which were fitted with Mr. Clifford's apparatus, but for which every soul would, in all probability, have perished.

The country papers are, we see, doing justice to the true founder of the London Mechanics' Institute. The *Leeds Intelligencer* says:—"It has been popularly believed that Dr. Birkbeck was the founder of this institution, and we think we have more than once seen it asserted by leaders of mechanics' institutions in Yorkshire that he was. The MECHANICS' MAGAZINE has done honour to whom honour is due."

A French astronomer, the Padre Secche, asserts positively, and without the least suspicion of mistake or illusion, that the third satellite of Jupiter is not of a spherical, but an elliptic figure; that it has marks upon it, and that its rotation is not in the plane of its orbit. We met with this statement first in the *Leeds Intelligencer*.

Dr. J. Forbes Watson, A.M., M.D., Reporter on the Products of India, desires to make known that an attempt made last year to grow "gram"—the great horse food of northern and western India—in this country succeeded in a few cases. He is now anxious to have the experiment repeated this season on a more extended scale. A piece of ground well sheltered from north and east winds will be required, and should any of our country readers feel disposed to give this important pulse a trial he will be happy to send them some. He may be addressed at the India Office, London, E.C.

On Friday evening the Lord Mayor and the Lady Mayoress entertained a distinguished company of learned and scientific guests at the Mansion-house, to meet the President (Mr. Glaisher) and Council of the Blackheath Photographic Society. There were a large number of eminent men present, and a brilliant assemblage of ladies on this interesting occasion. The guests, to the number of 500, commenced assembling shortly after 8 o'clock.

One of the boats of the Royal National Life-boat Institution did good and gallant service at the Goodwin Sands as our article in favour of the Society was passing through the press on Friday last.

M. Niklès has communicated to the Academy of Sciences, Paris, his researches on a new mineral recently found at Plombières, and which he calls *saponite*. Its appearance is a soapy-feeling stone, of a whitish colour sometimes veined with blue, it can be cut and scraped with a knife, and will crumble between the fingers; its cohesion is destroyed in cold water, when it becomes a paste, but does not dissolve. M. Niklès pronounces it to be a hydro-silicate of alumina.

His Royal Highness the General Commanding-in-Chief, attended by Colonel Tyrwhitt, Aide-de-Camp, went down to Woolwich, on Tuesday morning, and witnessed the trial of a new method of lubricating the barrels of the army rifles, proposed by Mr. Whitworth. Mr. Whitworth personally directed the trials with one of his own rifles and one of the Enfield large bore. The target stood at a distance of 500 yards from the firing station, and after firing a number of rounds, the distance was increased to 800 yards. The method was perfectly successful.

Mr. F. A. Abel, the chemist to the War Department, has been engaged at Chatham in making some further experiments for the purpose of demonstrating the manner in which charges of gunpowder may be fired by means of a magnetic agency, discovered by Mr. Abel, which is likely to supersede the voltaic battery at present used for submarine and other explosions.

A couple of sample gun carriages and slides are in course of construction in the Royal Carriage department, Woolwich, on a perfectly new principle, from designs submitted to Colonel Tulloh, the superintendent, by Sir William Armstrong. One of the carriages is intended for a 40-pounder Armstrong siege gun, for land service, and the other to work a 32-pounder ship's gun. The slope of the carriage for the reception of the gun is on an acclivity of 22 degs., which will considerably counteract the heavy recoil usually experienced with so much inconvenience, especially on board ship, where it has sometimes been found expedient to erect an exterior scaffolding for the purpose of loading and cleaning out the gun, so as to afford space for the recoil under the confined dimensions of a ship's decks.

It seems that the great organ placed in the new Leeds Town-hall is the third, as to size, in England, the number of pipes being 6,150, while it is larger, with one exception, than any on the continent. The organ is supplied with wind by hydraulic engines, patented by Mr. D. Joy and Mr. W. Holt, of Leeds. Five of these machines attached to a similar number of bellows, and conveying, by means of twenty-seven reservoirs, wind to the various parts of the instrument, are placed in the basement of the building.

Mr. M. Fryer has been lecturing on colliery machinery at the Bristol School of Mines. Mr. Fryer argued that the progress and success of almost every description of work depended in the present times upon the skilful use of machinery. Machinery advantageously employed at the surface of some of the best conducted and most profitable collieries, is at others entirely neglected. Proper tipping machines, screens, spouts, and self-acting apparatus for re-raising the small coal to a level from which it can be run down spouts into carts and waggons may at any rate partially obviate waste of time and labour. Self-recording weighing machines would be an invaluable addition to the surface machinery; and self-acting inclines and steam-engines for the underground transport of coal are true economy underground. Mr. Fryer does not doubt that in course of time we shall have practical and economical coal-cutting machines; and he considers that the methods which have in most cases been adopted for raising water from the deep workings of mines to the bottoms of the shafts are admissible of very considerable improvements; indeed, in machinery generally there is, he thinks, no standing still. Pounds, shillings, and pence considerations should never, however, be overlooked.

At Liverpool, by order of the Dock Board, certain alterations are to be made in the locks leading to the Leeds and Liverpool canal through the Salisbury and Collingwood docks. Two electric time balls are to be placed in an elevated position along the line of docks, one on the summit of the Victoria tower, and one on the south-west corner of the Albert warehouse; the cost is stated at £250. At the last meeting of the board a letter was read from the manager of the Woodside Ferry stating that in order to facilitate the carriage of loaded carts and carriages across the river at all times of the tide, the commissioners have under consideration the construction of steam-vessels on the American principle. The board resolved—with reference to another observation from the Birkenhead commissioners, that they could not effectually carry out their principle unless the landing stage at Woodside was constructed with this object and one of the landing stages on the Liverpool side altered—that every possible facility should be given. Mr. Hartley has been directed to prepare plans and report upon the best station for a coal dock and graving dock at Birkenhead.

Several journals have announced that a new gun-boat is being constructed at Bordeaux, 225 feet long, and capable of carrying 10 guns. The fact is not so. It is not a gun-boat that is being constructed at Bordeaux, but a model of a boat for landing troops, of which the idea originated with the Emperor, and which is intended to replace the old barges, which were so inconvenient. This new boat is sufficiently capacious to land 2,000 men, and will be armed with 14 swivel guns for the purpose of defending the landing. The Minister of Marine has appointed M. Duperrré, his orderly officer, to the command of the gun-boat lately constructed at Bordeaux, and which is at this moment on the Seine at Paris. We make these statements on the authority of the *Times'* Paris correspondent, who also informs us that the Emperor inspected a new kind of gun-boat at Grenelle on Friday last. He was accompanied by Major Treuil, of the artillery, attached to the Museum of Artillery in Paris. Experiments are to be made with the gun in this boat on the river between Paris and St. Cloud, for which purpose a provisional polygon is to be prepared, and great precautions adopted against accidents.

It has fallen to the lot of almost every person to have had in his possession, at one time or another, a silver or gold coin which was hollow, or cracked on the edge, and it is astonishing to think of the fallacy existing in the public mind as to the cause of this defect. The prevailing belief is, that at the Mint all coins are manufactured in halves, and that through defective workmanship, or wear and tear, some of them in time show symptoms of weakness, and become "cracked." Another supposition is, that gamblers have been unsuccessfully endeavouring to separate heads and tails for the purpose of uniting two heads and two tails, and thus forming cheating coins. This latter operation has indeed been performed, such pieces having fallen, we believe, into the hands of the authorities of the Mint. But neither of these theories as to cracked coins is the correct one. The evil arises in a way which we will briefly attempt to describe. All legitimate coins in this kingdom are made from cast bars of metal. At the Tower Hill establishment there are orthodox sizes for these bars, proportioned to the character of the coins to be produced from them. At a future time these sizes may be given exactly. That for sovereigns is about 26 inches long by about 1½ inches square. The bars are cast in vertical moulds of iron, fitted together in halves for the purpose of releasing the bars of gold. On filling the moulds from the crucibles, it will be comprehended at once by our readers, that in cooling there will be a natural subsidence in the centre of the upper end of the new made bar. Contact with the iron chills the outside of the bar first, and like the mercury in a barometer which is sinking, the gold is depressed in the centre. Such is the case, more or less, with all bars of gold or silver cast for coinage purposes. The lower end will be perfectly square as the bottom of the mould is, but the upper must be as we describe it. In this form the bar—for one will serve us in this explanation—is taken to the rolling mills. Here it is laminated between chilled rollers until reduced to nearly the required thickness for having punched out of it blank sovereigns. It will be observed that the hollow or upper end has been compressed to the riband-like thinness, as well as the square or lower ends, and it now exhibits, if closely examined, a crack on its edge. This, then, is considered a waste end, and a portion of it is cut off by means of a pair of shears, and returned to the melting pot. Sometimes, however, enough is not cut from the cracked riband to remove the entire defect, and it passes thus to the cutting-press room. Here the ribands are perforated from end to end by punches of the size of the sovereign, and if the hollowness has not been entirely removed by the shears, we shall have some few cracked sovereign blanks mingled with those that are perfect. Ringing boys are now employed to test the whole by dashing them—with as much rapidity as an expert drummer boy at the Tower beats "tattoo"—upon discs of polished iron. The sound pieces are musical—the unsound have "no music in their souls," and it is for the boys, by the aid of quick ears and eyes, to detect and put aside the defaulters. Boys are fallible, however, and they allow "dumb" pieces to escape occasionally. These pass on to be stamped on both sides and milled on the edge at a single blow, and the probability is, that the hollowness of their characters will only be discovered after some contact with the world, as in other cases, and then by the *counter* test of some suspicious shopkeeper, who pronounces them genuine though "cracked," and passes them into his till with pleasure.

The *Hampshire Telegraph* gives the following account of an experiment at the Gunboat Slipway at Haslar:—"On Thursday morning last a launch took place from this slipway, for the purpose of ascertaining in what space of time a boat could be taken into the harbour. The boat selected for this trial was the Cheerful, 2 (on board which the plan of fitting the boilers on cast-iron sleepers has recently been carried into effect), which had previously been placed on the incline for the experiment, with her steam up. The Commander-in-Chief, Admiral Bowles, Admiral Sir George Hope Grey, Flag-Captain Farquhar, Captain Gordon, and Commander Gardener arrived on the spot at twenty minutes past ten, and, everything having been previously placed in a state of readiness, the dogshoars were knocked away, and in a minute and a half the boat was fairly clear of the cradle. Her screw was set in motion at 10·30, and in five minutes she had steamed down as far as Haslar-bridge, where, in consequence of the abrupt turnings

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of the channel, the different 'sets' of the tide, the height of water underneath the bridge, and the circumscribed space through which the Cheerful had to pass, the screw-propelling power was abandoned, and warping assistance had to be relied on. The clearing of the bridge amid an almost momentary change of orders, such as 'Hold on, aft,' 'Together by the bow, handsomely,' 'Helm a-port,' 'Steady by the bow,' 'Starboard helm—so,' &c., &c., entailed a waste of exactly twenty-five minutes, the boat finally clearing the bridge at 11 o'clock. Her screw was then again set in motion, and in eight minutes more she had run clear through the intricate channel of the creek. The result was regarded as highly satisfactory, for, deducting the time expended in getting her underneath the bridge, she would have perfected the trial required in about a quarter of an hour. The delay alluded to is one that must always occur whenever a boat either goes up to, or comes down from, the slipway; and until a swing bridge is substituted for that now in use, with the appliances for damming up the water, so as to render the launching operations easy at any time, the principal provision for ensuring the assistance of the boats on Haslar slipway will have been neglected. We consider the difficult task of warping the boat underneath the arch of the bridge to have been most skilfully performed, there being not a foot of space in depth to spare, with a similar contraction at the sides, the tide at nearly a quarter ebb, and a strong breeze from the south. Since our last visit to the sheds several alterations have been made, which are designed to ensure greater privacy in the working of the machinery; a second cradle is also in course of construction, which, when completed, will materially facilitate the launching of boats whenever the services of more than one shall be called into requisition at the same time."

The *Photographic News* says,—"The question whether paper coloured green with arseniate of copper (Scheele's green) used in papering the walls of rooms gives off poisonous emanations is one which recent experiments have decided in the affirmative; and this, too, in quantities which render its use positively dangerous. At the same time the beauty of the colour, and the relief it affords to the eyes, makes the continued use of this coloured paper desirable. A very simple means of preventing these arsenical emanations may be found in the use of varnish; this, and the coating of size which precedes it, effectually isolating it from contact with the atmosphere.

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated March 12, 1859.

636. J. Thornton, of Liverpool. Improvements in machinery for the manufacture of bricks, tiles, and other similar articles.

Dated March 16, 1859.

658. C. Parker, of Dundee, Engineer. Improvements in looms for weaving.

666. E. Anscombe, of Pimlico, Joiner. An apparatus for taking an accurate delineation of any view or object in open air or otherwise.

Dated March 17, 1859.

676. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Treating barley so as to obtain new alimentary substances therefrom. A communication from P. Marmay, of Riom, France.

682. J. Donat, of Paris. Improvements in apparatus used with matches for obtaining instantaneous light.

Dated March 19, 1859.

700. J. W. Hart, of St. Mary-Axe, Gentleman. An apparatus for the destruction of flies and other insects. A communication from F. Barnett, of Paris.

Dated March 22, 1859.

722. W. Weild, of Manchester, Machinist. Improvements in machinery and arrangements for coating slips, sheets, rods, and bars of metal, and laths, rods, and boards of wood, and similar articles formed of other substances, with paints, varnishes, and other like preparations, and drying the same.

727. D. L. Banks, of Kennington, Engineer. Improvements in suspension rail or road ways, and in machinery or apparatus connected therewith.

734. J. Macintosh, of North Bank, Regent's Park, Gentleman, and G. Rhodes, of Regent-st., Major. Improvements in tents and such like coverings for shelter against the weather.

Dated March 29, 1859.

778. T. Carr, of Bebington, Chester, Artificial Manure Maker. Improvements in machinery for disintegrating artificial manures, and various other substances.

779. C. L. Roberts, of Clerkenwell. Improvements in cigars.

781. J. W. Kelly, Civil Engineer, of Ennis, Ireland. Improvements in gas burners.

782. E. de Caranza, of Paris, Engineer. A new system of gas lighting through new apparatuses and matters richer in gas than pitcoal.

783. E. N. Norminton, of Camden Town. The cleansing and re-manufacturing of old used dirty railwaygrease for the manufacturing of new railway grease, for the cleansing and re-manufacturing of old used cotton waste, tow, or any textile fabrics, and for the purifying of oils or any fatty matter.

785. R. Scarle, of Woodford Wells, Gentleman. Improvements in apparatus used for transmitting signals by electricity for telegraphic purposes and in the construction of telegraphic cables.

786. I. Spight, of Glandford Briggs, Lincoln, Iron Founder. Improvements in horse hoes.

787. T. Taylor, of Vere-st., Chemist. Improved means of giving increased strength to paper.

788. H. P. Burt, of Charlotte-row, Mansion House. Improvements in apparatus for preparing and preserving timber.

789. H. Moss, of Somers Town, Boot Maker, and T. West, of Jewin-st., Machinist. A machine for the cutting of leather for every purpose, and cutting cloths, linen, and other fabrics and materials.

Dated March 30, 1859.

791. J. H. Linsey, of Cheapside. Certain improvements in binding or covering books.

793. W. V. Edwards, of Swindon, Wilts, Iron-founder. Improvements in the construction of ways and apparatus to facilitate the conveyance of mails, goods, and passengers.

794. G. T. Bousfield, of Brixton. Improvements in preventing explosions in steam boilers. A communication from F. Marchal.

795. T. D. Shipman, of Toronto, Canada. Improvements in apparatus for stamping and printing. Partly a communication.

796. H. Jefferies, of Birmingham, Button Maker. Improvements in castors for furniture.

797. J. Cartwright, of Shrewsbury, Agricultural Implement Maker. An improved implement for crushing clods and pulverizing the surface soil, also convertible into a press wheel roller.

798. C. P. Coles, of Southsea, Hants, Captain R.N. An apparatus for defending guns and gunners in ships of war, gun boats, and land batteries.

799. W. Gossage, of Widnes, Chemist. Improvements in the manufacture of certain alkaline silicates, and in the production therefrom of liquor silicis or liquid flint.

800. A. V. Newton, of Chancery-lane. An improved governor for marine and other steam engines. A communication.

801. W. Smith, of King-st., Smithfield, and E. Smith, of Hamburgh, Gas Meter Maker. Improvements in means or apparatus for the purpose of regulating the flow or passage of fluids.

Dated March 31, 1859.

802. J. Lacy, Cotton Spinner, and S. Simpson and H. Smith, Managers, all of Walsden, near Todmorden. Certain improvements in machinery for preparing and spinning cotton, and other fibrous materials.

803. C. Pickering, of Tonbridge. Improved apparatus for brewing.

804. R. C. Ross, of Glasgow, Engineer. Improved apparatus for cultivating land.

805. T. Ivory, of Edinburgh, Advocate. Improvements in rotary engines.

807. A. Morton, of Kilmarnock. Improvements in sextants or quadrants for nautical purposes, and which are also adapted to the measuring of altitudes or angular distances.

809. J. S. Bateson, of Mayfair, Barrister-at-Law. Improvements in generating steam and in the apparatus employed therein.

810. F. Morton, of Liverpool, engineer. Improvements in the construction of fences and the posts or pillars for the same, parts of which improvements are also applicable to the construction of gate posts or poles for telegraph purposes or for signal posts.

811. W. E. Newton, of Chancery-lane. Improvements in mills for cleaning rice. A communication.

812. A. V. Newton, of Chancery-lane. Improvements in the construction of steam boiler and other furnaces. A communication.

Dated April 1, 1859.

813. D. K. Clark, of Adam-st., Adelphi, Civil Engineer. Feed water heating apparatus.

815. I. Sigismund, of Hull, Dentist. Certain improvements in the manufacture of artificial teeth, and in the apparatus connected therewith. Partly a communication.

816. R. A. Brooman, of 166 Fleet-st., London, Editor of the Mechanics' Magazine and Patent Agent. Improvements in machinery for solidifying, pressing, and moulding. A communication from F. Dehaynin, of Paris.

817. R. A. Brooman, of 166 Fleet-st., London, Editor of the Mechanics' Magazine and Patent Agent. A new preparation of indigo for dyeing. A communication from Messrs. Depoully Frères, of Paris.

819. W. E. Newton, of Chancery-lane. An improved process of manufacturing sulphate of lead, carbonate of lead, nitrate of potash, and sulphate of soda. A communication.

820. J. J. Davis, of Clerkenwell, Die Sinker. An improved pad, applicable for inking, damping, and other like purposes by hand.

821. W. Tod, of Glasgow, Marine Engineer. Improvements in marine steam engines.

822. Y. Thomas, of Paris. An improved propeller for ships, vessels, boats, and water-wheels.

Dated April 2, 1859.

823. J. Desmet-Séaut, of Mons, Belgium, Mechanician. An improved gas burning and lighting apparatus.

825. J. Hall, of Chelsea, Engineer, and J. S. Sparkes, of St. John's Wood, Gentleman. An improved application of machinery for the purpose of hoisting, lowering, pulling, or drawing weights.

827. S. Desborough, of Noble-st., City, Agent. Improvements in making up needles, steel pens, and other small articles for sale.

829. W. Mather, of Manchester, Druggist. An improved apparatus for catching and destroying flies and other insects.

831. M. Scott, Parliament-st., Westminster. Improvements in diving apparatus.

833. T. Richardson, of Hartlepool, Engineer, and G. W. Jaffrey, of the same place, Engineer. Improvements in the arrangements and construction of harbours of refuge, breakwaters, sea walls, or barriers, and other like structures.

Dated April 4, 1859.

835. F. Potts, Tube Manufacturer, and R. Brough, Engineer, both of Birmingham. Certain improvements in the manufacture of calico printing rollers or cylinders, also in the machinery and apparatus for performing certain parts of the same, and which said apparatus are also applicable, separately or conjointly, to the manufacture of parallel and other metallic tubes, and the rolling of the metal for the same or other purposes.

837. C. F. Kirkman, of Argyl-st., Gentleman. Protecting telegraph wires, and in using them for subterranean and submarine purposes.

839. W. Brown and C. N. May, of Devizes, Engineers. Improvements in hay-making machines.

841. W. E. Newton, of Chancery-lane. An improvement in ladies' hooped skirts. A communication.

843. C. Russell, of Stubbers, near Romford, Esq. An improvement in the working of marine engines.

845. D. B. White, of Newcastle-on-Tyne, M.D. Improvements in arranging ships and other pumps.

847. D. Sowden, of Bradford, Jacquard Machine Maker. Improvements in Jacquard machines employed for weaving figured goods or fabrics.

Dated April 5, 1859.

849. G. Haseltine, of Southampton-buildings. Improvements in sewing machines.

851. L. Brierley and H. Geering, of Birmingham, Manufacturers. A new or improved method of ornamenting metallic bedsteads and other articles of metallic furniture.

853. G. F. Chantrell, of Liverpool, Furnace Engineer, and E. Dutch, of the same place, Commercial Traveller. Improvements in the apparatus for regulating the quantity of water to be used for the flushing of water closets and other purposes.

855. J. Hetherington, of Manchester, Machinist, and T. Webb, and J. Craig, of Tutbury, Cotton Spinners. Improvements in machinery or apparatus for spinning and doubling cotton and other fibrous materials.

857. N. Libotte, of Paris, Mechanician. An improved safety apparatus to be applied to cages in the drawing of coals.

Dated April 6, 1859.

859. T. P. Luff, of Shepton Mallet, Somerset, Estate Agent. Improvements in cheese vats.

861. J. A. H. Ballande, of Paris, Gentleman. An improvement in the preparation of writing-paper, and ink to be used thereon.

863. J. Rogers, of Queen-sq., City, Rope Maker, and E. J. Tweed, of Castle-street, Falcon-sq. Improvements in coating conducting wires used for electric telegraphic purposes.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

860. I. Adams, of Massachusetts. An improved tubular chain cable guide for vessels' bulwarks. A communication from A. S. Phillips, of Boston. Dated 6th April, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, April* 19, 1859.)

2793. D. B. White. Gauges.
2797. J. E. Boyd. Taps, valves, &c.
2800. J. Whitley and T. Kitchenman. Hot pressing.
2803. J. G. E. Larned. Steam fire-engines.
2806. W. Burness. Pumping liquids.
2808. J. Ferrabee and F. H. England. Carding, &c.
2810. G. F. Chantrell. Animal charcoal.
2811. C. de Cappot and A. Jarriant. Hydraulic counter.
2817. C. M. Westmacott. Permanent way.
2818. H. Meidinger. Electric batteries.
2826. J. Stewart. Pianofortes.
2831. B. Lauth. Rods and shafts.
2833. J. Lightfoot. Printing yarns.
2837. C. Hodgson. Peat.
2838. W. Beardmore. Steam boilers.
2840. G. W. B. Kiallmark and W. T. Timewell. Cements.
2842. J. B. Guthrie. Overshoes.
2843. S. Dudgeon. Gas regulator.
2850. J. A. Carruthers and T. Blackburn. Guiding warp threads.
2852. L. C. V. Von. Elastic beds.
2854. J. E. Boyd. Candlesticks, lamps, &c.
2858. J. Ferrabee. Steam engines.
2860. E. Bow. Pumps.
2870. P. C. N. J. Viellard-Migeon. Screws, rivets, &c.
2882. A. and F. J. Stokes. Screws.
2884. J. H. Selwyn. Paying out cables.
2899. J. Aitken and J. Brooks. Looms.
2901. A. Mitchell. Registering the speed of Engines.
2904. E. Weber. Dyeing.
2916. A. S. Beliard. Pumicing felts, &c.
2925. W. Spence. Granaries. A communication.
2927. E. Green. Tables.
2939. J. T. P. Newbon, T. Smith, and J. Brown. Moving weights.
3007. J. H. Johnson. Steel. A communication.
114. F. J. Manceaux and E. N. Viellard. Firearms and cartridges.
317. A. Allan. Locomotive steam engines.
434. W. Horstmann. Telegraph cables.
495. S. R. Samuels. Twist lace machines.
496. S. Russell. Handles.
538. J. Kershaw. Weaving.
582. F. W. Parker. Sewing machines.

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651. B. Rider. Hats, caps, &c.
670. H. Bessemer. Crank axles.
775. A. V. Newton. Furnace. A communication.
777. A. V. Newton. Annealing. A communication.
809. S. S. Bateson. Generating steam.
819. W. E. Newton. Sulphate of lead, carbonate of lead, &c. A communication.
821. W. Tod. Marine steam engines.
839. W. Brown and C. N. May. Haymaking machines.
849. G. Haseltine. Sewing machines.
860. I. Adams. Chain cable guide. A communication.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed April 16, 1859.

2327. J. Smith.
2328. E. Walker.
2329. J. Whitworth.
2331. J. Owen and H. Duckworth.
2332. A. Allan, T. Whimster, and R. Gray.
2405. T. Railton.
2435. C. Perley.
2465. C. Mather.
2513. A. V. Newton.
2529. A. V. Newton.
2685. E. Dixon and J. Fisher.
2695. J. Tangye.
2907. T. S. Woodcock.
267. J. Marino.
459. A. R. de Normandy.

Sealed April 18, 1859.

2339. W. Riddle.
2341. R. D. Clegg.
2344. T. Twells.
2345. J. Wainwright.
2346. S. T. Clarke.
2348. J. and S. Marland.
2351. J. M. Napier.
2361. J. and W. Bagnall.
2362. A. Shaw.
2363. R. Waller.
2366. E. and E. Palmer.
2379. T. and J. Ashworth.
2380. W. Craddock and J. White.
2403. J. Westerby.
2429. G. Davies.
2434. E. Maynard.
2412. R. C. Smith.
2461. J. Oxley.
2481. H. N. Penrice.
2503. J. S. Dawes.
2529. J. and W. Lees.
2532. M. Benson.
2538. T. F. Cocker.
2540. J. G. Martien.
2543. M. N. Mills and N. Sidebotham.
2561. A. Dick.
27. C. B. Blyth.
365. J. Crossley.
374. J. Young.
409. T. Hunt.
413. J. Copcutt.
439. J. Breeden.
440. J. Eason.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

876. R. S. Newall.
879. R. B. Lindsay.
882. P. Robertson.
889. S. C. Lister.
895. H. F. Forbes.
916. J. H. Johnson.
959. A. S. Vimont.
963. C. Nickels and J. Hobson.

LIST OF SPECIFICATIONS, &c.

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NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINES, &c., 1980, 1993, 2008, 2033, 2034.
BOILERS AND THEIR FURNACES, 1977, 2032, 2051.
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1990, 1994, 2010, 2023, 2026, 2044, 2045, 2055.
SHIPS AND BOATS, including their fittings, 2027, 2031, 2039, 2042.
CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 1999.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 1951, 2004, 2007, 2056.
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1986, 2000, 2012, 2014, 2015, 2024, 2028, 2035, 2046, 2047, 2049, 2052, 2054.
BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c., 2021.
LIGHTING, HEATING, AND VENTILATING, 1978, 1983, 1991.
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1979, 2002, 2003, 2006, 2017.
METALS, including apparatus for their manufacture, 1988.
CHEMISTRY AND PHOTOGRAPHY, 2018, 2021, 2036.
ELECTRICAL APPARATUS, 2013.
WARFARE, 1982, 1984, 2009, 2022, 2050.
LETTER PRESS PRINTING &c., 1992, 1996, 2016, 2025.
MISCELLANEOUS, 1985, 1987, 1989, 1995, 1997, 1998, 2001, 2004, 2005, 2011, 2013, 2020, 2029, 2030, 2037, 2338, 2040, 2041, 2043, 2048, 2053, 2057.

1977. J. H. JOHNSON. *Improvements in the prevention of steam-boiler explosions.* (A communication.) Dated August 31, 1858.

A complete specification of this invention was filed with the application, and an abridgement of it was published at page 621, No. 1846, of the MECHANICS' MAGAZINE (Old Series.) *Patent completed.*

1978. A. V. NEWTON. *An improvement in gas burners.* (A communication.) Dated August 31, 1858.

This consists in the application to "fish-tail" gas-burners of a cap or cover of a peculiar construction, whereby, with a small consumption of gas, a large and brilliant flame is produced. *Patent completed.*

1979. W. ROSE. *An improvement or improvements in piling or combining metals to be used in the manufacture of arms and cutlery, and for other similar purposes.* Dated August 31, 1858.

The object here is to produce an ornamental effect on the surface of the metal, which effect shall run through its entire body. The patentee combines together rods of iron and steel, or the action of such rods being of any figure he pleases, that, when united by heating and rolling, the mass or bar presents in its cross-section a chequered appearance. This bar may afterwards be twisted, and, as every turn of each twist will vary the patttern, an endless variety of ornamental lines may be produced upon the surface, and this effect will be still further diversified when the metal is intended to be worked up into twisted gun or pistol-barrels by the very process of twisting or coiling the metal. *Patent completed.*

1980. A. V. NEWTON. *Improvements in air engines.* (A communication.) Dated August 31, 1858.

The inventor connects the working and supply pistons to the crank of a fly-wheel shaft, by a system of levers, rock shafts, and connecting rods, of such a nature that an alternating accelerated and retarded reciprocating movement will be imparted to the two pistons capable of effecting the cooling of the working cylinder, and at the same time to produce motive power. Separate supply and working cylinders are so combined, and the pistons so moved, that the loss of temperature which attends the increase of bulk of the heated air during the outward movement of the working piston shall be made good by a process of reheating the air during its passage from the supply to the working cylinder. *Patent completed.*

1981. P. D. MARGESSON. *Improvements in treating sugar canes, and other canes containing saccharine matter, in the preparation of food for animals, also in manufacturing sugar, and worts, or wash, for brewing, distilling, and vinegar making, and in applying the resulting fibre in the manufacture of paper.* Dated August 31, 1858.

Here the cane is, as soon as ripe, cut into thin slices, and then dried by the sun in the open air. The dried cane is then reduced to a fine powder, and the powder is made into cakes by pressure. *Patent completed.*

1982. W. PURSALL. *Improvements in the manufacture of percussion caps.* Dated September 1, 1858.

The caps having been charged with the detonating composition, the powder is dropped into the same through perforated plates. The powder in each cap is then subjected to such pressure as equally to coat the surface of the detonating composition therewith, thus rendering the coating impervious to moisture, and protecting the detonating composition from injury resulting from exposure to damp. *Patent abandoned.*

1983. W. PHELPS. *Improvements in wet gas meters.* (A communication.) Dated September 1, 1858.

This consists in the use in wet gas-meters of an aqueous solution of deliquescent metallic and earthy salt or salts employed constantly neutral, by the pressure of a base or carbonate of such salt or salts. *Patent abandoned.*

1984. W. HOBBS. *Improvements in ordnance and warlike projectiles to be used therewith.* Dated September 1, 1858.

This consists in making portable guns capable of being used either as ships' guns, siege guns, field pieces, or long range guns, and when required for easy and speedy transit they can be taken apart, and each portion conveyed separately. *Patent completed.*

1985. J. SLOPER. *Improved means of and apparatus for indelibly crossing or marking bankers' cheques, drafts, documents, or other things, with a view of preventing erasures or fraudulent dealings therewith.* Dated Sept. 1, 1858.

This consists in forming any required crossing, word or words, letters or marks, by a series of perforations, punched in and through the cheques, drafts, &c., and so grouped as to represent the required crossing word or words, letters or marks. *Patent completed.*

1986. H. C. JENNINGS. *Improvements in the manufacture of artificial parchment, and converting the same into leather.* Dated September 1, 1858.

The inventor exposes fish to the action of dilute solutions of soda ashes, crystallized soda of commerce, or carbonate of potassa, after which to a solution of hydrochloric acid. The mass is pulped and saturated with a weak solution of bichloride of mercury, after which it is formed into sheets by the ordinary means, and then rolled or pressed to equalize the surface. To convert the parchment into leather he uses solutions of oak bark, terra japonica, or any of the substances employed by tanners. *Patent abandoned.*

1987. W. WARNE. *Improvements in the construction of elastic pavements and linings for walls, and in the manufacture of elastic mats, brushes, and pads for packing furniture.* Dated September 1, 1858.

Here tubes or hollow cells are used, made of india-rubber or india-rubber and its compounds rendered permanently elastic by sulphur, or sulphur compounds, and heat. *Patent completed.*

1988. A. V. NEWTON. *Improvements in the manufacture of alumina.* (A communication.) Dated September 1, 1858.

This relates to the manufacture of alumina from various substances, and by various processes, which, however, are grounded upon the principle involved in the artificial formation of a combination between alumina and soda, or of aluminate of soda, soluble in water mixed with an excess more or less considerable of soda or the carbonate of soda. This aluminate of soda, which results from the various reactions set up, when submitted to the action of a current of carbonic acid gas, is subject to the precipitation of the alumina, the carbonate of soda being left in solution. *Patent completed.*

1989. W. E. NEWTON. *Improvements in the construction of locks for doors, safes, and other purposes.* (A communication.) Dated Sept. 1, 1858.

This relates to that class of permutation locks in which what may be termed the key remains at all times within the lock, and the leading objects of the invention are, 1, to prevent feeling the position of the tumblers, so as to discover the combination by which it was locked; 2, to avoid the use of a keyhole, so that powder cannot be introduced within the lock for bursting it open by explosion; 3, to have the parts so arranged that force cannot be applied to the bolt to force it back until after the lock has been properly operated by the combination used in locking it; 4, to have the parts so arranged that the instrument by which the position of the tumblers is usually determined cannot be brought to act on more than one at a time, so that the proper instrument for operating the bolt cannot act upon it until the proper distribution or arrangement of the tumblers shall have been effected. *Patent completed.*

1990. W. E. NEWTON. *Improvements in springs for carriages and other purposes.* (A communication.) Dated Sept. 1, 1858.

This consists in forming a spring of a pile of steel plates or leaves, each plate of the pile being so bent as to form a series of reversed semi-ellipses. The plates are so piled one upon the other that the convex part of one plate shall be in contact with the convex part of its fellow and next adjacent plate, and *vice versâ*. *Patent completed.*

1991. S. LAING. *Improvements in the apparatus employed in the manufacture of gas.* Dated Sept. 1, 1858.

This consists in forming retorts of a barrel shape, the interior having several ribs around its circumference, the said ribs running through the barrel longitudinally, and set at an angle from each end, by which the materials are caused in their rotation to move or collect towards the centre part of the barrels, whilst the tar is collected from the ends at the centre, and being carried over is caused to fall on the hottest part of the retort. The front end or mouth of the retort is formed with a flange to receive a cover for charging or discharging the retort, and behind the flange, the retort is formed for revolving upon friction-bearing wheels or rollers, and a cast iron throat plate is formed so as to surround the throat of the retort, and prevent the escape of the flame and smoke from the oven furnace, and exclude the in-draught of cold air. *Patent abandoned.*

1992. J. WALKER and J. BARNES. *Improvements in blankets and lappings for machine and block printing and other similar purposes.* Dated Sept. 2, 1858.

The inventors employ a blanket or lapping, having cotton pile pressing surface. These blankets may be constructed by cementing together by india-rubber solution, two or more thicknesses of cotton fabric, the outer or pressing surface of such combined fabric having a pile raised thereon. *Patent completed.*

1993. G. PRICE and W. DAWES. *Improvements in steam engines, steam boilers, and apparatus connected therewith.* Dated Sept. 2, 1858.

This consists, 1, of a boiler for generating steam and consuming the smoke; 2, of a safety apparatus for steam boilers; 3, of a governor or regulator for steam engines; 4, in arrangements of gearing for closing the steam valves of engines working expansively; 5, of a lever for opening the plate or lifting valves of large steam engines. *Patent completed.*

1994. J. BLEAKLEY. *Improvements in apparatus for communicating between the guard and engine driver of railway trains.* Dated Sept. 2, 1858.

This consists in forming communications between the guard and engine driver by electricity or magnetism. *Patent completed.*

1995. J. T. PITMAN. *An improvement or improvements in the construction of pneumatic condensing apparatus for the purpose of compressing air, aeriform or gaseous bodies preparatory to their use as prime motors, or for other purposes.* (A communication.) Dated Sep. 2, 1858.

This invention is not described apart from the drawings. *Patent completed.*

1996. B. WINSTONE. *An improvement in the composition of copying and writing inks.* Dated Sep. 2, 1858.

This consists in the introduction of glycerine as an ingredient, in addition to those usually employed in making ordinary copying and writing ink. *Patent abandoned.*

1997. J. M. BULLANGER. *Caoutchouc socks or clogs with springs and without bridles.* Dated Sep. 3, 1858.

This consists in the use of metallic springs placed between the soles of the goloshes. *Patent completed.*

1998. J. ROBERTSON. *Improvements in driving belts and springs.* Dated Sep. 3. 1858.

This relates to the application of corrugated, undulated,

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or indented plate or sheet metal to the construction of driving belts and springs, and has for its object the obtainment of economy, efficiency, &c. *Patent completed.*

1939. W. HARKES. *An improved plough and pulveriser.* Dated Sep. 3, 1858.

This consists in arranging a series of cutters in a circular frame directly behind the plough-share, and at right angles to it, so that as the soil leaves the plough-share it is delivered on to cutters, which are caused to revolve rapidly by gearing in connection with the wheels of the plough, so that as the plough progresses the knives rotate, and cut or pulverise the earth. The apparatus may also be employed for digging up potatoes, &c., a series of forks being substituted for the knives. *Patent completed.*

2000. E. COCKER. *An improvement or improvements in machinery for spinning, twisting, or doubling cotton, flax, silk, wool, or other fibrous materials.* Dated Sep. 3, 1858.

Here the inventor uses two or more rows of spindles, and to make this disposition of the spindles effectual, he combines it with certain variations in the construction of the spindle boxes, the fallers, the faller wires, the under fallers, and in the mode of banding or conveying the motion to the spindles, a part of these improvements being also applicable to machines with a single row of spindles. *Patent completed.*

2001. G. T. BOUSFIELD. *Improvements in knitting machinery.* (A communication.) Dated September 3, 1858.

This refers to that class of machines by which yarn is knit into fabrics, and the main object is to cause the various devices in the machine which operate directly upon the yarn to narrow and widen the fabric automatically according to a previously-conceived design or pattern. *Patent completed.*

2002. R. A. BROOMAN. *An improved apparatus for supporting the skirts of ladies' dresses.* (A communication.) Dated September 3, 1858.

This consists in fitting around the body a band of varying breadth, being narrowest at the sides. The upper line of this band is straight. The back and front are strengthened with whalebone, and the front is secured by lacings. To the upper edge is attached a frame of springs, similar to the upper part of a hooped skirt; the front ends of its hoops are secured to the sides of the broad part of the band. The framework is circular in form, although the opening when it closes around the waist is not central, but is nearly tangential to the front edge of the general circle. When the apparatus is worn it will afford a support for any number of skirts without involving the necessity of bringing any of them into contact with the waist. *Patent completed.*

2003. A. GUYE. *Improvements in the escapement of chronometers and watches.* Dated September 4, 1858.

Here the detent has ruby-locking pallets formed with angular-shaped sides, so as to form a step movement for releasing consecutively the teeth of the escapement wheel in connection with an arrangement of two hair-springs, by which the unlocking of the wheel is effected, and a dead beat of the seconds obtained. In lever watches the patentee also employs two hair-springs in connection with the ever, for steadying the action. *Patent completed.*

2004. R. P. LAVIE. *Improvements in mills.* Dated September 4, 1858.

This consists, 1, in a particular means employed for regulating and maintaining the running stone upon its pivot. 2, in the arrangement of the rhynd of the stone spindle as a breaker. 3, in the arrangement of certain parts of the rhynd and its cover, which have an upper and lower stone of small size, forming the breaker. 4, in the use of a cylinder for supplying the corn to the breaker. 5, the use of a conical helical sifter, used for separating the "middlings." 6, the use of stones, either small or large, placed one upon the other, horizontally, and directly or indirectly worked. The several parts are not described apart from the drawings. *Patent abandoned.*

2005. R. A. BROOMAN. *Improved apparatuses for receiving, containing, and delivering liquids.* (A communication.) Dated Sept. 4, 1858.

These apparatuses are intended for liquids which, on coming together, effervesce. They consist of two or more vessels combined together, or of one vessel with compartments, each vessel or compartment having an exit passage leading to one point of delivery, so that when the apparatus is inclined, the liquids from each vessel or compartment will mingle in the receiving vessel. In the interior of the vessels or compartments are placed screens, which prevent the exit of deposits, and also aid in regulating the outflow of the liquid. There is a separate opening in each vessel or compartment for the introduction of the liquids, &c., all of which can be closed by one cover or otherwise. There is also a vessel similarly constructed for containing supplies of the solutions used. The apparatuses are adapted for refreshment rooms. *Patent completed.*

2006. W. H. CHILD. *Improvements in hair and skin brushes.* Dated September 4, 1858.

This consists in constructing electrical brushes by the use of steel pins or wires in substitution for, or in combination with, bristles, which pins or wires are placed in metallic connection with a battery contained in the handle or back of the brush. *Patent completed.*

2007. W. P. PIGGOTT and S. BEARDMORE. *Improvements in vinous and fermented liquors.* Dated Sept. 4, 1858.

The patentees claim, 1, the improvement of wines, spirits, &c., by currents of electricity. 2, the use of separate porous cells containing negative and positive metals, excited in the usual manner, and connected together by wires, so as to form currents and counter-currents of electricity through the wine or spirit, &c. 3, the application of electricity to wine in bottle, by placing the negative and positive metals in connection with the cork. 4, the application of electricity to fermented liquors by making the cask, jar, bottle, &c., partly of positive and partly of negative metals or substances, so as to create currents whenever the vessel filled with liquor. *Patent completed.*

2008. D. ANDREW. *Improvements in apparatus for obtaining motive power.* Dated September 4, 1858.

This relates to the obtainment of motive power from steam, water, or air, by the agency of a cylinder and piston movement arranged to work upon the direct rotative principle. *Patent completed.*

2009. A. V. NEWTON. *An improvement in fire-arms.* (A communication.) Dated September 4, 1858.

Here a gun-stock is fitted at its forward end with a metal socket for receiving the stock of a pistol. From each side of the frame of the pistol projects a metal stud for bearing respectively against a shoulder on the edge of the metal socket. The pistol socket is held firmly in the socket by a clamp, which passes through the gun-stock, and catches into a notch formed in the rear end of the strap of the pistol. A milled nut fitted on the upper end of the clamp will cause the clamp to bind tightly against the pistol, and thus hold it firmly in place. By this addition to the pistol, the soldier may use the arm as a carbine, or the pistol may be removed and placed in the holster, the loose butt being allowed to swing from a strap with which the soldier is furnished. *Patent abandoned.*

2010. H. HYDE. *Improvements in the construction of carriage springs.* (A communication.) Dated Sep. 4, 1858.

The leaves of which this spring is composed are of an equal length, and for avoiding friction between the leaves they are separated from each other excepting at their central parts and near their ends. By this device the elastic parts of the spring are allowed to move with ease, and with little friction. The inventor secures any number of leaves in such positions that the leaves so secured can act in conjunction with the other leaves of the spring only at such times as the pressure upon the spring may render it desirable. *Patent completed.*

2011. A. HILLS. *A method or methods for the better securing the integrity or genuineness of bankers' cheques or orders for money.* Dated September 4, 1858.

The inventor makes a hole in the body of the cheque, &c., and crosses the cheque in the usual way, drawing the crossing lines above and below the said hole. In the event of crossing lines being removed from the cheque, the hole will denote that the cheque has been crossed and may only be paid through a bank. To prevent the original amount of the cheque being altered, he writes it in divided syllables, one syllable under the other transversely to the signature, so that the drawer of the cheque writes his name over and upon the words specifying the amount. There are other similar details. *Patent abandoned.*

2012. T. WARBURTON. *Improvements in machinery for preparing cotton and other fibrous materials, and for doubling yarn.* Dated September 6, 1858.

This relates to slubbing and roving frames, and to doubling frames, and consists in dispensing with the spindles used in the ordinary machines, and substituting in their stead hollow tubes, upon which the bobbins are placed. The position of the lifting rail and stationary rail is reversed, the lifting rail being underneath the stationary rail, the tube before-mentioned moving in the two rails with sufficient length above the stationary rail for the bobbin to traverse. This tube is driven by bevel-wheels. The invention also consists in lengthening the flyer-legs and attaching them to bushes which are driven by bevel-wheels in the ordinary way in the stationary rail. The flyer-legs are made of sufficient length to allow of the traverse of the bobbin. The tops of the flyers are lengthened so as to revolve in another stationary rail, which is fixed to the frame ends. By these means the flyers are held steady without the aid of the spindles, which are dispensed with, and thus a higher working speed in attainable. *Patent abandoned.*

2013. S. HOGA, W. P. PIGGOTT, and S. BEARDMORE. *Improvements in submarine electric telegraphs.* Dated September 6, 1858.

This invention was described at page 256 of our last Number. *Patent abandoned.*

2014. J. FIELDEN. *An improvement or improvements in the construction or building of cops, whether of cotton, flax, silk, wool, or other fibrous materials, and also for certain utensils thereunto conducing or belonging.* Dated Sep. 6, 1858.

Here when a fresh set of cops is to be commenced after several layers of the yarn, &c., have been wound on the bare spindles in the ordinary way, the inventor applies to the yarn on the spindles a small quantity of an adhesive substance sufficient to cement the yarn together, so as to form tubes. On these tubes the cop bobbins are built, after which the formation of the cops is continued in the usual manner. The adhesive substances used are various. *Patent completed.*

2015. J. RAMSBOTTON and T. WATSON. *Improvements in machinery or apparatus for weaving.* Dated Sep. 6, 1858.

This consists, 1, of a method of stopping a loom when an obstruction occurs in the shed by any of the warp threads breaking, to prevent the formation of "floats." The inventors fix a spring on a hollowed part of the nose or taper part of the shuttle, where it is liable to be affected by entering or leaving the shed. They attach a pin or projection to the said spring, which passes through an orifice in the nose of the shuttle, to actuate a lever in a recess, one end of which lever is caused by the depression of the spring to interfere with and break the weft thread when leaving the cop, thus causing the stoppage of the loom by any of the well-known weft motions. 2, in the use of springs or weights in connection with an L-shaped lever, the springs or weights being attached to the rising frog motion. In the use of another spring to the slay upon which the rising frog operates. In affixing the said frog in a moveable frame which recedes with the concussion, thereby giving motion to a double brake which operates upon the two opposite parts of the fly-wheel of the loom. *Patent abandoned.*

2016. R. A. BROOMAN. *Improvements in printing or marking words or figures on papers, parcels, books, pages, tickets, and other articles requiring to be marked, printed, stamped, or addressed.* (A communication.) Dated Sept. 6, 1858.

The words or figures to be printed on successive articles are arranged in type in columns, so as to run down one column and up the next. The form thus arranged is inked, and a longitudinal and lateral motion imparted to it, by machinery which causes each column to traverse at intervals, so that each name, address, figure, &c., to be marked at one time shall come successively under an aperture in the frisket. The article to be marked is placed in a fly, which nips it, and holds it over the aperture until it is pressed down by a lever, so as to receive an impression, after which the lever releases it, and the fly removes it to some receptacle. *Patent completed.*

2017. H. J. DISTIN. *Improvements in cornets and other musical wind instruments.* Dated Sep. 6, 1858.

Here the patentee so constructs cornets and other instruments of that class of brass or other suitable metal, that he has the contour or outer line thereof circular, or nearly circular, and he has the bell or pavilion and also the keys, rotary cylinders or pistons, and cylinders within or nearly within the circumference or outer line of the instruments. *Patent completed.*

2018. J. SHANKS. *Improvements in the manufacture of chlorine.* Dated Sep. 7, 1858.

This consists in the use of chromate of lime as a medium for the production of chlorine from hydrochloric acid. *Patent completed.*

2019. W. S. CHAMPNESS. *Improvements in syringes for male and female use.* Dated Sept. 7, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

2020. J. FYFE. *Improvements in stop-cocks or valves.* Dated Sept. 7, 1858.

This invention relates to a valvular arrangement, consisting of a tube or through-way piece, cast or formed with an internal transverse diaphragm or division piece, so as to separate the tubular shell into two distinct portions. *Patent completed.*

2021. E. FULLWOOD. *Improvements in the manufacture of cements.* Dated Sep. 7, 1858.

This consists in mixing sulphate of iron with lime, where the lime is converted into cement preventing it from bursting after use, and rendering it hard. *Patent abandoned.*

2022. G. G. BUSSEY. *Holding and carrying cartridges.* Dated Sep. 7, 1858.

This consists of a spring clip by which the cartridge is in part encircled and grasped so as to be quite securely carried, and when required for use can be either drawn out perpendicularly, or pulled out at the side with the greatest ease and dispatch. *Patent abandoned.*

2023. W. TUCKER. *An improved variable boring bit.* Dated Sep. 7, 1858.

This invention is not described apart from the drawings. *Patent completed.*

2024. F. W. BRIND. *Improvements in sewing machines.* (A communication.) Dated Sep. 7, 1858.

This relates to various improvements in the working parts of that class of sewing machines wherein the stitch is produced by the conjoint action of a needle and a vibrating shuttle. We cannot afford space for a detailed description of the invention. *Patent completed.*

2025. G. LARSONNIER and A. BLANCHE. *Improvements in block printing by hand on tissues, paper, or other suitable fabrics.* Dated September 7, 1858.

The object here is to offer to the printer a ready means for the application of the printing-block on the required spots of the surface of tissue paper, &c., thereby allowing of operating with great speed and accuracy. By this method each block is always obliged to apply itself exactly in the required position on the fabric. *Patent completed.*

2026. L. PELLISSIER and J. PUYTORAC. *Improvements in railway breaks.* Dated September 7, 1858.

This consists in causing suitably curved break-blocks or shoes to be pressed against the wheels. Each wheel of the carriage has two such shoes acting in opposite directions to each other in the periphery of the wheel; the corresponding shoes of each two opposite wheels are connected by a cross bar suspended from the frame of the carriage; each of the cross bars has a crank-arm, which arms are connected by rods, one rod acting with one of its ends on one of the said arms commanding the shoes of one pair of wheels, whereas the opposite end of this rod acts on one end of a balance-lever, the other end of which lever is connected by the other rod to the crank actuating the shoes of the other pair of wheels. The said rods and balance-lever receive motion by a rack, in the teeth of which acts a pinion fixed to the spindle of a wheel in gear with an endless screw, which latter may be turned in the required direction by a winch handle within reach of the guard of the carriage, thus enabling the breaks to be operated. *Patent completed.*

2027. B. HOCKIN. *Apparatus for repairing and fitting dock-gates and their machinery.* Dated September 8, 1858.

This consists in constructing in plate T and L-iron a caisson of a three-sided box-like shape, the open side being made to fit against the face of the gate, and a water-tight joint being effected by vulcanised india-rubber strips, or strips of other suitable material, close contact being secured by straps and bolts and nuts, &c. *Patent completed*

2028. J. R. ROSTRON. *An improved press for packing or pressing wool and other materials.* Dated Sep. 8, 1858.

Here the uprights supporting the top plate have at intervals two complete sets of doors, two pairs at each side of the press, one above another, which when closed form an upper and lower chamber or shaft, the lower set of doors having laths or bars which retain the over-lapping edges of the bag which is to contain the wool, &c., when the doors are closed, and hold the bag firmly in the lower chamber for the reception of the wool, &c. Upon the top plate are mounted two bevel-wheels in a moveable or sliding bearing, and supporting a spur-pinion, gearing at will either into another pinion, or into an internally-toothed disc, both of which have the screw for their centre, so that as the sliding pinion is brought into gear with the greater or lesser surface, the quicker or slower the screw becomes driven. The wool, &c., is filled into the upper chamber until the bag and chamber are full. The canvas to form the cover of the bag is secured upon the pressing plate keyed on to the screw, and the screw being put in motion compresses the wool into the bag, which is then sewn up to

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the pinion; being moved to the large wheel on the disc, the screw and plate are raised rapidly, and by opening the doors the finished bale may be removed. *Patent abandoned.*

2029. J. O. BUTLER. *Improvements in weighing cranes.* (A communication.) Dated September 8, 1858.

This crane consists of a vertical pillar supported below in a footstep, and guided above in a circular rim with internal cogs, in which a pinion gears for causing the jib to swivel. To the upper part of the vertical pillar is fixed a circular platform, upon which are fixed standards, between which the frames for supporting the jib, chain, drum, and gearing are suspended. These frames have above and below bridles with pivots, which bear upon centres connected to the standards, and the whole internal framing with the jib, chain, drum, and gearing are suspended to a weigh beam or steel-yard. When this weighing apparatus is not in use, by a locking movement acted upon by a lever, the centres are relieved of their weight, and the whole internal framing rests firmly upon heel pieces cast upon the platform. *Patent abandoned.*

2030. J. F. DICKSON. *Improvements in the construction of taps, cocks, valves, hydrants, and other apparatus for regulating the flow of water and other fluids.* Dated September 8, 1858.

This consists, 1, of a tap or cock connected in the ordinary mode to the supply-pipe, wherein is fixed a clack valve with or without a hinge on its upper or under surface, opening against the pressure by a slide or plunger acting on the cam or the external face of the valve, which valve is lined with india-rubber, &c. 2, of a tap or cock having an enlarged chamber on one side to permit the working of a valve attached to an upright plug of mineralised india-rubber, such valve being lifted from its seat by a metal plug in two parts inclosed in the before-mentioned india-rubber, its action being to twist and at the same time stretch the india-rubber plug, which valve may be used either for high or low pressure purposes, as it will always be self-closing. *Patent abandoned.*

2031. A. LAMB and J. WHITE. *Improvements in life-boats.* Dated September 8, 1858.

This invention is described and illustrated at another page of this number. *Patent completed.*

2032. W. PARSONS. *Improvements in apparatus to be applied to steam-boilers in order to keep the surfaces of the tubular flues free from incrustation.* Dated Sep. 8, 1858.

Here, where a boiler has numerous parallel tubular flues, plates are employed, having as many passages through them as there are tubular flues, and the holes through the plates are made only slightly of larger diameter than the outside diameter of the tubular flues, so that by moving the plates slowly to and fro within the steam boiler all sediments or incrustation is prevented setting or forming on the surfaces of the fine. *Patent completed.*

2033. C. BARTHOLOMEW and J. BELL. *Improvements in pistons and safety-valve levers of steam and other engines.* Dated September 8, 1858.

This consists of a mode of making the piston, and of arranging the metallic packing and springs. The novelty consists in the packing pieces being in two circles in the depth, one above the other, each circle divided into three, four, or more segment pieces. The improvement of the safety-valve lever consists of applying the principle of the steelyard centre to the lever joint at the short or thick end of the lever, to avoid friction, and allow freedom of action. *Patent abandoned.*

2034. W. PARSONS. *Improvements in safety valves of steam boilers.* Dated September 8, 1858.

The valve here employed is of a spherical form on its under side, where it rests on a corresponding hollow seat. Through the valve a tube is fixed, which descends into the boiler, and at its lower end a hollow float is placed, which slides up and down a short distance upon the tube, that it may act on a rod within the tube, and by it on a whistle at the upper part or end of the tube; when the water sinks below the proper level in the boiler, provision is made for the rod moving down a certain distance by the descent of the float before it acts on the valve. The tube of the valve is weighted according to the pressure desired. Over the valve is fixed a hood, up into which the steam rises when the valve begins to open, and by acting on the interior tends to lift the valve. The hollow standard on which the seat of the safety valve is formed admits of the tube to which the valve is fixed moving or swinging therein, so that as the ebullition of the water acts on the float, and causes it to move, the safety valve is also caused constantly to move in its seat, by which it is prevented sticking. *Patent completed.*

2035. J. U. FAESSLER-PETZI. *An improved process for the boiling off of tussah silks or wild silks.* Dated September 8, 1858.

This consists, 1, in submitting the silks to three baths composed of soda, or potash, or caustic potash, or a mixture of the three dissolved in water. 2, In submitting the silks subsequently to a fourth bath composed of a solution of potash and chloride of lime. The silks must next be well washed in cold water, and then submitted to a fifth bath composed of hydrochloric or muriatic acid diluted with water. The silks may afterwards be submitted to aqua-fortis or nitric acid diluted with water. The silks must now be washed and then passed between drawing rollers. *Patent completed.*

2036. R. A. BROOMAN. *An improvement in the preparation of sulphate of quinine.* (A communication.) Dated September 8, 1858.

This consists in treating quinine by liquid hydro-carbons. *Patent abandoned.*

2037. A. MC. E. PETRES. *Improvements in apparatus for regulating the flow or passage of fluids.* Dated September 8, 1858.

This relates particularly to water-closets and urinals where a predetermined supply of water is to be periodically let in. Under one modification the apparatus as applied to water-closets, takes the form of a duplex valvular chamber or shell in three sections. The water from the main enters from beneath, and flows into the lowest section of the valvular chamber, between which section and the section above is a valve seat governed by an elastic disc or other valve, set on a vertical valve spindle, which extends upwards through the centre of the chamber, and projects out through a stuffing box at the top. This lower valve opens by a descending action of its spindle. The section above or the intermediate section of the valvular chamber, has also a valve-seat between it and the upper or top chamber. This valve opens by an ascending movement of its spindle. The central or intermediate section of the chamber has a latteral passage communicating with an air vessel, or with an elevated pipe or reservoir, whilst the upper section similarly communicates with the pan or basin of the water-closet. The duplex valve-spindle has jointed or attached to its upper end a short lever oscillating upon a stud-centre carried by a fixed arm fast to the valve-shell, whilst the other end or arm of the lever is jointed or connected to the back part of the water-closet seat. This seat is hinged upon a pair of stud centres so as to be capable of rising and falling by the action of the pressure and the removal of the pressure when in use. *Patent completed.*

2038. J. G. NEWBERRY. *An improved machine for tapping nuts, bolts, and screws, and other similar purposes.* Dated September 9, 1858.

The specification of this invention, which involves much minute detail, is too long to permit of our giving an intelligible abstract of it in our pages. *Patent completed.*

2039. J. LUIS. *An improved life-preserver raft or buoyant mattress.* (A communication.) Dated September 9, 1858.

This relates to mattresses stuffed with cork shavings, and consists in providing a ship's mattress with straps and buckles on their upper and under surfaces, and with loops round their edges in a peculiar manner. By this means a series of mattresses can be buckled together, and a life-preserving raft formed, by placing several layers or tiers of the mattresses buckled together on the top of one another in a manner to form angular break joints. *Patent abandoned.*

2040. W. PRISLEY. *Advertising by day or night.* Dated September 9, 1858.

The patentee first removes the top or upper part of any of the lamps, &c., now in use for lighting streets, &c., and affixes to the lamp, in the place of its ordinary top, an addition or elongation, which is not described apart from the drawings. *Patent completed.*

2041. J. ROWLEY. *A new compound material applicable as a substitute for leather and leather-cloth, in the manufacture of various useful and ornamental articles.* Dated September 9, 1858.

This consists in coating any felted, woven, or textile fabric, with a peculiar kind of paint, forming the subject of letters patent, No. 109, dated 20th June, 1858. *Patent completed.*

2042. W. TAYLOR and P. A. BAVON. *An improved apparatus for propelling ships or other navigable vessels through water.* Dated September 9, 1858.

This consists of an angular framework suspended on a shaft or shafts along the side or stern of the vessel. Connected to the framework are two or more boards or flaps, suspended by a hinge at the centre of the angular frame, to allow the boards or flaps to open and close by the reciprocating motion transmitted through a beam and rods, by which action the vessel is propelled, either ahead or astern. *Patent abandoned.*

2043. C. N. KOTTULA. *Improvements in the manufacture of grease for lubricating purposes.* Dated September 9, 1858.

This consists in the manufacture of grease from saponified resin and fatty or oily matter. *Patent completed.*

2044. J. TATLOW and H. HODGKINSON. *Improvements in railway breaks.* Dated Sep. 9, 1858.

Here the brake proper consists of two parts, one of which is a brake block attached to a jointed arm, and extends down nearly to the rail; and the other is a brake band that may be divided at one, two, or more places, and attached to a metallic band correspondingly jointed. The arm which carries the brake block at one end is jointed at the other end to the carriage frame, and the brake band is connected to it near the brake block. The other end of the brake band is connected to one arm of a bell-crank lever for imparting to it such a motion that when the said end is pulled upon both the brake block and the brake band may be thereby drawn tightly against the wheel. *Patent completed.*

2045. T. TIMMS. *Improvements in bits.* Dated Sep. 9, 1858.

Here a bit is made with cheeks or side bars, so that a rein may be attached near to or at the ends of the bit, and the horse is then driven as if with a snaffle; but in the event of more power being required over the horse, the act of pulling on the rein causes the ends of the rein to slide down the cheeks or slide bars further and further from the bit, and thus greater leverage is obtained; this is accomplished by having two sliding pieces on the cheeks or side bars of the bit, to which the two ends of the rein are attached. These sliding pieces are constantly acted on by springs of vulcanised india-rubber, so as to keep them near the bit; but as the rein is more and more pulled on, the side bars or cheeks assume an inclined position, and the springs yield to allow the sliding pieces to move along the bars away from the ends of the bit, and thus is the leverage increased; but so soon as the horse yields, the springs draw back the sliding pieces towards the bit. *Patent completed.*

2046. J. WRIGHT, sen., and J. jun. *Improvements in machinery and apparatus used for preparing fabrics or materials to receive eyelet holes or fastenings, and fixing eyelet holes, and in fastenings for stays and other articles.* Dated Sep. 9, 1858.

This invention cannot be satisfactorily described apart from the drawings. *Patent completed.*

2047. W. NIMMO. *Improvements in weaving checks in power looms.* Dated Sep. 9, 1858.

The peculiarity of this invention consists in arranging a power loom so that from time to time it shall cause a greater number of picks of the weft to be thrown into a given length of fabric than at other times. *Patent abandoned.*

2048. A. BAADER, jun. *Improvements in the preparation of lubricating compounds.* Dated Sep. 9, 1858.

This consists in combining quicksilver and asbestos with the following fatty and oily matters:—Tallow, rape, oil, sheep's fat, linseed oil, and hog's lard. *Patent abandoned.*

2049. W. CLARK. *Improvements in materials for dyeing and printing.* (A communication.) Dated September 9, 1858.

This applies particularly to the manufacture of the tartrates, citrates, oxalates, and chromates of baryta, and the ferro-cyanide of barium, by liberating their acid by the addition of a quantity of hydrochloric or sulphuric acids sufficient to saturate the baryta. *Patent abandoned.*

2050. J. L. CHESTER. *Improvements in self-priming apparatus for fire-arms, and in the preparation of percussion primers to be used therewith.* (Partly a communication.) Dated September 10, 1858.

These primers are composed of the usual ingredients, but made into thin flat discs, and arranged one upon another in a tube, or other similar device, and are then or subsequently moistened with gum, shellac, caoutchouc, or other adhesive matter having waterproof qualities, so that they will adhere together in the form of rolls when removed from the tube, and the rolls be coated with a coating thereof. *Patent completed.*

2051. J. PARKER. *Improvements in steam boilers.* Dated September 10, 1858.

This consists in the use of a supplementary boiler supported within the flue or flues of a Cornish or other boiler having suitable flues, and connected to the main boiler through one or more passages. The feed water may pass through this supplementary boiler, or the supplementary boiler may form part of the main boiler, and it may be made with an internal flue. *Patent abandoned.*

2052. J. KNOWLES. *Certain improvements in machinery for preparing cotton and other fibrous materials.* Dated September 10, 1858.

This consists of a stopping motion applicable to all the machines used in preparing cotton and other fibrous materials, and that are fed or supplied with slivers or rovings by means whereof such machines may be instantly stopped, when one of the slivers or rovings breaks or otherwise ceases to be supplied. The patentee claims the application of differential wheels to the stop motions of machines used in preparing cotton and other fibrous materials. *Patent completed.*

2053. J. P. KŒNIG. *Improvements in a surgical instrument called a pneumatic catheter.* Dated September 10, 1858.

This instrument is designed to supersede fropes, bougies, &c., employed in the treatment of the genito-urinary parts, fistula, lachrymalis, and also external and internal affections of the ear. The instrument is not described apart from the drawings. *Patent completed.*

2054. J. H. JOHNSON. *Improvements in Jacquard machines.* (A communication.) Dated September 10 1858.

This relates, 1, to a peculiar construction and arrangement of the card-actuating cylinders employed in Jacquard machines. 2. To a mode of changing the position of the cards on the cylinder. 3. To a mode of allowing for the longitudinal expansion of the cards. 4. To a system of adjusting the ends of the needles to the expansion or contraction of the cards. *Patent abandoned.*

2055. F. W. J. JOHNSON. *Improved means of communicating between the passengers, guard, and engine-driver of railway trains.* Dated September 10, 1858.

This consists in providing tubes of india-rubber &c., for communicating with the guard. *Patentabandoned.*

2056. F. A. E. GUIRONNET DE MASSAS. *An improved machine for decorticating and cleaning grain and seeds.* Dated September 10, 1858.

Here a drum of wood is fixed on an axis free to revolve and inclined to a certain extent, the drum is covered with punched iron similar to that used in cleaning operations in mills, and the drum extends over a portion of the length of the axis, and immediately beyond it on the same axis is fitted an arrangement of brushes forming a screw. On the punched iron-covered drum are fixed blades or arms, so arranged as to form an interrupted screw for conducting the grain. These arrangements are enclosed in a fixed casing formed of punched iron at the upper part opposite the drum, and of wire-cloth at the lower part, or opposite the brushes. The punched-iron part of this casing may be enclosed in an outer casing. On rotary motion being communicated to the apparatus, the grain fed-in is conducted from the upper to the lower end, by the inclination of the axis, the interrupted screw on the drum, and the screw-form of the brushes, all choking or reciprocal pressing of the grains among themselves being thereby prevented, while the action of the punch-iron and brushes effects the decortication and cleaning; the punched iron tearing the outer, skin the interrupted screw guiding the grain or seeds to the brushes, and the brushes conducting them to the outlet decortication and cleaning being thus performed on them during the whole of their progress along the apparatus. *Patent completed.*

2057. W. E. NEWTON. *An improvement in water-wheels.* (A communication.) Dated September 10, 1858.

This relates to an improvement in that class of water-wheels in which the water is made to act upon the wheels by atmospheric pressure or suction, produced by a vacuum formed in a draught tube below the wheel. The invention consists in a peculiar construction of the wheel and gates in connection with the draught tube, which construction is not described apart from the drawings. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, APRIL 29, 1859.

THE ADMIRALTY COMMITTEES.

The Admiralty Committees appointed to investigate the various branches of our naval affairs during the last year and the present are among the most interesting curiosities of the period. Ostensibly appointed in the interest of the public, and really eliciting from necessity much useful information, their composition has, notwithstanding, been of so singularly absurd a character that their recommendations are for the most part worthless to the country. That they will to a certain extent serve, and have already served, some of the purposes of the ingenious politicians and scheming administrators who appointed them cannot be doubted; but that they will do much more than this no well-informed person can believe.

The first of these precious committees consisted, it will be remembered, of a late Secretary to the Treasury, the present Secretary to the Admiralty, the Accountant-General of the Navy, and a Treasury Clerk, and as an example of the modesty with which these gentlemen performed their duties, it is only necessary to say that their chief practical recommendation was that our dockyards should for the next year be exclusively employed upon the conversion of sailing ships into steamers. Now what in the name of reason do these clerks and secretaries know of matters of this kind? Are they aware that when a sailing ship is converted into a steamer the vessel thus produced, although cheap for the moment, is liable to early decay from the old timber left in her; is of an intrinsically bad form for all the purposes of a steamship; and cannot be made either so capacious, so fast, so handy, or in any single respect so useful as a vessel designed expressly as a steamship? Do they know that by confining our efforts to the conversion of sailing ships only we should be absolutely depriving ourselves of every chance of competing with the new ships building by France, America, and other powers? Have they any adequate means whatever of forming a sound opinion upon so purely professional a subject as this? Certainly not.

The next Committee appointed consisted of Admiral Ramsay, Mr. James Nasmyth, and Mr. Ward, and their business has been to examine the steam machinery of the navy. What are their qualifications for the task? Admiral Ramsay, being an admiral, cannot be expected to speak with much authority upon such a subject; Mr. Nasmyth is almost the only eminent English engineer whose professional depth and soundness are called in question, because he is the only one who puts forward impracticable schemes, and the only one who devotes much of his time to the study of the moon; and Mr. Ward, of Keyham, is remembered in the navy only as the producer of certain strange, not to say alarming, specimens of boiler incrustation! We are not surprised therefore to find that their report is a very curious one, as it most certainly is. We are not astonished to see such a committee as this at point blank issue with the only thoroughly qualified member of the Administration at Whitehall — the Surveyor of the Navy. We do not wonder at finding such a committee accused by that officer of making foolish imputations "without a shadow of evidence," to use his own language —of omitting altogether to apply to the Surveyor himself for information — of selecting witnesses who could speak with no kind of authority, and neglecting others whose evidence would have been valuable—and of other like things, which we shall mention on a future occasion.

The third Admiralty Committee, which has yet to report, consists of Admiral Smart, Mr. Laws, the Storekeeper of Chatham Dockyard, Mr. Chatfield, the Master Shipwright of Deptford Dockyard, Mr. Murray, the Chief Engineer of Portsmouth Dockyard, and one of Mr. Lindsay's foremen, we believe. Dockyard economy is the subject into which these gentlemen have to inquire, and upon which they have to write. Now we have but little to say against these gentlemen individually, except to state that one or two of them is believed to be devoted too ardently to personal crotchets. But who can for a moment believe that such a committee are competent to pronounce any conclusive judgment upon affairs involving an expenditure of many millions annually? That they would be so, even if unanimous, we strongly deny, for their number is far too small. But, judging from our knowledge of most of these gentlemen themselves, and from rumours that have been floating for many weeks past through the dockyards, we believe they are by no means of one mind.

It is of the first importance, therefore, that the action which the Admiralty may venture to take upon the recommendations of these committees be closely and intelligently scanned. The constitution of the committees shows clearly enough that their design is not improvement but interference. If we had forgotten the Derby Admiralty of 1852, late events would have guarded us against the manœuvres, not to say the machinations, of the party who now rule at Whitehall, and would have given us ground for keeping anxious eyes upon their proceedings. But we have not forgotten the past, nor do we fail to recognise the animosities of a former period working secretly but surely in the present. It is becoming daily more and more evident that mischief is meant by the present heads of the Admiralty and their colleagues; but our hope is that their devices will be frustrated, and that the officers to whose hands the efficient extension of the navy are intrusted will be speedily freed from the embarrassments with which the last year has been so rife. If they be not, the country will rue—perhaps bitterly—the day when its affairs were committed to the management of the present Government. This is no time for trifling with our naval establishments merely to gratify political or personal jealousies and hatreds; and if Sir John Pakington and his colleagues cannot be patriotic enough to sink all considerations of partizanship under existing circumstances, we must do our best to keep the public sense alive to the evils with which we are threatened.

THE PRACTICABILITY OF INTRODUCING A DECIMAL COINAGE IN ENGLAND.

We have taken some pains to ascertain the number of silver and copper coins of the various denominations in circulation throughout Great Britain at present, with a view to demonstrate the mechanical possibility of substituting for them a new coinage of silver and bronze on a decimal plan. The social difficulties to be encountered in effecting so great and salutary a change we leave to the Decimal Coinage Commission, and to Lord Overstone, who does not seem disposed to make the least of them. The annual returns of the coinage laid before Parliament, prove that there are, or ought to be, in existence, as regards silver coins, of—

Crowns	2,250,000
Half-Crowns	37,500,000
Florins	10,000,000
Shillings	113,000,000
Sixpences	80,000,000
Fourpences	20,000,000
Threepences	8,000,000
Total	270,750,000

and as regards the inferior copper coins, of—

Twopenny pieces (obsolete) ...	722,200
Pence	115,000,000
Halfpence	270,000,000
Farthings	100,000,000
Half-Farthings	70,000
Total	485,792,200

The aggregate number of silver and copper coins therefore which, setting aside hoardings, losses, &c., may be considered to be now in circulation, amounts in round numbers to 756,542,200—a goodly number truly, and one which, if divided equally among the thirty millions of inhabitants of the British islands, would fill the pockets—for a little while—of everybody. The Mint is capable of producing, and has been producing lately, if report speaks truly, a million of pieces per week; and doubtless it might easily be made yet more productive by the addition of further mechanical appliances. Well, fifty-two millions of old coins annually withdrawn from circulation, and replaced by fifty-two millions of new, would extend the operation of exchanging the coinage completely over about fifteen years. It has taken fifty years, however, to raise the number of coins to those shown in our table, and this would demonstrate an improvement in the present system of coining over the past nearly in the ratio of three to one—as regards rate of productiveness.

But the Mint might, if more speed still were necessary, be supplemented in its exertions by contractors, who would pour large streams of bronze coin into the great channel of circulation, whilst the Royal establishment might replenish it with gold and silver only. There is indeed no question but that the existing coinage—worn, torn, and heterogeneous—might, within the space of half-a-dozen years, be entirely supplanted by a handsome and uniform coinage on the decimal plan, which would be at once a credit to the scientific, the artistic, and the mechanical character of England, and a convenience to the tradesman and merchant. When the election and its turmoil is over perhaps Parliament may look to this important subject.

EXPLOSIONS AT GUNPOWDER WORKS.

This subject is one which, setting aside the vital considerations it involves, reflects the greatest disgrace upon our boasted progress in chemical science. What is there, it is emphatically asked, in the whole range of discovery besides the gunpowder manufacture that has stood still throughout the world, and has not been improved by the deep-searching minds of modern men? Manufacturers appear to consider that unsusceptible of improvement; but the men of the laboratory are at direct issue with them, or why is it that a week scarcely elapses without some "pestering suggestion" of the practical chemist disturbing those made rich by its production? The gunpowder manufacture—one of the closest and most profitable of monopolies—supported and highly paid by the Ordnance, affects the airs and exclusiveness of its chiefs, and superciliously rejects every

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suggestion which would involve the smallest disturbance of its antiquated routine. We have it on record that the Ordnance Committee of 1855 condemned every invention submitted to it. "One thousand and five persons, amongst "whom were some of the most scientific men in "England, made suggestions, upwards of 6,000 "in all. All were rejected." The gunpowder manufacturers out-Ordnance the Ordnance. They not only week by week, but year by year, perseveringly and systematically thrust aside all proffered aid. Frequent explosions have closed their ears to every appeal that has for its object the discontinuance of these fearful calamities. In such a case what is to be done? Are the lives of men, the weal of families, and the prosperity of large districts to be left to the mercy of those who are *in* the present century but not *of* it? Can Government do nothing for us? Would a few hundreds spent upon a commission to inquire into these calamities, and to hear the suggestions of those who have devoted days and nights to the practical solution of their causes, bring any relief? If so, the sooner the better; for Hounslow Heath, once the rendevouz of Turpin, of Abbershaw, and their "pals," is now a populous neighbourhood; the gorse has been succeeded by the garden, and houses are closing in the precincts, and will ere long peep over the palings of the grounds devoted to gunpowder and to death.

The causes assigned for the non-removal of gunpowder works to such safe, because desolate, places as Salisbury Plain, or to floating and disconnected factories in the centre of large lakes, are thought by some to have reason in them —"Distance of transport increases the danger "of explosions," for example. But if this be true, how is it that we never hear of explosions of large quantities of gunpowder after it has quitted the works? At Bugsby's-hole on the Thames, the place named by Government for the shipment of gunpowder, nothing more than the most trifling accidents have happened, and we cannot call to mind any occasion in which an accident has happened between that spot and the several mills throughout the kingdom, or, after this land carriage, on the many thousands of miles which the powder has often had to travel by water. We are, of course, willing to admit that a greater cost would be incurred by the manufacturer in the carriage of the ingredients to the mills, as well as in the transport of the powder itself from them. But is not this, after all, exclusively a money consideration, in no wise affecting the social and vital question of life and property? Such objections are no more tenable than a second one, which is brought against an advance of wages to the men employed in the most hazardous portion of the factory. "It has been found by "experience that the low rate of wages keeps "men sober, and that every extra penny be-"yond the scale would be an additional induce-"ment to drink." Here, at least, is consistency! The specious reasons made use of against improvements in the manufacture of gunpowder are here brought against any advance in the payments to the men. The question, then, appears to be, not that more is not due to them, but that they cannot be entrusted with it. If any such conviction really exist in the minds of the masters, we would earnestly suggest that they visit the homes of their men, and at their neat, cleanly, and well-ordered hearths they will find the most substantial evidence that any rational increase of wages would be no super-inducing motive to other than habits of frugality and industry.

In Austria the most dangerous stages of gunpowder manufacture are wholly conducted in pits and excavations beneath the surface of the earth. The consequence of a "blow" under such circumstances is to expend the whole lateral force of the powder upon the sides of the trench, and these being elastic in their nature, act as a buffer to deaden shocks seldom felt beyond a comparatively few yards from the place of the explosion. The upward tendency of the blow is of course directed against the heavens only. It is evident that this practice receives the sanction of the British manufacturer, for he essays to imitate the Austrians, but proves in so doing that there are two ways of attempting the same thing—a right and a wrong. While admitting the principle, our manufacturers erect their mills upon the *surface* of the soil, and surround them and their dangerous charges with a raised mound of earthwork. When a "blow" takes place, this encrusted barrier is scattered in pieces to the four quarters of the winds, and deals destruction to life and limb to all within its range. At the recent accident, not a vestige of this mound was left standing, and the oft-repeated assertion of the advocates of its utility, who state that such opposing walls must be necessarily blown to harmless dust, must have received the most convincing evidence of their error in the huge pieces of the wall which were scattered to some fifty yards or more from their positions. We fear that if a "return of the ac-"cidents resulting from the manufacture of "gunpowder" were to be moved for and honestly rendered, it would afford a fearful account of killed and wounded. Indeed, those living around Hounslow itself, who are now, after the loss of a limb, or distortion in face or form by hideous scars, following some less dangerous calling, would form a most formidable corps of disabled followers for a *peaceful* occupation. The suggestion that convicts should be alone engaged in the more hazardous employment of gunpowder works is, we are informed, at length engaging the attention of the Government, with whom it is to be hoped the truly absurd objections to the employment of this class of operatives will have but little, if any weight.

A notice of a few of the many causes of the explosion of gunpowder mills may be interesting to our readers. At Dartford, a cricket ball struck by the batsman across the stream fell upon the gravel path and bounded from thence into the trough of the grinding wheel. The ball getting beneath the wheel caused it what is technically called to "kedge" or drag. Friction was occasioned thereby, and an explosion was the consequence. The boy who ran round to get the ball saw the state of things, plunged head foremost beneath the stream, and arose uninjured amidst a shower of falling *debris*. In loading a waggon from a punt a barrel of powder fell, and exploding, caused the destruction of several lives. A man half immersed in water, while cutting the sedges at the side of the river which feeds the mills, struck his sickle against a stone and occasioned a spark. He saw with fear little trains of smoke arise over the powder-bestrewed path, but had the presence of mind to scoop up water with his hands and throw over and put out the dangerous ignition. At one mill, eleven men and seven horses were blown to fragments. A boy whose duty it was to stand at the horses' heads of one of the waggons complained of cold, and got another lad who was passing to take his place while he went into the corning house to warm himself. While thus employed the accident occurred, but the remarkable portion of our "note" upon this instance is:— "The boy regrets that he neglected his duty, as "his pay has been stopped in consequence." It has been before remarked that great atmospheric changes have often preceded the explosion of gunpowder works, and the last at Hounslow was not an exception to this fact. But of this phase of the question, more anon.

THE SOCIETY OF ARTS' EXHIBITION OF INVENTIONS.

THE Eleventh Annual Exhibition of Inventions was opened at this Society on the 25th inst. It is a very interesting exhibition, but as the catalogue—which is profusely illustrated—may be obtained for 3d. or 4d. at any part of the country, we think it scarcely worth our while to do more than announce the opening of the exhibition, and recommend our readers either to visit it in person, or, where they cannot do that, to procure the catalogue.

Literature.

The Life of James Watt, with Selections from his Correspondence. By JAMES PATRICK MUIRHEAD, M.A., &c., with Portraits and Woodcuts. Second Edition. London: John Murray, Albemarle-street. 1859.

SOME reviewers of valuable works like this, instead of sending their readers to the volume, by pronouncing deserved eulogies upon it—which they should do, in justice to both authors and publishers—adopt the selfish practice of cunningly extracting all or most of the author's new and striking facts, and building from these a highly entertaining article—*of their own!* This practice is not, in our judgment, an honest one, and we will not follow it. The life of Watt needs study—for our own sakes. What man is there among us who will fail, now that the means are before him, to trace back the history of that giant, the steam-engine, to his beginnings in the breast and brain of its author—we may fairly dignify Watt with that name.

We have here the latest, the richest, the completest, the best life of Watt. We cannot give a better statement of the nature of the work than the author furnishes in his preface. This, therefore, we quote below, with the earnest hope that it will attract many readers to the volume itself. It is as follows:—

"The present volume may, it is hoped, supply a want which has long been felt; that, viz., of a full, yet compendious and authentic biography of James Watt. In a recent work,* prepared by the authors from the MSS. of the great engineer, preserved by his son, as well as from others of no less value, in the possession of Mr. Boulton, there were comprised. (1.) a biographical memoir of Mr. Watt; (2.) a selection from his correspondence; and (3.) the specifications of all of his patents. The favour with which that work was received by the press and the public is gratefully acknowledged. The long series, however, of large copper-plate engravings of machinery by which it was illustrated—(thirty-four in number, delineating no fewer than sixty-eight separate figures)—necessarily raised its cost above the means of many who might otherwise have desired to possess it; while the minute descriptions contained in the specifications of patents, and their relative drawings, are of course more desirable for the use of the scientific engineer and the mechanical philosopher, than of the general reader.

"The author has now, therefore, ventured to remodel and to reproduce in a form at once more comprehensive, more convenient, and less costly, the biographical memoir above referred to. A few unimportant pages have been omitted; many of the most interesting passages from the correspondence of the great engineer have been incorporated; and other large additions, from various sources, have been made,—a considerable portion of the new matter relating to Mr. Watt's family and private history; while the principle has been adhered to of allowing his inventions and discoveries to be explained, as far as possible, in his own plain, clear, and forcible language.

"Of the immense results of those inventions, and

* "The Origin and Progress of the Mechanical Inventions of James Watt." 3 vols., 8vo and 4to. London: John Murray, 1854. This work was reviewed in the MECHANICS' MAGAZINE, Vol. 62, Nos. 1647-8, pp. 193-225.

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their present and future value to the world, it is already difficult to form any adequate conception. But some faint idea of their magnitude may be gathered from such facts as these:—that less than a single century ago, only a few clumsy and imperfect 'fire-engines,' of the old atmospheric sort, were employed in pumping water out of some widely-scattered coal-pits and mines—that they did their task laboriously, expensively, and badly—that steam was not then applied directly, nor, as then used, was it capable of being applied, with advantage, either to manufactures, to processes in the useful arts, to navigation, to land transport, to war, or to agriculture, and that now, the united steam-power of Great Britain alone, employed in all of those different ways (every engine having been constructed since the improvements of Watt were first made known), is estimated as equivalent to the manual labour of upwards of four hundred millions of men, or more than double the number of males supposed to inhabit the globe. How startling are such statistics—how eloquently is the panegyric of the inventor thus expressed by the stupendous works of his genius!

"As a kinsman of the illustrious engineer—as long the intimate friend, and now one of the executors of his son, and as the son-in-law of the late Mr. Boulton, the author has enjoyed the peculiar privilege of unrestrained access to the stores of original documents, as well as of anecdotes, by which this volume has been enriched. This circumstance may be a sufficient guarantee of the genuineness and interesting nature of the materials from which he has had to select; and the care bestowed in moulding them to their present form will be well repaid if it secures a complete and accurate history of the life of one whom the common consent of mankind has now placed 'at the head of all inventors, in all ages and nations.'

"The checkered career of so great a man—now dark with shadows, now bright with lights—may well teach the stern truth,—

'That life is not as idle ore,
But iron dug from central gloom,
And heated hot with burning fears,
And dipp'd in baths of hissing tears,
And battered with the shocks of doom
To shape and use.'

Yet it is full of hope and encouragement to those who read its lessons aright. For it sets forth the dignity of that intellectual pre-eminence which crowns perseverance in honourable toil—the lustre of that nobility of soul which finds its highest scope even amid humble pursuits—the majesty of that wisdom which intently, tranquilly, and reverently searches out the mysterious works and ways of Creation.

'Fame is no plant that grows on mortal soil,
Nor in the glistering foil
Set off to the world, nor in broad rumour lies;
But lives and spreads aloft by those pure eyes
And perfect witness of all-judging Jove;
As he pronounces lastly on each deed,
Of so much fame in heaven expect thy meed.'"

New Resources of Warfare, with Especial Reference to Rifle Ordnance, in the Chief known Varieties, including Authenticated Weight, Measurement, and Mode of Construction of Armstrong's Wrought Iron Breech-loading Guns; together with an Account of their Shells and Fuses. Illustrated by Descriptive Drawings. Being a Supplement to "Projectile Weapons of War and Explosive Compounds." By J. Scoffern. London: Longman, Brown, and Co. 1859.

The name of Mr. Scoffern is known to us, but we readily acknowledge that this is the first of his books which has come under our attentive notice. It professes to afford much new and "authentic" information respecting the Armstrong gun, and its profession in this matter is carried out in a most remarkable manner.

Let us first describe the general features of the book. It is very small—considering its pretentious title—and, although its pages number seventy, it would altogether make but little more than six of our pages if printed in type like that in which "Our Weekly Gossip" is set on another page. It is, however, beautifully printed on excellent paper, and neatly bound in red cloth.

Now for its contents. It contains three chapters: the first (of seven pages) on the balance of destructive forces; the second, on Paixhan shells and rifled small arms; the third, on forms of rifled ordnance, war rockets, floating batteries, and shells. The reader will, if he please, take our word for the fact that he must know extremely little about ordnance and projectiles in order to learn much of a scientific nature from the book. We can only consider all that does not relate to the Armstrong gun as little better than so much verbiage scrawled down for the mere purpose of making a book. This is not an illiberal interpretation; but a conclusion forced upon us by the discursive, inconclusive, and aimless character of what we find in the volume.

Let us turn our attention, therefore, to that portion of it which relates to the Armstrong gun. On the first page we find the following words in italics:—"*I am able to supply, for the first time, a full explanation, accompanied by correct drawings, of that gun;*" and to this remark is appended this foot-note:—

"I am aware that a technical illustrated journal has published drawings of the Armstrong gun. The editor very fairly stated that he could not vouch for their perfect accuracy; and, indeed, they will be found to differ from my drawings of the gun (obtained from a reliable source, and which I can depend upon) in some important particulars. To cite an example:—the breech screw of the Armstrong gun is perforated as described at p. 37, whereas the journal referred to depicted it solid. Other particulars of discrepancy will be discovered by reference."

Now, it will be in the recollection of our readers that when we gave drawings illustrative of the principle of the Armstrong gun, we distinctly stated that they were to be considered only as "rough representations" of the principal features of the weapon. In the following number we also corrected the only error which occurred in our long description of the gun, by saying "the large screw at the breech is formed hollow." This correction was published nearly seven weeks ago, but Mr. J. Scoffern has found it convenient not only to ignore it but to make a pompous allusion to our error in the note above quoted. On p. 37 he repeats the allusion in another foot-note. We will not say why this correction of ours is ignored: all we will do is to state that if Mr. Scoffern had acknowledged that correction he would have left himself without the smallest shadow of justification either for writing the above foot-note, or for describing the Armstrong gun at all. The only drawing of the gun which he shows, and of the pretended accuracy of which he makes a great parade, is less like the gun itself than our sketch, rough as it was, and little importance as we attached to it. On the very point in question—the passage from the screw—although Mr. Scoffern's drawing shows such a passage, he gives the reader no information whatever respecting the object of it! On the other hand, he shows no enlargement whatever in the bore at the breech end; and yet that is a most essential feature of the gun. Certain unessential features of the gun, in which we made no attempt at accuracy, are either copied from us into Mr. Scoffern's drawing, or stumbled upon by him accidentally; but, however he got them, they are not, as he pretends, "correct." All that he says in his title-page about the weight, "authenticated measurement, and mode of construction" of the Armstrong guns means no more than that in the book he repeats much of what we published weeks ago (leaving out, however, much that is most important) and adds this foot-note:—

"Armstrong's cannon have hitherto been constructed of two dimensions only, the larger having a bore of 3¼ inches, the smaller a bore of only 2½. In either case the pitch of rifling is one revolution in 12 feet. The weight of the larger gun is 18 cwt., of the shell, 32lbs.: the lighter shell weighs 18lbs."

We shall spend no more time and space on this volume. However any man with common sense can have written and put his name upon such a production, after the universal circulation of our article, we cannot conceive. Every reader of this Magazine has as great a right as Mr. Scoffern to take our article on the Armstrong gun, add one or two facts, omit several, misunderstand more, make a blundering copy of our engravings, and then publish a volume on one of the great topics of the day. We do not say he has done this; but we do say he might have done it, and then have sent forth just such a work as that before us.

Recent Practice in the Locomotive Engine. By D. K. Clark, C.E., and Z. Colburn, C.E. Parts 3 and 4. Blackie and Son, London, Edinburgh, Glasgow, and New York.

It is only necessary here to mention the contents of these parts of this very useful work. The steel engravings are, as usual, of the highest excellence, and the letter-press is profusely illustrated with carefully-executed wood-cuts. Part 3 treats carefully of the combustion of both coke and coal, chemically and practically, and furnishes an inquiry into the qualifications of the ordinary locomotive boiler for the combustion of fuel. Part 4 gives a succinct but lucid, and, on the whole, fair notice of the various expedients adopted for burning coal in locomotives, with some account of the results obtained with it in practice. Mr. Clark's own system of inducing air currents into the fire chamber by means of steam jets is noticed with the approbation it deserves, and with no more. On what ground, however, does the author state that the brickwork used by Mr. Lees in his apparatus is troublesome to maintain? We have close knowledge of the operation of Mr. Lees' apparatus, but have not remarked this defect.

Abridgments of the Specifications of Patents for Inventions relating to the Manufacture of Paper, Papier Mâché, &c. Printed by order of the Commissioners of Patents. Published at the Great Seal Patent Office, 25 Southampton Buildings, Holborn. 1859.

Those who are wise enough to put themselves in possession of the cheap but invaluable series of abridgments of which this forms the last published volume, will only need to see it announced. To others we may say that if it will be either interesting or profitable for them to possess a brief description of every invention patented in Great Britain for the manufacture of paper, pasteboard, and papier mâché—patented, that is, between 1665 (when the first patent was granted) and December, 1857, they can do so by obtaining this little blue book.

On the Relative Power of Metals and Alloys to Conduct Heat. Part I. By F. Crace Calvert, F.C.S., &c., and R. Johnson, F.C.S., &c. From the Philosophical Transactions. Part II. for 1858. London: Taylor and Francis, Red Lion Court, Fleet-street. 1858.

The experiments here recorded have already taken their place in the treasury of scientific knowledge. Readers will be glad to observe that the paper is procurable in a separate form.

LIST OF NEW BOOKS.

Adamson's Cottage Garden, new edit., 1s.
British Catalogue of Books Published during 1858, 5s.
Burgess's Amateur Gardener's Year-book, 3s. 6d.
Cameron's Variation of the Compass Rectified, by Azimuth and Altitude Tables, 10s. 6d.
Encyclopædia Britannica, 8th edit., re-issue, Vol. 2, 24s.
Glenny's Hand-book to Flower Garden and Greenhouse, 4th edit., 5s. 6d.
Hobbs's (Lieut.-Col.) Subaltern's Hand-book and Guide to Military Examination, 2s.
Hills's Navigation of the Irish Sea, its Tides, &c., 2s. 6d.
Jay's (J.) Statistical View of American Agriculture, 1s.
Mangnall's Questions, by Wright and Guy, 12mo., 4s. 6d., boards.
Neill's Fruit, Flower, and Kitchen Garden, new ed., 3s. 6d.
Of the Plurality of Worlds, an Essay, 5th edit, 6s.
Salmon's (Rev. G.) Lessons Introductory to the Modern Higher Algebra, 6s.
Stevenson's (T.) Lighthouse Illumination; a Description of the Holophotal System, 8vo, 7s. 6d.
Watson's (A.) American Home Garden, 9s.
William's Wonders of the Heavens, new edit., 1s.

Fire Bricks.—That very important element connected with the fittings of all local steam apparatus, a thorough fire-resisting brick, is now being made at Grays, Kent, clay having been there discovered which, it is said, is equal to the well-known Stourbridge. Specimens have been shown to us at Messrs Robinson, Nicholls and Co., the British Mercantile Agency, 13 Old Jewry Chambers, City.

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INCENDIARY SHELLS FOR WARFARE.

(From the *Morning Advertiser.*)

CAPTAIN NORTON presents his compliments to the Editor of the *Morning Advertiser*, and begs that he will be so kind as to give insertion to the enclosed letter, as the intemperate and groundless accusation contained in the letter signed "Justice," in the *Sun*, of Captain Norton having infringed upon Mr. Macintosh's Patent in his experiments at Chatham, cannot be too speedily and publicly refuted.

Rosherville, 23rd April, 1859.

TO THE EDITOR OF THE "MORNING ADVERTISER."

SIR,—Under the above heading in the MECHANICS' MAGAZINE of yesterday, I have read a letter signed "Justice," and dated the 17th inst., addressed to the editor of the *Sun*. I did not see the *Sun* of that day, or I would have instantly answered it, by quoting an extract of a letter to the editor of the MECHANICS' MAGAZINE, dated 20th December, 1855, and inserted in their number, 12th January, 1856, on the subject of Captain Disney's liquid fire shells. Extract.—"I do not pretend to any claim on the liquid fire concoction —bisulphuret of carbon and phosphorus—which I consider to be the most 'naufragious' fire stuff ever invented by the ingenuity of man." In my late experiments at Brompton, Chatham, I only used my *own* rifle-shells charged with the liquid fire, without adding asphalt or any other matter. The liquid was the same that Dr. Scoffern gave me about three years ago, and Mr. Wentworth Scott filled a few of my shells with his *own* liquid fire, which I fired in his presence in the garden of the Rosherville Hotel, about the same period, and found his liquid to be very potent, as reported in the daily and weekly papers of the time. I am, Sir, your obedient servant,

J. NORTON.

Rosherville, 23rd April, 1859.

THE ESTIMATES OF THE ENGLISH AND FRENCH NAVIES.

(Concluded from p. 265.)

It will be seen that France, since 1852, has increased her steam line-of-battle ships from 2 to 40, of which there are 5 building and 4 converting, and that this has been effected by the conversion of 26 sailing-ships, and the building of 14 screw-ships. England, in the same time has increased her line-of-battle screw-steamers from 17 to 50; of which there are 10 building and 7 converting. This has been effected by the conversion of 27 sailing-ships, and the building of 23 as screw-ships. The addition, therefore, to the French navy, in steam-line-of-battle ships, complete, building, and converting, is 38, and of England, 33, since 1852. France has, at present, 4 iron-sided ships (*"frégates blindées"*) in course of construction, as before stated. The steam frigates of France, screw and paddle, have been increased from 21 to 46; and England has increased her steam-frigates, screw and paddle, from 22 to 34, and her block-ships of 60 guns each from 4 to 9. It is necessary that we should notice this superiority in steam-frigates on the part of France over Great Britain, which, in the event of hostilities, might form a serious detriment to this country, especially in relation to the interruption of commerce. On the other hand, the French steam-corvettes and sloops, which, in 1852 were 31, are now only 22; while those of Great Britain, which in 1852 were 59, are now, including 7 vessels since reduced from frigates to sloops, 82; our screw floating-batteries are 8, as against 5 French; our screw gun-vessels and other small vessels are 53, whereas the French have 93; our screw gun-boats are 162, and those of France 28; and the whole steam navy of Great Britain now amounts to 464 vessels, while that of France numbers 264.

As regards sailing-vessels England, it will be seen, still possesses a great superiority over France. England has 35 line of-battle ships, of which 6 are proposed to be converted into steam-ships; of the remaining 29, only 13 are considered by the Surveyor of the Navy effective as sailing-ships; and, in his opinion, if it should be deemed expedient to convert any of them, they are convertible only into frigates; France has 10, of which only two are convertible; England has 70 frigates (of which 27 only are reported by the Surveyor as effective sailing-ships). France has 32, of which it is supposed that 9 or 10 will be converted into steam-transports, the remainder being too old for conversion; there are in both countries several other vessels which, being too small for conversion, it is not necessary to notice. The total number in the two sailing navies is, England, 206; France, 144.

The following statement prepared from the French estimates and accounts, shows the expenditure for naval purposes in France during the series of years as compared with our own, as also statements of the actual expenditure in pay, victualling, and clothing for the naval service of both countries, during each year since 1852; of new works, improvements, and repairs of docks, and of labour and material; the total being as follows:—

England in the Seven Years.	£
Victualling, pay, clothing	25,331,264
New works, repairs, &c.	3,441,721
Labour and materials*	24,406,601
	£53,179,586

France in the Seven Years.	£
Victualling, pay, clothing	17,755,817
New works, repairs, &c.	2,819,901
Labour and materials and ordnance	18,369,666
	£38,935,384

	Acres.
The Dockyard area of England at the present time is	866†
" " of France	865
	No.
Docks—England	32
" France	17
Ditto, building—England	2
" " France	7
Slips—England	41
" France	73
Ditto, building—England	0
" " France	3

In conclusion, the reporters again call their Lordships' attention to the weakness of Great Britain in steam-frigates, and then add, "The large increase of the French steam navy, since 1852, in line-of-battle ships and frigates, has been effected mainly by the conversion of sailing ships. The Surveyor of the Navy reports, that there are at least 19 ships of the line in the English Navy convertible, of which he proposes to convert 6 into steam-ships of the line, and 13 into steam-frigates. We append a return of the number of vessels launched in the dockyards in England since 1852; which also shows the number of shipwrights employed on building ships, as compared with repairing ships. The number of men required to convert a three-decker into a 90-gun steam-ship is stated to be five-eighths of the number required to build a new 90-gun steam-ship. The chief difference in the cost of conversion arises from the saving in materials. The cost of converting a line-of-battle ship of 90 guns is estimated at £25,000, and the cost of building the same, at £105,000, but the latter will, of course, be a far more efficient and durable vessel. The process of conversion, on the other hand, is speedy, as compared with that of building. The present seems a state of transition, as regards naval architecture, inducing the French Government to suspend the laying down of new ships of the line altogether, and it is more especially so with respect to artillery. The late invention of "Armstrong's gun," it has been stated to us, may supersede the use of the ordinary ship's guns, and possibly affect even the size and structure of ships of war. We therefore venture to suggest, for your Lordship's consideration, whether, if the force in the dockyards were to be used next year in the conversion of ships of the line and frigates, as far as the available dock accommodation will admit, the most useful results might not be attained at a comparatively small expenditure.

We beg, also, to direct your Lordships' attention to the prospective outlay contemplated by France, to complete her steam navy and her naval establishments. According to a report of the Minister of Marine, prefixed to the French Navy Estimates for 1859, it appears that it is intended to raise the French steam navy to 50 vessels of war of various classes, built after the best models, with engines of full power, in addition to 72 steam-transports, and to complete the building, in the several military ports, of the dry docks and factories indispensable to meet the requirments of the new steam fleet. The expense of these works is to be spread over the period from 1859 to 1871. The money to be appropriated to these works is also stated in the Minister's report; he proposes that the annual grants for labour, materials, armament, new works and repairs, up to the year 1871, shall be raised to the sum of £2,600,000; he estimates that £1,920,000 of this sum will be absorbed in the "annual consumption of the steam navy, works of maintenance, and the renewal of existing materials," leaving the annual average sum of £680,000, for the increase of the fleet and the extension of the naval establishments. The sum which France intends to devote to the latter purposes up to 1871, when the fleet will have reached the limit of its proposed extension, amounts therefore to £8,840,000.

The proposed annual grant of £2,600,000, would amount, in 13 years, to £33,800,000. Maintenance and renewal will absorb nearly three-fourths of this sum, leaving the above sum of £8,840,000, or rather more than one-fourth, to be devoted to the increase of her strength in ships and naval establishments. The sum granted in England by Parliament, in the year 1858-59, for the same services in the navy estimates, including £757,000 for naval ordnance and ammunition provided for in the army estimates, amounted to £3,754,000, being £1,154,000 in excess of the increased annual grants proposed by France for the next 13 years. Before we can ascertain how much of this sum, or of any smaller sum, can be considered applicable to the increase of our steam-navy and naval establishments, it will be necessary to fix the strength of the fleet to be maintained in commission; for it is clear that the larger the number of ships in commission, the larger must be the sum for maintenance, outfit, and repairs; and consequently, the smaller will be the margin available for the increase of our existing force. France founds her calculations upon a return to her peace establishment of 1852; the number of her ships in commission for 1859 being 152, against 175 in the year 1852; and the number of seamen afloat being 25,784, against 25,016 in 1852. Our position is very different. On the 1st of December, 1858, our ships in commission, and their complements, as compared with 1852, were as follows:—

	Ships.	Guns.	Complements.
1st December, 1858	267	4,649	47,953
1st December, 1852	203	3,584	36,372
Increase	64	1,065	11,581

This number is exclusive of a further increase of 3,302 marines on shore, including 1,800 employed on shore in China, also of 3,880 seamen employed in the coast-guard on shore, making a total increase in 1858, as compared with 1852, of 18,763 seamen and marines. It is clear, therefore, that although the sums voted on our navy estimates for labour and materials are greater than those expended in France, a much smaller proportionate surplus is available for building new ships.

* N.B.—The expense of ordnance for the navy is excluded but the estimated cost may be taken at about £4,000,000 for England in the same period.

† This includes 284 acres, St. Mary's Island, adjoining, but not included in Chatham dockyard.

The number of passengers who used the horse railroads of New York and Brooklyn during the past year, amounted to 34,633,525, and the gross receipts therefrom to 1,731,676 dollars 25 cents. This gives a daily average of 94,882 persons, showing the money taken every day in the year to average 4,744 dollars 10 cents. These railroads, which are tracks laid down in the streets, the rails being made of a peculiar form to avoid the objections of the ordinary rail, all concentrate in the business part of New York, and take the most of the travel to and from it. Can we not imitate this with immense advantage in London?

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MEETINGS FOR THE WEEK.

Mon.—*London Inst.*, "On Ballet Music," by John Ella, Esq., at 7 p.m.

Tues.—*Society of Antiquaries*, Annual Meeting.

Inst. Civil Engineers—I., "On the Tyne Docks at South Shields, and on the Mode adopted for Shipping Coals," by Mr. J. E. Harrison; II., Discussion upon Mr. Kingsbury's paper on the Victoria (London) Docks, and upon Mr. Harrison's paper on the Tyne Docks, at 8 p.m.

Royal Inst., Lecture on "The Nature and Extent of Geological Enquiry—Relation of Geology to the other Sciences—General laws of Structure recognized in the Earth—Submarine origin of most Rocks," by James Morris, F.G.S.

Wed.—*Royal Agric. Society*, General Meeting at 12 noon.

Thurs.—*Chemical*, 8 p.m.

Royal Inst., "On Art—The first period—The birth—The development—Art as writing—As history—Egypt, Assyria, The Jews, and other Asiatic Nations," by A. H. Layard, at 3 p.m.

Linnean, at 8 p.m.

Royal Society, F. Elefánty, on "Proposition upon Arithmetical Progression;" Prof. Matteucci, "Sur les Propriétés électriques des corps isolants."

London Inst., "On Commercial Law," by G. W. Hastings, Esq., at 7 p.m.

Frid.—*United Service Inst.*, at 3 p.m.

Royal Inst., Robert Druitt, M.R.C.P., "On Houses in relation to Health," at 9 p.m.

Sat.—*Royal Inst.*, "On Modern Italian Literature," by J. P. Lacaita, Esq., at 3 p.m.

Proceedings of Societies.

INSTITUTION OF CIVIL ENGINEERS.

April 12.—Joseph Locke, Esq., M.P., President, in the chair. The whole of the evening was occupied by the discussion of Mr. McMaster's paper, "On the Permanent Way of the Madras Railway." It was remarked that for India and other similar countries it was desirable to aim at obtaining the smallest number of pieces and simplicity of parts. The arrangements should be made with a view to guard against peculation, as well as to the best mechanical construction, for the natives were apt to steal fishing plates and bolts. It was further urged that the quality of the materials and the machinery to be sent to India and other distant places should be carefully attended to, as the heavy charges for freight and shipment formed a large portion of the expense. It was thought that sufficient stress had not been laid on the importance of utilizing, as far as possible, the resources of the country in which the works were being carried out. In Ceylon, for instance, there were forests of almost interminable extent, which might be made available. Eighteen different samples of timber had been examined, at least nine of which were applicable for railway sleepers, in situations where they would be exposed to extreme variations of atmosphere and weather. The drainage of railways in tropical climates was a matter of the utmost importance, as the ballast was liable to be carried away by the heavy periodical rains. In reply it was intimated, that the necessity for sending out timber sleepers to India arose from the circumstance, that the supply there could not be relied on. There was great difficulty in determining the precise value and quality of woods in foreign countries, especially when such practices are carried on as steeping the wood in order to deceive, as had been the case in Madras. In closing the discussion, the great diversity of opinion that still prevailed on this subject was commented upon. Every one appeared to think his own plan the best, and naturally preferred to be guided by his own experience rather than by that of others. As to the question of the durability of timber, whether prepared or not, and, if prepared, then by what process, few persons were able to obtain reliable data as far back as twenty or thirty years. The Minutes of the Institution would contain a variety of opinions on this subject, but it was doubted whether the question could be solved, or whether there could ever be universal agreement as to what was the best system of permanent way to be used under all conditions.

After the meeting, Mr. Curtis explained a system of Axle Boxes, in which, by centrifugal action, the oil was constantly thrown over the upper side of the axle, and descending slowly upon the axle was returned again to the oil chamber. As soon as it had passed the axle, a piece of thin porous flannel, placed at the bottom of the oil chamber, was found in practice to answer as a filter to receive the parts of the metal, or other residuum, resulting from the working of the boxes. These boxes were now at work on eight railways in England and on one in France. They had been in use for upwards of eighteen months; in some cases they had run for two months without any oil being applied; but the ordinary practice was to introduce about a wine glass full of oil to each box once a week.

SOCIETY OF ARTS.

April 25.—The Annual Exibition of Inventions was opened on this day.

April 27.—Mr. Robert Hunt, F.R.S., in the chair, Mr. John Arthur Phillips read a paper "On the Metallurgy of Lead." The author began by describing the principal ores from which the metal was usually obtained. The various localities where this ore was found were enumerated. Mr. Phillips described in detail the construction of the reverbatory furnace, and pointed out the chemical changes brought about in the ores by exposure to its action, and concluded by stating that it is in the treatment of ores of good produce that the reverbatory furnace and "Scotch-hearth" are to be preferred; but for working minerals of a low per-centage the blast furnace may generally be substituted with advantage; the slag-hearth, from the amount of fuel consumed, and loss experienced, is a somewhat expensive apparatus, and might in many cases be advantageously exchanged for the Castilian furnace.

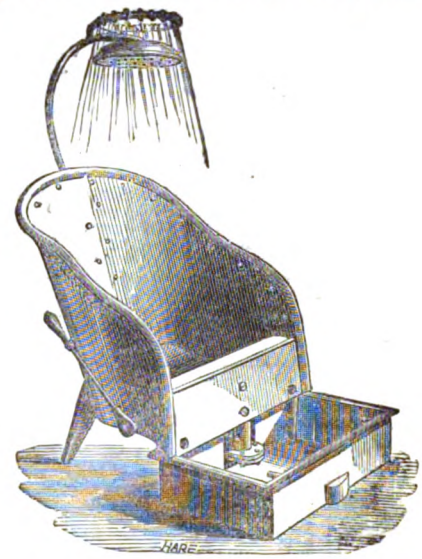
HOW GREAT GUNS ARE MADE.

In our last week's number something was said about the quality and character of iron requisite for producing sound heavy guns, and the experiments made at Woolwich during the last two years were referred to. This week we propose to give further information on the important subject, and more especially in reference to the furnaces and other appliances connected with the Woolwich factories. A 68 lb. gun, when finished, is 17 feet long, 28 inches in diameter at the breech, and weighs 95 cwt. As guns of this description are cast vertically, and require a "dead head" of considerable magnitude in order to insure sufficient density, it may be imagined that the furnaces are matters of important consideration. In practice it was found advisable to use two furnaces in the melting of a sufficient quantity of iron for the production of one such gun as we have described. The Woolwich furnaces would each hold sufficient molten metal for the casting of one gun, but as it was not possible to charge with ten tons of pig iron at once, it was found better in every way to charge two furnaces with five tons, and melt simultaneously. The quality of the iron produced in this way was found to be superior to that resulting from one furnace, when a portion of the charge must have been melted first and the remainder afterwards. Repeated tests proved this fact to demonstration, and it is a practical point of much consequence. The Woolwich furnaces are partly constructed of Stourbridge fire-brick, but the beds are of a different material. The throwing in of old "carronades," "dead heads," and "pigs," was found to chip off, or to crack and destroy the fire-bricks, and a substitute for these in the construction of the furnace beds had to be found. A cheaper substance, and one which admits of easy repair, is now used. It is composed of equal parts of glass-grinder's sand and blackfoot sand. The former is the refuse from the Thames patent glass works, and contains a considerable admixture of fine particles of glass, and the latter is obtained from the sand pits at Charlton. These are amalgamated, rammed hard upon the foundation of the furnace, and after the application of heat form a vitrified surface impervious to liquid iron. The sand furnace bed is in point of efficiency and economy immeasurably superior to that of fire-brick, and we recommend it strongly. With respect to the dimensions of the furnaces, it may be stated that they are about 22 ft. long, from centre of fire grate to centre of chimney; 5 ft. 2 in. wide; and 2 ft. 6 in. in height from bed to crown. The fire-grate is 5 ft. 2 in. square, and open for the admission of air at the end of the furnace, and the chimney is 60 ft. in height and 2 ft. 6 in. square. The furnaces are always heated before receiving their charges, and when the latter are sufficiently fluid and hot, the molten streams from two furnaces, as we have stated, are made to flow through separate channels into one reservoir. Here they mingle and blend for a little time in one harmonious whole, so as to equalise any difference of temperature which may have existed prior to their being tapped. Metal is now ladled in small quantities from the reservoir for the purpose of casting testing bars, and a sluice door being opened the molten ocean courses its way down river-like into the centre of the gun mould, which is placed vertically, and muzzle upwards, to receive it. Scoria and other impurities float upwards as the metal rises, and great precautions are taken to prevent their flowing with the iron into the "trunnions," which they would weaken, and thus make the whole casting useless. When the metal reaches to within a few inches of the guide shute, the flood-gates through which it flowed are shut for a minute until the shute is removed, and then again opened for the complete filling of the mould. In cooling there is a great subsidence of the metal, especially in the centre, but the hollowness thus produced is in the dead head entirely, and by no means deteriorates the gun. Everything is suffered to remain *in statu quo* for about three days and nights after the pouring operation. The mould is then opened and the casting, usually perfect, is prepared by lathe and boring mill for proving, and mayhap for battle. Such is some account of the gestation and birth of a great gun, and which in these non-piping times of war may be acceptable to the public generally, and certainly must be to the scientific reader.

Erratum.—"Northerton," in last week's Magazine—subject, Gun-making at Woolwich—should be "Netherton."

GRIFFITH'S PATENT CHAIR BATH.

The illustration below shows one of the most useful improvements that we have seen for some time in articles of domestic convenience. It is the invention of Mr. Griffith, the inventor of the Griffith screw propeller, and it will, no doubt soon come into general use, as by the arrangement, the inconvenient amount of space occupied by any ordinary bath in a bed or dressing room is



no longer necessary, for when the bath is not required, the foot bath is placed under the chair, and covered over with any ordinary furniture. The whole will then form a complete easy chair. The covering can be removed instantly, and it is at once ready for either a foot, hip, or sponging bath, and if the bent pipe and rose head shown are also fixed, it can be used as a shower bath.

It has long been a desideratum in Paris to obtain some accurate means of checking the drivers of public vehicles; the problem being to produce an instrument that would register the hours and minutes during which the vehicle was employed. This has been very cleverly attained by M. Giaccobi, Lieutenant-Colonel in the *Garde de Paris*. He places a time-piece, enclosed in a cylinder, under the seat of the driver; the cylinder carries a dial-plate, in which is a circular paper divided by minutes. The time-keeper is provided with two needles, one of which is provided with a point perpendicular to the paper circle. Around the dial of the time-keeper and the paper dial is a frame, which can only be moved by the opening of the door of the carriage. By the movement of this frame the paper dial is pierced by the needles showing thus the exact minute at which the door was opened. The other needle performs a double office; it shows the persons within the carriage the time at which they entered it, and how the time goes; and it likewise draws a black line during the time the carriage is in motion. The invention is very ingenious, but it does not show the distance passed over, so that it is not a register of mileage.

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REDL'S CONE TELEGRAPH FOR THE NAVY AND WAR DEPARTMENTS.

(*Concluded from p. 269.*)

THE DUAL SYSTEM.

This System is so called because by it *two* symbols can be made to indicate any disposition of the four Cones. And it can be used with two different sounds, or two different visible objects.

The Dual System by Sound can be used with a Bell, Drum, Bugle, Steam Whistle, or other instrument, capable of producing a single sound, and two quickly repeated sounds. The single sound is used as a *positive*, and when made, represents a cone to be open, and may be denoted on paper by a X. The double sound is used as a *negative*, and when made, represents that the cone referred to is closed, and may be represented on paper by an O. Four successive *positives* or *negatives* complete a series or figure.

By using the fingers again for illustration, we have the code represented as before.

The application of the five *auxiliary signs* and of the Alphabetical numbers and pendants, is the same as in the Cone System, except the "*Substitute*," which is used only as an affirmative answer.

The "*Preparative*" and the "*Stops*," are repeated in reply, by the receiver of the signal, but the other sounds need not be repeated should it confuse the ear.

But great advantage is found both as regards *celerity* and *correctness*, by abbreviating the sounds for figures 1, 2, 3, and 4.

The figure 1, is denoted by a *positive* (*single* sound);
figure 2, is denoted by a *negative* and *positive*;
figure 3, is denoted by a *positive* and *negative*;
figure 4, is denoted by two *negatives* and a *positive*.

The Dual System by Sight can be used with any *two* different visible symbols, as a flag and pendant, or two different articles of clothing; or for a distant signal, a single pair of cones or sails; or for night signals, two different coloured lanterns, or a single and a double common light.

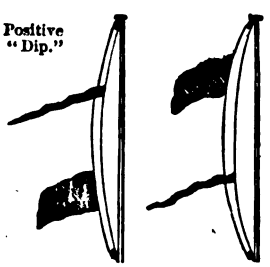
In the first case, the pendant may represent the *positive*, and the flag the *negative*, but where other articles are used *without* any preconcerted arrangements, it follows as a matter of course, as the "*Pendant*" must be made, that the article *first* shown above the other is the *positive*, and the other article the *negative*.

This system is essentially the same as that already explained for *sound*, the *positive* representing to the sight the *open*, and the *negative* the *closed*, state of the cone. And is also capable of considerable abbreviation, by omitting the *negatives after* the *last positive* in the series or figure.

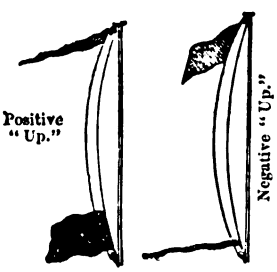
For instance, let the two symbols (suppose a flag and pendant) be stopped on to the two different parts of the same signal halyards, so that as one goes up the other comes down, and the position of each may be determined by that of either.

Square.

When they are "*square*," they are about 20 feet (more or less) from the mast head, according to the distance to be signalized and the height of the mast, and in this position they have no meaning.

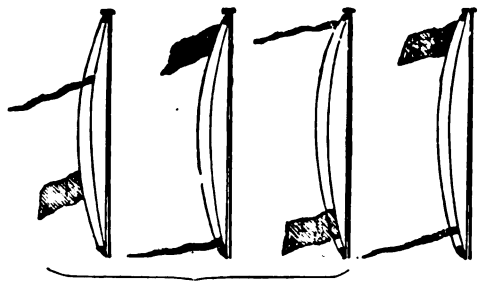


When the *positive*, or *negative*, is shown at the "*dip*," a short distance *above* the other, it denotes a *positive* or *negative*.



When the *positive* is shown at the mast head or "*up*" it denotes, that *the last positive in the figure* is made and that the series or figure is complete; the hoists following pertain therefore to another figure.

When the *negative* is shown close "*up*," it is the duplicate of the *hoist* immediate preceding it.



¶ 1

Thus—to make (¶ 1) "Pendant 1."

For ¶ { 1st hoist *positive* at the "*dip*" as common positive.
2nd " *negative* "*up*" as duplicate of ditto.
3rd " *positive* "*up*" as last positive of the series.

For 1. Hoist *negative* "*up*" as duplicate of ditto.

The "*Preparative*" is made by causing the two symbols to pass each other rapidly and frequently, and is used to correct mistakes, &c., as explained in the Cone System.

Positive. Negative. Substitute.

In the Dual System by a Single Pair of Cones where the Upper Cone open represented the *positive*,
the Lower " " *negative*,
Both Cones open together " *substitute*,
the communication might be abbreviated by using the "*substitute*" as the *last positive in the series*;—care being taken to see the receiver's Cones closed before the sender repeats the hoist.

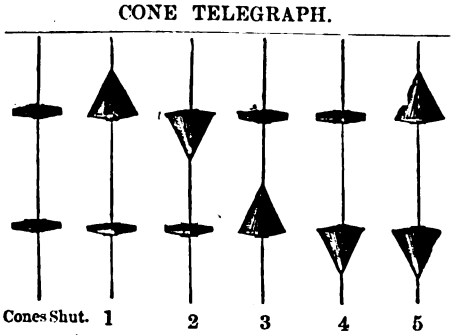
Similarly in the Dual System applied to Lights for Night Signals, one common light might represent the *positive*, and a red light or two common lights the *negative*, and both together the *substitute*.

With common lights only, the system as explained for sound might be used.

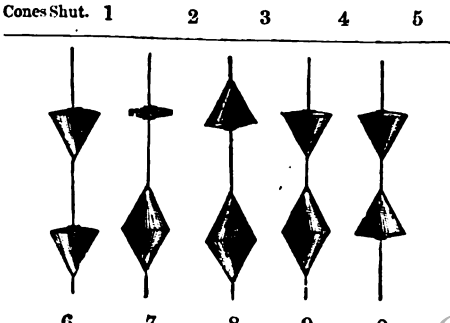
But with a red and a common light, the abbreviated system as explained for flag and pendant might be used.

The Dual System may also be used with one Symbol in two different places, for instance with a *ball on one mast*, let the "*up*" be the *positive* and the "*dip*," the *negative*; or *with a ball on two masts* let the ball at the Main be *positive*, and at the Fore or Mizen be *negative*; or *at night* let a red light *above* a stationary common light be *negative* and *below* the common light be *positive*.

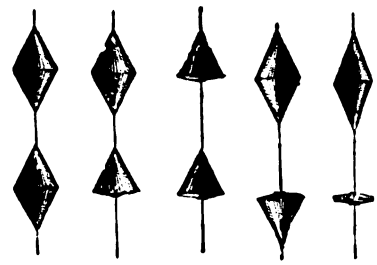
CONE TELEGRAPH.



Cones Shut. 1 2 3 4 5



6 7 8 9 0



Preparative. Pendant. Substitute. Negative. Stop.

ALPHABETICAL TABLE.

		A 5		
B 6	C 7	D 8	E 9	F 10
G 11	H 12	I 13	J 14	K 15
L 16	M 17	N 18	O 19	P 20
Q 21	R 22	S 23	T 24	U 25
V 26	W 27	X 28	Y 29	Z 30

(¶) PENDANTS.

¶ Stop.	List of the Navy.*	¶ 5	Latitude and Longitude.
¶ 0	Numeral.	¶ 6	Military.
¶ 1	General Signal.	¶ 7	Horary.†
¶ 2	Telegraph.	¶ 8	Interrogative.
¶ 3	Alphabetical.	¶ 9	Compass.‡
¶ 4	Geographical.		

IMPROVEMENT IN SCREW SHIPS.

M. A. Normand, the well-known ship-builder of Havre, France, has patented in this country an improvement in the construction of screw ships. In carrying out this invention he says—and we give his own words, although they are not very intelligible:—"To the part of the stern comprised between the two stern posts, on each side of the central plan of the vessel, and on a proper extent, a segmental form, either convex or concave in cross section, or a plane surface, whichever will best suit the shape of the stern of the ship. Secondly, I close the bottom opening of the well-hole by sliding lateral doors or shutters (of wood, or metal, or both), taking the form of the outside of the vessel, and moveable either from within or from the deck of the vessel, so as to recede or approach each other. If thought desirable the sliding doors may be divided into several parts, and either worked altogether or separately. They may be opened or closed by means of endless chains, racks, and pinions, screws, or any other means found most suitable according to the size, form, and arrangement of the vessel to which they are fitted. I also propose to alter the usual shape of the opening of the well-hole, making it follow the profile figure of the screw when viewed from the stern, the screw being turned to bring the central part of its blades into a vertical line, which is the position it will be required to take when it is raised or lowered. This novel arrangement has the advantage of reducing, as far as is practicable, the internal size of the well-hole, and consequently the surface which the sliding doors have to cover, and so give a greater length to the guides for the shutters."

The unsettled state of home and foreign affairs is reported to have exercised an injurious influence over Sheffield trade. A new rolling mill has, however, been started at Messrs. Hopper's Britannia Iron Works further north. Most of the India lines are using the conical-necked twisted railway spike which Mr. Hopper manufactures in considerable quantities. His works are now turning out about 1,000 tons of these fastenings.

* In making Ships' Names, use "Stop" after ¶ with number of distant signal.

† Nautical time (24 hours, from noon to noon) is used.

‡ *North* being 32, N. by E. 1, N.N.E. 2, and so on.

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THE CONSERVATION OF FORCE.

Gentlemen,—I am one of those common-place persons who cherish a lively faith in the common saying, "Brevity is the soul of wit." I participate in the antipathy which the illiterate feel towards long sermons, prosy lectures, and big books. Is this a proof of weakness? Does it show the man of low mental status if he prefer Emerson to Swedenborg—an express train to an omnibus—an article in the *Times* to a German treatise on politics? My favourite principle is the principle of economy. I like to have ideas communicated to me in as few words as are consistent with clearness of expression. It may be a proof of small intellectual endowments, but I must avow the truth—I have a disgust for the effort required to hunt a solitary forlorn idea through pages of verbiage as that needle has to be hunted for in a bundle of hay of which the proverb speaks. It may be that I am unequal to the necessary effort of attention, and therefore have failed to discover the great scientific truths which M. Seguin seems to think are expressed in his "*Mémoire sur l'origine et la propagation de la force.*" This gentleman appears to be devoted to a law of economy just the inverse of that which I approve. His object is, one would think, having caught a stray notion, to load it with as much misty language as it can possibly be made to carry; and he is an accomplished professor of what Moliere calls,—

"L'art de ne vous rien dire avec de grands discours."

A full analysis of this Mémoire would require more time than I can give, and more space than you can spare. I will confine my attention, therefore, to M. Seguin's remarks on the subject. He says:—

"Take as an example, the attraction exerted by the earth upon a body falling from rest during a second of time; we know that, in this case, the velocity of the falling body, beginning at zero, gradually increases after the manner of an arithmetic series, till at the expiration of the second of time a velocity is attained such that if gravitation were then to cease to act, and the velocity were to continue constant, the body would move through a distance of ten metres every second. From this it is deduced that as the velocity of the body began at nothing and arrived at ten metres at the end of the first second, the mean velocity during that second was five metres; and therefore the body fell through a space of five metres in the first second. Further, as the velocity of the falling body continues to increase, the distance described by the body from the commencement of its fall, represented by the sum of all its velocities, will vary as the square of the velocity. Again, when two bodies, by virtue of mutual attraction, move towards each other the velocities which they acquire are inversely proportional to their masses. Hence it follows that if the number or the density of the molecules which form the earth were suddenly increased a thousand times, and just at the instant when a body is projected upwards with a velocity of ten metres, it would be reduced to rest after rising through a space equal to one thousandth part of five metres, or five millimetres, and the time occupied would vary as the square root of the ratio of the two masses." • • •

"Now let us suppose that the body, instead of losing in motion in whole or in part by the gravitation of the earth, parts with it to some other body with which it comes into collision. It is evident that if the two bodies are not broken by the impact, they will undergo a mutual compression. The molecules of which the bodies are composed will be forced to change their distances apart, as well as their relative positions. And as this requires a certain amount of force, the part of the force necessary to produce the compression of the body struck must be furnished by the impinging body. This body, then, must lose a part of its motion in the same way that it would if it had moved through a small space in opposition to gravity. This compression and communication of motions continue till the body striking has, according to its nature, exhausted all the motion which it is capable of transferring to the body on which it impinges. The two bodies will continue to move in the same direction, or in contrary directions, with the amount of motion with which the impinging body was previously endowed, diminished by any which may have been absorbed in separating the parts of the bodies, or in changing their form, or any which may have passed into the form of light, heat, or electricity."

From this we are conducted, through more words than I care to attempt to translate, to the following proposition:—

"The force which, during the impact, passes from one body to the other, follows the same laws which govern the motion of falling bodies; and the effects produced ought therefore to be measured by the product of the mass, and the square of the velocity."

That is, when two bodies impinge and undergo a change of motion, the *vis viva* gained by the one is equal to the *vis viva* gained by the other. The ordinary theory is, that the momentum lost by the one body is equal to the momentum gained by the other. M. Seguin severely criticises mathematicians in general, and M. Poisson in particular, for adopting the latter proposition. Now, it is my humble opinion that Poisson and the others are quite right, and that M. Seguin has fallen into a most transparent error. M. Seguin is quite correct when he states that the same laws of motion apply to the collision of bodies as to their motion under the action of gravitation. But herein he promulgates nothing new—nothing which would not, with perfect consistency, be assented to by any disciple of Poisson; for it is in accordance with these very laws that M. Poisson has conducted his investigation. M. Seguin adopts the ordinary account given of the fall of bodies under terrestrial gravity; and, therefore, agrees to the ordinary laws of motion. Of the two following equations he perfectly approves:—

$$v = g\,t \qquad (1);$$

$$s = \tfrac{1}{2} g\,t^2 = \frac{v^2}{2\,g} \qquad (2);$$

Where v = velocity acquired in t seconds by a body falling from rest, s = space described in same time, and g = the accelerating force of gravity = 32·2 feet.

These equations apply to the motion generated in a falling body by terrestrial gravitation. They are not independent equations; for, either being given, the other can be deduced from it. These two equations are independent of the mass of the falling body, because terrestrial gravitation produces the same velocities in all bodies falling from the same point during the same time. But, introducing the mass of the body, and giving the law which these equations express a general interpretation, they would stand thus:—

I. Let M = mass of the body, P = force in pounds acting on it and setting it in motion, V = velocity generated in time, t; and suppose m and v to be the mass and velocity of another, acted on by the same force P, during the same time t, and under similar circumstances; then

$$M\,V = m\,v = P\,t;$$

that is, the momenta are equal.

II. Now suppose U and u to be the velocities generated in the two bodies by the same force P, acting through the same space s; then we get

$$M\,U^2 = m\,u^2 = 2\,P\,s;$$

or, the *vires vivae* are equal.

It must be understood that M. Seguin by no means questions these two propositions, but he misapplies them. How he can have made this mistake I cannot understand, for it seems to me that these two propositions, in conjunction with the law of action and re-action, leave no room for mistake in the general treatment of the dynamical phenomena produced by the mutual action of any two bodies. For any kind of mutual mechanical action of two bodies on one another we have the two laws already cited, and the law that their mutual attraction or repulsion are equal in amount, but opposite in direction. It is quite axiomatic, too, that when two bodies exert any reciprocal action on each other, the bodies are subjected to the action during precisely the same time. Thus, when two bodies strike one another, the blow is of the nature of a very great pressure acting during a very short period of time. But this small time during which the pressure acts is the same for one body as for the other. Hence equation 1, and not equation 2, applies to the collision of bodies, as it must apply to all mutual actions. Thus, in impact the impinging bodies are acted on in opposite directions by the same pressure during the same time. Hence it follows, from the laws which M. Seguin himself adopts, that the change of momentum in the one body is equal and opposite to the change of momentum in the other. The sort of case to which the second equation applies, may be illustrated by the stopping of a railway train by means of the break. If it be required to stop trains having various speeds within a given distance of the spot whereon the break is first applied, then the resisting force applied by means of the break should vary with the weight of the train and the square of its velocity, or in other words with its *vis viva*. But this is a case very distinct from the impact of two bodies, because in the latter, not the space through which the impulsive force acts, but the time during which it acts is the same for the two bodies. If it were desired to stop the various railway trains within a given lapse of time after the application of the break, the resisting force must vary as the weight of the train, and as the first power of the velocity, or, in short, as the momentum.

His erroneous views on impact are not the only errors which M. Seguin's paper contains, but I shall spare all parties further reference to them at present. I am, gentlemen, yours, &c.,

A Mechanic.

TELEGRAPHS TO CHINA AND AUSTRALIA.

To the Editors of the "Mechanics' Magazine."

Gentlemen,—The immense field of commerce now opened to England in China, and the increasing prosperity of the British possessions in Australia, make it a matter of no small importance that the distance, *in time*, between China and England, and between Australia and England, should be diminished to such a degree as to afford merchants in China and in Australia better means of transacting business than they now have, alienated, as they are, from the electric world. We are promised, at no very distant period, an electric communication with Calcutta and Madras. It must be evident to every one who takes an interest in such matters that a comparatively small expense—to that of the Red Sea telegraph—would connect Calcutta or Madras with Singapore; Andaman's Islands forming a most convenient point for a "station," aided, if necessary, by a station on one of the Nicobar Islands. The distance from Calcutta to Singapore being about three-fifths the distance of the coast of Galway from America, all risk as to the laying of a cable is comparatively *nil*. The extension of the line to Hong-Kong or Canton, on one side, and a convenient point on the Australian coast, on the other, would soon be accomplished by the aid and eager co-operation of those who have interests at stake in those parts of our small earth. As you are never backward in publishing what may be of practical use to the community at large, I hope you will publish these suggestions from one whose means will, unfortunately, only admit of his investing *hundreds* towards the achievement of such a scheme.

Before concluding, I beg to remark that the Atlantic Telegraph would now be in perfect working order if steps had been taken to obviate the total want of longitudinal expansion, or elasticity. This could easily be done by placing, at distances (which should be regulated by the length of the cable and geodetic formation of its resting-place), *conductive spring joints*, which would add a *little* to the bulk and first outlay, but would ensure the wanted elasticity and success of the enterprise.

I have not been so statistical as I should have wished, owing to my being temporarily separated from references; but I shall feel some satisfaction if my remarks are appreciated. I enclose my card, and remain, Gentlemen, your obedient servant,

Time is Money.

Vienna, March 31st, 1859.

His Majesty the Emperor of the French has presented Mr. Henry Bradbury with a magnificent gold snuff-box, surmounted by the Imperial crown and cypher in brilliants, in token of his admiration of Mr. Bradbury's system of "nature printing."

Experiments have been made at Vienna, Dresden, and other places in the use of tungsten or wolfram in the alloying of steel, and some extraordinary results are stated to have been achieved. It is said that steel alloyed with 20 per cent. of tungsten produces a mixture which, while it retains all the general qualities of steel, is so excessively hard that tools made of it will cut, without difficulty, the hardest cast steel. Large quantities of the new alloyed metal are said to be in preparation, and a company is about to be formed to work the discovery.

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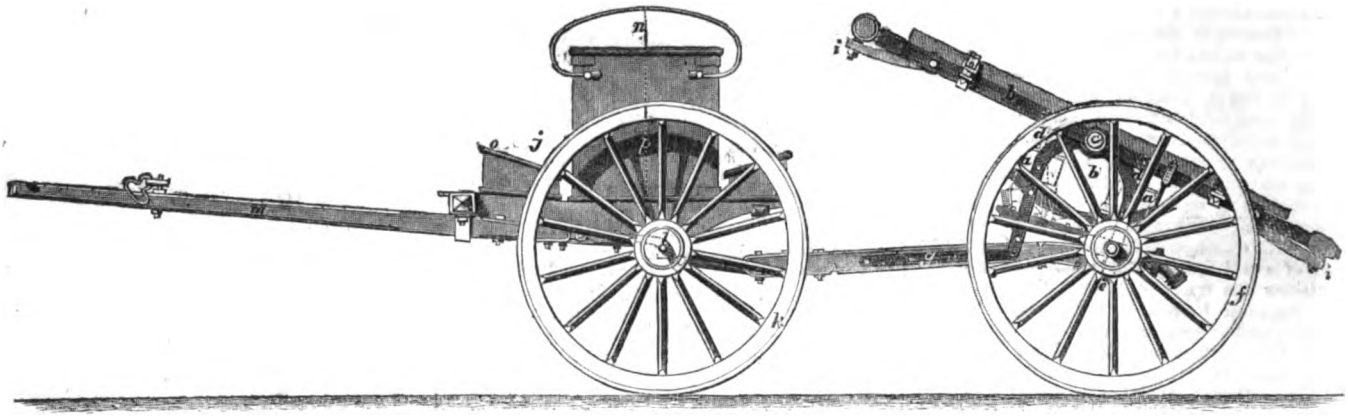
CAPTAIN FOWKE'S PATENT FIRE-ENGINE.



Captain Francis Fowke, R.E., who is well known as a scientific man, has patented the peculiar arrangement of portable fire-engine which is represented in the annexed engraving, and which is capable of being easily transported either by manual labour or horse power, and forms a compact and powerful fire-engine, the ordinary wood or metal cistern hitherto employed being dispensed with, whereby the efficiency and lightness of the engine are greatly increased. "The improved engine consists," says Captain Fowke, "of a pair of single-acting force-pumps *a*, *a*, fitted with metal valves, and a suction and delivery air-vessel *b*, and to insure the proper action of the suction air-vessel (not shown in the engraving) an additional valve is provided at *c*. The pistons or plungers are connected to the slings *d*, *d*, by a joint in the centre of the body of the plunger, so as to prevent any objectionable vibration, by which the ordinary guide-rods are dispensed with, and the pistons are enabled to be instantly withdrawn, thus affording immediate access to the suction valves. The delivery air-vessel *b* is so constructed that, by unscrewing the part to which the hose is fastened, immediate access is also obtained to the delivery valves. The pumps are fixed direct to a wrought-iron cranked axle *e*, mounted on two high-running wheels *f*, and having a wooden pole *g* attached, to the end of which a cross-bar (not shown in the engraving) is fitted, which serves as a drag handle when the engine is drawn by men, and when working rests on the ground with two or more men standing on it, their weight preventing the engine from moving. The wrought-iron frame *h* for working the pumps are fitted with swivel sockets *i* to receive the working handles, which are parallel with the axle when in use, and when not in use placed at right angles to it, being still supported by the swivel sockets, and serving as poles to carry the suction pipes. The fore-carriage *j* may be detached from the engine, and may consist of a pair of high wheels *k*, mounted on an axle *l*, and suitable shafts *m*, with driving-seat *n*, footboard *o*, and box *p*, to contain implements. The axle may be fitted with a reel which revolves freely upon it, and on this reel the whole of the hose is coiled. When used merely as a hand engine, the fore carriage may be dispensed with, and the hose and implements placed on the engine."

CAPTAIN CONNOLLY'S RIFLE REST.

FIG. 2.

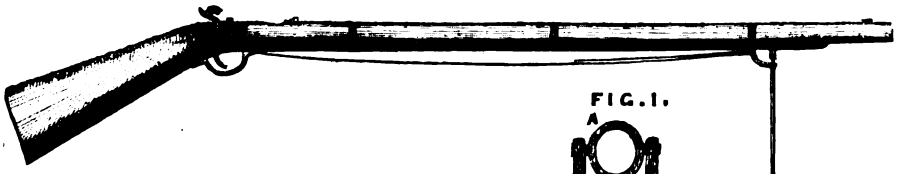


FIG. 1.

We have been favoured by a friend with the following description of the nature and advantages of a new rifle-rest lately invented by Captain Connolly, R.N.; it was drawn up by the inventor. Captain Connolly, in this description, scarcely does credit to his simple and promising invention. The ramrod itself is employed to form the rest, by fitting it with a swivel radius pipe (frequently used for the ramrods of pistols). When the rod is pulled out sufficiently to release the end from the fixed pipe in the stock, it assumes a hanging position, as seen in Fig. 2 of the annexed engravings, and on lowering the rifle so as to allow the end of the ramrod to rest on the ground, a really efficient rest is provided for the piece. A socket, or cup in the stock, receives the upper or butt end of the ramrod, which adjusts itself to its work; and it is this simple self-acting principle which constitutes the beauty of Captain Connolly's invention. The following are Captain Connolly's remarks:—

This rest is made by a swivel screwed on to the lower part of the upper band of the rifle (*vide* sketch Fig. 1), the upper swivel, *A*, being sufficiently large to give the ramrod full play, and being slightly ovalled if necessary, to fit flush into the stock when not being used and the ramrod is returned. A small brass cup or socket, large enough to receive the head of the ramrod, is let into the stock above the band—the ramrod being then let fall through the swivel, and the head inserted into the cup, a most perfect rest is obtained.

It is by no means indispensable that the head of the ramrod should rest in the cup; it is nearly equally steady butting against the slings or any other part of the stock; indeed, for a sportsman firing from the kneeling position, it is better to slope the ramrod forward, and let the head of it rest against the upper band. I merely insert the *cup* into the stock, because a small incision must be made to receive the swivel *A*, when not being used, at the same time it steadies the ramrod more, and makes the rest more perfect when the cup is used.

The advantages of this rest I conceive to be—

1st. Its extreme lightness and simplicity, so that it is little or no encumbrance to the rifle, even should it not be used, as it would not be in close quarters, or on common occasions of skirmishing. Some men, indeed, would probably prefer never to use a rest; still I think even if twenty per cent. fire better with it, it is an object gained, and this rest is so exceedingly light and simple, as to be but little encumbrance to the rifle should it not be used.

2ndly. I have observed in firing that it is in the *elevation* more than in the *direction* that most misses occur, from a habit some men have of throwing their heads back when firing, by which the piece is raised, or the act of pulling the trigger, however gently, causing the muzzle slightly to fall. Both these errors are entirely avoided by using the rest, for the muzzle resting entirely on its support, both hands are brought near the trigger guard, and the elevation, therefore, at all events, is not likely to be disturbed by the act of firing the piece.

3rdly. It is in long distances, *i.e.*, from 600 to 900 yards, that a rest appears to me of so great advantage, a man having to raise his head so considerably at those elevations, as to lose in a great measure the equilibrium of body which is assured by the present kneeling position.

I have myself found this to be the case; it was, indeed, from observing this great defect, and skirmishers being instructed to use every possible means of obtaining a rest at long distances, that caused me to turn my attention to this important desideratum in the rifle; especially as men are taught to form a rest, by inserting the screw end of the ramrod under the middle band of the rifle, with the head of it resting against the person; a plan, in my mind, as inefficient as it is dangerous to the soldier.

4thly. By means of this rest, a disabled man having the use of one arm can use his rifle almost with as much facility as with both, either in the stooping or kneeling position; a fact I submit of no small importance to the wounded soldier—in protecting himself, for instance, from marauders, who, however unscrupulous in general in silencing resistance, would not face a loaded rifle.

5thly. The expense of fitting the rest to the present Enfields, or any other rifle, would be very trifling, and if broken or impaired it is easily replaced, without injury to the rifle.

I repeat that I by no means wish to make it compulsory that every man *must* use a rest; still I feel quite sure that there are many men who would at all times fire better with it; and for taking a deliberate aim, and at long distances, I cannot but think that nearly all would find it a simple and useful appendage to the rifle.

W. Connolly, *Captain, R.N.*

Bury-road, Gosport, April 20th, 1859.

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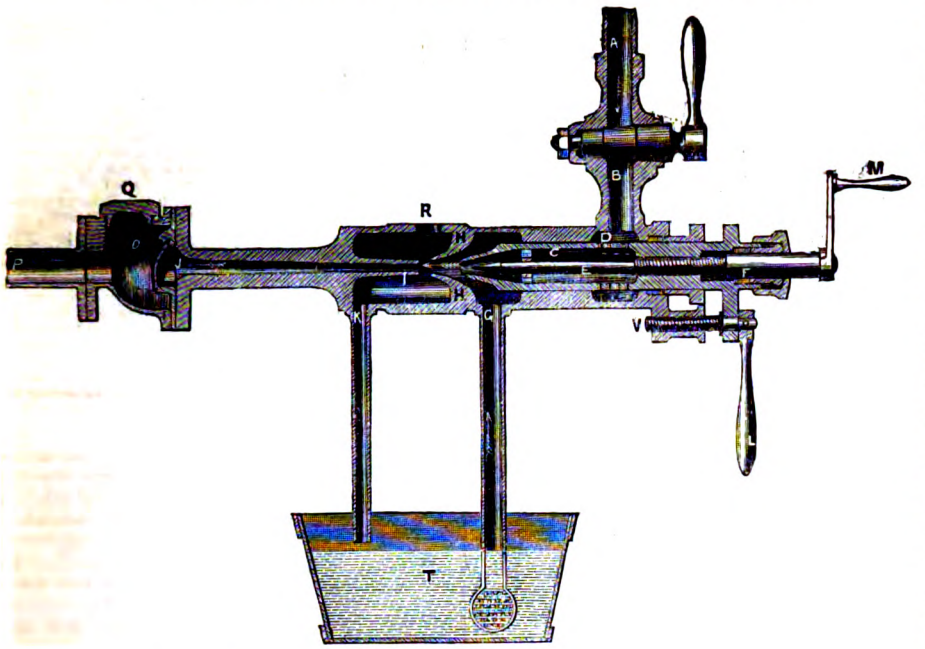
SUBSTITUTE FOR FEED PUMPS AND DONKEY ENGINES.



A VERY curious apparatus, called an *Automatic Injector*, invented by M. H. Giffard, and made by M. H. Flaud, the well-known engineer of Paris, has recently attracted considerable attention amongst scientific and practical men in France. The apparatus has been adopted by the Director General of Naval Construction in France; and has already been ordered by more than one well-known firm in the north of England.

The object of the apparatus is to supply water to the boilers of steam engines, or other steam apparatus, by means of the force of the steam contained in the boiler alone, and to return to the boiler all, or very nearly all of the heat contained originally in the steam thus used as the motor for supplying water to the boiler. It works without any aid from machinery; it is, in fact, perfectly automatic, as the title implies, and, consequently, it acts equally well when the steam-boat, locomotive, or engine to which it is attached, is in motion, or at rest.

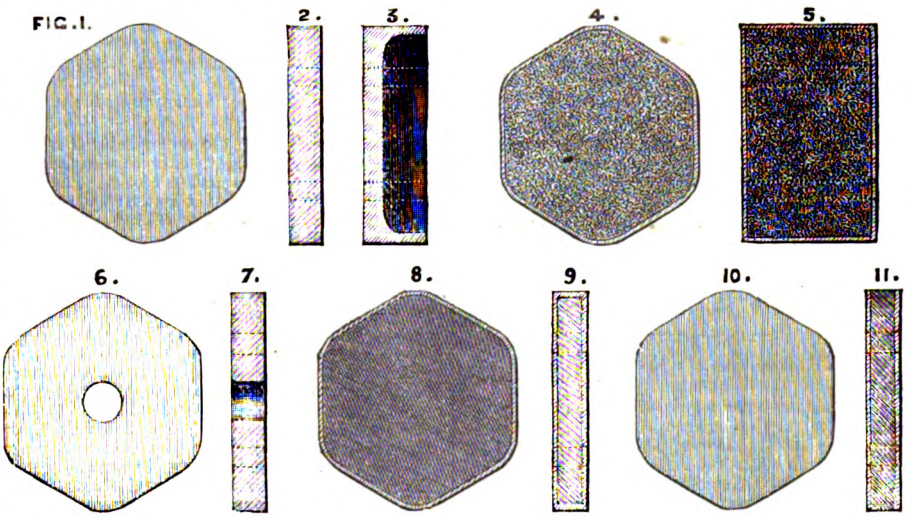
A B is the pipe bringing steam from the boiler; *C D* another pipe or chamber which receives the steam from the former through the holes at *D*—this latter pipe terminates conically; *E F*, small piston or rod working by means of a screw and handle, *F M*; this serves to regulate or prevent entirely the passage of the steam; *G* is a suction water-pipe. The water is drawn up into the chamber which surrounds the conical end of the steam pipe *C D*, and passes through the opening marked by an arrow between *H H*. The space left for the exit of the water is regulated by means of the lever and screw *L*, which moves the steam pipe, or chamber, *C D*, in either direction; *I J*, is a passage to carry the water to the boiler, together with the steam which communicates to the water a portion of the force with which it is charged by the pressure in the boiler; *O* is a valve to prevent the return of the water from the boiler when the apparatus is out of work; *P* leads directly to the boiler; *Q*, is a screw stopper, to allow of readjustment or cleansing of the valve; *K* is a tube which carries off any superabundant water which may collect in the space around; *I R* is an opening with a sliding corner, through which the action of the apparatus may be distinctly seen; the steam and water combined forming a continual and rapid stream between the parts *H* and *I*.

To work the apparatus—the diameter of the water supply pipe being calculated to give the necessary amount of water—the rod *E F* is moved forward by the handle *M*, until the conical end of the rod stops the orifice of the cone. The steam cock in the pipe *A B* is then turned on; the screw handle *M* is then turned back a turn or so, to permit a small quantity of steam to pass. The steam in its rapid passage creates a vacuum in the chambers of the apparatus, and the water rushes up the pipe *G* into the space above. As soon as the water has entered, the handle is turned round so as to draw back the conical rod, and permit free passage to the steam; the water is then carried rapidly into the boiler, and ceases to run off by the discharge pipe *K*.

The principle upon which the apparatus is based is, that as the pressure is equal upon all the interior surface of a steam boiler, and consequently as each unit of surface sustains the same pressure, if the steam is taken from the boiler into the apparatus by a larger orifice than that through which it is returned, the force of entry of the steam will be greater in proportion to the dimensions of the two orifices; or, in other words, steam brought from a boiler through a pipe of a given diameter, can easily be forced into the boiler again through the other end of the pipe, provided it have a much smaller aperture. In the machine in question the entering orifice bears but a very small proportion to that of the supply pipe, because it is necessary to allow for the loss of force occasioned by the action of the water upon the steam.

In the above cut the apparatus is represented in a horizontal disposition, whereas it is now made vertical, but the only difference in the arrangement of the parts is the curving downwards of the two water-pipes *G* and *K*.

WHITWORTH'S IMPROVEMENTS IN GUNS, GUN-CARRIAGES, AND AMMUNITION.



MR. JOSEPH WHITWORTH has just completed a patent for a set of improvements, which relate first, to a mode of giving accurate horizontal adjustment to a gun by moving its trunnions laterally in their bearings. This is effected by means of a lever which acts on one of the trunnions, the opposite end of the lever being connected with a screw which is adjusted by hand. To this apparatus, and mode of adjusting guns, the patentee makes no claim. Secondly, it relates to the use of discs or cakes of wax, tallow, or other similar lubricating compounds or substances, as wads for ammunition for ordnance and fire-arms, whereby the piece is properly lubricated. The lubricating materials may consist of bees-wax and tallow, used separately or combined, or of paraffine, or of such other similar substances as are not materially affected by being exposed to the action of the atmosphere. Mr. Whitworth has obtained good results from a composition consisting of equal quantities of wax and tallow; but the proportions may be varied according to the temperature of the weather and climate, care being taken that a sufficient quantity of tallow is used to ensure perfect lubrication of the barrel at low temperatures, while sufficient wax is employed to make the wad cohere, and withstand the effect of high temperature. Instead of mixing the wax and tallow together whilst both are in a melted state, he sometimes melts the wax, and runs it into a mould and when set pours the tallow on to the wax. In this case the tallow adheres to, but does not mix with, the wax, which thus forms a coating. In making wads for small arms, he takes a cake or sheet of the lubricating material made of the requisite thickness, and by means of a suitable punch cuts out of it wads or discs. Or the melted material may run in the form of a rod, and afterwards be cut into wads or discs. In making wads for large ordnance, he prefers to use moulds of the proper size and shape corresponding with the interior of the piece. The material is poured into the moulds, and allowed to set. Other modes of manufacturing, forming, moulding, or cutting the discs or wads may be adopted, but the simple methods explained answer well. Mr. Whitworth uses one or two discs or wads similar to those shown in end view in Fig. 1, and in section in Figs. 2 or 3. When two discs or wads are used, they may be of diminished thickness, one being

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placed in front of, and the other behind the powder. He also in some cases connects the two discs together by a casing of thin wax, as shown in Figs. 4 and 5. The space between the two discs forms a chamber in which the powder may be inserted, as in a bag or cartridge, and where necessary, he uses several such chambers, which are made short for the sake of strength. Perforations must be made to secure communication and complete ignition of the powder in the several chambers. He also uses perforated wads, as in Figs. 6 and 7, made of lubricating material, which he places in the midst of the powder to remove the deposits caused by excessive fouling when inferior powder is employed. In some cases he employs roads made with the softer lubricating material in the centre, surrounded by a casing of harder substances, such as wax, or other suitable material, as shown in Figs. 8 and 9; or the wad may be made of wax on the front and rear sides, and tallow between, as shown in Figs. 10 and 11—all of which several descriptions of wads are applicable to small arms and ordnance. In all cases the lubricating materials, or compounds, which he employs as described, consist wholly of substances that are melted by the heat of, and are altogether dispersed by, the exploding gases of the powder; the use of pulpy or fibrous materials may be altogether dispensed with. In choosing the lubricating materials, or compounds that may be required for use in hot climates, it will be necessary to select such as are to a certain extent heat-resisting, and possess the necessary hardness and toughness. He prefers to employ these in combination with other substances easily melted, as shown in Figs. 8, 9. 10 and 11.

Thirdly, the invention relates to the application of tin or zinc, or other hard metals or alloys, as an outer coating for soft metal rifle projectiles. The soft metal for the projectiles is made in a continuous length, and is coated by an adaptation of the well-known apparatus employed in manufacturing lead pipes, and coating them with tin, or other metal, and which it is not necessary to describe. Any apparatus whereby the soft metal is made in a continuous length, suitable for being divided into shorter pieces, and formed into projectiles by the ordinary bullet-making machinery, may be used, provided the continuing length of metal is forced through suitable dies, and through a bath of melted coating metal, or alloy, whereby a continuous coating is deposited.

ROYAL NAVAL ENGINEERS.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—The very kindly manner in which you have taken up the case of the Royal Naval Engineers, in your Magazine of March 4th, induces me to trouble you with a few remarks in reference to the position in which the Admiralty think fit to keep this important class of officers. The Naval service is in many respects remarkable for its anomalies, but that of the status of its engineers is certainly one of the most curious, their position being of the most undefined and indistinct character. They are supposed to be placed upon the same footing as Masters, yet we find a great many differences, both as regards treatment and emoluments. The "with but after" rank applies also to other officers, but in the case of engineers it is a veritable fact, for from the treatment accorded them they are made to feel that they rank "*after*" everybody. As you justly observe, if "there is any inferiority in the character and education of the engineers, the fault lies with the Admiralty who admit such persons." And how does this system, or rather want of system, act? The engineer, looked down upon, and in many cases brow-beaten by his superior officers (?), finds his engine-room occasionally converted into a blacksmith's or carpenter's shop, for ship's work, utterly regardless of his remonstrances and representations, that his machinery will suffer not only by the possibility of accident but also by the positive neglect compulsorily entailed by such a course: or perhaps he finds his prospects, and his character and reputation as an engineer, ruined in consequence of the inefficiency of his machinery, when that result has actually been brought about by the arbitrary conduct of the captain, who, in order to have a "*smart ship*," takes his stokers to pull ropes, to work guns and polish brass-work, when they ought to be employed in the engine-room in keeping the machinery in order. These are and must be the results of a system which gives the engineer no position in the ship, and no voice in the appropriation and employment of his men, except when positively under steam. It may be said that the efficiency of the engine-room ought to be the first wish of a sensible commander; granted, and there are fortunately many who have a just appreciation of the importance of the duties of the engineer; but for one such, how many are there who entertain a thorough contempt for what they please to call a "mere mechanic," who laugh at, and "pooh-pooh" his representations, and treat his objections as "paltry obstacles," knowing full well that when the natural result does take place it will be but a few weeks in harbour under repairs; and should the engineer be reprimanded or reduced it is of not the slightest concern. Such cases do occur, and will continue to do so, until the engineer obtains proper consideration, and until his position is properly defined, and he is given a thorough and undivided control over his own department—men as well as machinery. The French Emperor saw the necessity of placing the engineers of his navy on a proper footing. Class prejudice had no place in his mind when reconstructing the Naval power of France, and it is to be hoped that Sir John Pakington will be sufficiently wise to include in his reforms a proper organisation of this important, and now absolutely necessary body of officers. Unfortunately for Naval engineers, the journals, with the exception of your own, which are especially devoted to engineering and scientific information, hold aloof from this question, and instead of affording what would be felt as great and important aid, look coolly on at the struggles of their naval brethren, and in too many cases, it is to be feared, consider it a matter of satisfaction than otherwise, that their exertions are so fruitless and their progress so small. Under such circumstances, engineers will be doubly grateful for the just and considerate articles in your journal. I shall be very glad, if you will afford me space at another time, to go further into this matter in order to expose one or two other anomalies, especially in reference to the treatment of the junior branches of the profession, but I am afraid that I have already trespassed too far upon your space.

I am, Gentlemen, yours truly,

CRANK.

[We avail ourselves of the opportunity which the preceding letter affords, to offer a remark for the guidance of engineers and others in the Royal Navy. We have found that in the minds of some there exists a crude belief, or at least a dread, that we are in some way associated with, and in the confidence of, the British Admiralty, or some of its high officers. This has been conjectured, we are informed, in consequence of some of the information which we have on former occasions published having an official appearance. The consequence is, some of the Naval engineers have felt doubtful whether it was quite a safe thing to commit their confidence to us. We desire to assure any such that their fears are utterly groundless. Let them only turn over our pages since January last, and they will find that when we have had occasion we have spoken without hesitation or scruple against, as well as for, the Admiralty and all its officers. We are not in the personal or private confidence of any Government functionary whatever, and therefore in no sense is our independence compromised. The true and only secret of whatever interest we may possess in reference to the navy is to be found in the fact that we write upon what we understand, and that we do not write upon what we are ignorant of—as mere journalists unhappily do.—EDS. M. M.]

MR. BESSEMER'S IRON-MAKING PROCESS.

April 11, 1859.

GENTLEMEN,—Upon the communication having been made to the Society of Civil Engineers of Paris relative to a new method of obtaining metals in a finely-divided state by means of rotation, the President—it is stated in your last week's impression—objected to the process because "the rotating action of the foreign bodies contained in the iron could only be effected at the cost of the combustion of a portion of the iron itself, as occurred in casting, and *also happened in Mr. Bessemer's apparatus.*" Now there is little doubt but the said president is a man of integrity and high scientific attainments; any statement, therefore, emanating from such a source, would necessarily carry with it a certain amount of weight, and tend to influence the public mind. It is to be regretted, therefore, that an error of this kind should have obtained credence with such a man. It is satisfactory, however, to know, that notwithstanding the prejudice and misrepresentation to which the Bessemer discovery has been subjected, it is steadily and surely establishing for itself a reputation as lasting as steel itself, and which shall carry down to generations yet unborn the name of its author as one of the greatest inventors of his age. That the discovery had difficulties to contend with, obstacles to surmount, details to work out, none could deny. Nor did any person at all conversant with such matters doubt, even at its birth, that such would be the case. Some there were, indeed, who were so dazzled by the brilliancy of the idea as to be unable, or unwilling to see such difficulties, and who, therefore, in their *impatience*, scoffed at that which before had given them so much delight, but for the fruits of which they could not wait. Others of a more practical turn of mind having witnessed the dawn of the discovery, were content to abide with patience its complete development. Nor have such been disappointed in their expectations. For a considerable time the invention has been in successful operation in a foreign land, and now works are established in our own country from which steel of the very best description is being daily turned out in large quantities, not only yielding large profits to the principals, but affording comparative sinecures to the operatives employed thereon. Such, indeed, is the reputation which the Bessemer steel has established for itself, that none is permitted to pass from the works without the mark of the firm; and so well satisfied with it are many of the principal engineering firms, that they now use nothing else; this, too, after the use, in many cases, of several tons upon their own tools alone. Some of the principal railway works, too, are also extensive users of this steel, and give to it the preference over all other kinds. Nor are these results the effect of any adventitious circumstances, as might have been said to be the case when the matter was first taken up by the public press, but are attributable solely to the intrinsic excellence of the metal itself. The inventor being fortunately a gentleman of adequate means and high mechanical genius, has done that which too many inventors could not have done; that is, he has not only established works on a sufficiently large scale to develope his discovery practically and profitably, but he has introduced therein a number of mechanical contrivances of such beauty and completeness, that workmen of the most ordinary capacity of mind can scarcely fail of working the new principle efficiently. Hence we do not presume to much prescience when we predict that the time is not distant when this discovery shall be employed generally throughout the world. Indeed it cannot well be otherwise; for apart from the prejudice and obstacles which are so generally opposed to all new ideas, which are likely to interfere with existing plants, it will manifestly be to the pecuniary advantage of manufacturers to adopt it. From trials recently made upon the Bessemer iron and steel at Woolwich, and elsewhere, the following are the mean strengths:—

Iron boiler plate...	68.347
Bar iron	75.897
Round steel	162.970

When we consider, therefore, that the ordinary strength of Staffordshire bar iron is only 56.000, the superiority of this over other kinds of iron will at once be apparent. Moreover, such is the toughness of the boiler plates that pieces ¾ thick can be folded up, while cold, like a sheet of paper, and though doubled over three or four times, and flattened down, they show no symptoms of fracture at the edges of such folds. Such, too, is the strength and toughness of the steel, that a spiral shaving about seventy feet in length, was a short time since submitted to Mr. Bessemer by one of the workmen. This shaving, a portion of which the writer has seen, more resembles a piece of wire rope than anything else. With such evident advantages, therefore, as this process possesses over all others, and with the facilities which it affords the inventor of making cylinders, cannon, &c., *in the converting* operation, it is impossible to foretell the ultimate benefits which will accrue therefrom. I am, Gentlemen, yours truly,

WILLIAM GREEN.

Victoria Works, Dod-street, Limehouse.

April 24th, 1859.

P.S.—If *one* great advantage has come from the experiment in gun founding at Woolwich, a still *greater advantage* to the public has generally resulted from M. Bessemer's discovery in connection with the same object. A gun has recently been made by the Bessemer process from Hæmatite iron, which is quite a marvel in metallurgy. A six-inch round ingot having been run, it was then heated and rolled in the usual manner, until reduced to the proper dimensions for a four-inch gun. After being turned and bored, a cylinder of about six inches in length was cut therefrom, and subjected to hydraulic pressure until completely flattened. Yet notwithstanding this severe test no symptom of a crack or fracture could be discovered upon any part thereof. Now, certainly no metal at present in use for ordnance—not even the best gun-metal—would stand such a test, and yet the price of the prepared ingots at Woolwich, after paying good wages to skilled workmen and the several expenses connected with rolling, &c., would not exceed the price of the commonest pig iron now used for cast-iron ordnance. Rejoicing as I do, therefore, to see scientific merit rewarded—sparingly, alas, as it is—I trust that an invention of such transcendent beauty and national importance will soon be adopted by the Government authorities, and that its indefatigable author will receive that honour and reward to which he is justly entitled.

THE HOUNSLOW EXPLOSION.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—The inquiry into the accident at the Hounslow Gunpowder Works has been again postponed, and this time for a month. It is not, I presume, your purpose to make any comment upon the proceedings of the inquest until the report of those deputed to examine scientifically into the causes of the event are before the public. Then with

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your permission I may have a good deal to say respecting the discrepancies which arose during the inquiry, and some explanations to offer which may reconcile many of them and account for the inconsistencies of others. One remark will not, however, be here out of place. Surely the council employed by the manufacturers were not, even by their zeal for their clients, justified in stating that the scene of the disaster was at the period of the inquest exactly in the same state as it was at the immediate moment after the explosion, nor could the managers of those works have instructed their advocates to state that such was the case. *For such was not the truth.* It may be that nothing had been touched that was deemed of importance by those in authority, "but things to a very great extent had been made straight," and the supernumerary gang of masons and bricklayers' labourers could scarcely have dared to remove a fallen tree or a barrow of bricks from the spot unless they had been so instructed. Indeed, they would have found enough to do in repairing the brick-work and re-tiling the surrounding buildings on the premises, before they essayed to mitigate the horrors of a scene which was quite bad enough after being thus "put to rights." What I mean to imply is not blame to any one, but what you, gentlemen, should insist upon is, that not a stock nor a stone ought to have been turned much less moved from the spot in which it fell. In case of a fire the premises of which are insured, the whole place, as it lies, is taken possesion of by trusworthy men deputed to this office. In the event of an accident of this nature the coroner ought to be held in some wise responsible for "the situation," and it ought not to be left to an irresposible and paid advocate, to impart the necessary amount of confidence into the inquiry, to insure strict and impartial justice to be done, and a rational conclusion of causes if possible being arrived at. You have very justly the ear of the public in such and similar cases as these. The ordinary journalist dare not approach it for lack of the more intimate knowledge of the subject, and the less conscientious but not the less gifted of "the chemically practical" have a decided "shop interest" in such events. I pray you, therefore, do not wait until the neighbourhood is again aroused to force the proper and most diligent inquiry by the pressure you can bring to bear upon it.—I beg to remain, yours, &c., A. Z.

SUBMARINE TELEGRAPHS.

Gentlemen,—In your journal of the 15th inst. I observed a statement, headed "A Novel Method of Telegraphing," and due to Messrs. Hoga, Piggott, and Beardmore. I am not aware of the date of those gentlemen's claim for the invention as therein stated, but beg to state that provisional protection for an invention of a similar nature was applied for and granted to me in the month of October last. I also observe that those gentlemen abandoned their provisional protection for the invention. In my own case, however, my investigations, extending over a period of many months, have been of a nature sufficiently satisfactory to induce me to an opposite course; and my final specification for the same was completed on the 16th day of the present month. B. Nickels.

Mitcham, 23rd April, 1859.

The *Photographic News* announces a very singular discovery, by M. L. Scott, by means of which sounds may be made to record themselves, whether they are those of musical instruments, or emitted by the voice in singing or speaking. Professor Wheatstone, during his recent visit to Paris, was invited by the Abbe Moigno to inspect the papers on which these sounds had printed themselves, and is said to have been greatly surprised and pleased with what he saw. The mark produced on the paper by a particular note is invariably the same; so, also, if a person speaks, the tone of voice in which he speaks is faithfully recorded. As yet no practical advantage has been obtained by this discovery; but M. Scott is sanguine that, in course of time, he will so far improve his apparatus that it will be capable of printing a speech, which may be written off *verbatim*, to the great saving of the labour of Parliamentary reporters.

THE NEW PATENT LAW OF INDIA.

The following is an authentic copy of the new Patent Law of India, derived from the official paper of the Commissioners of Patents for Great Britain:—

Whereas it is expedient, for the encouragement of inventors of new manufactures, that certain exclusive privileges in their inventions should be granted to them in India, and that such exclusive privileges should be protected:—It is enacted as follows (the sanction of Her Majesty to the passing of this Act having been previously obtained and signified in pursuance of the statute):—

I. The inventor of any new manufacture may petition the Governor General of India in Council for leave to file a specification thereof. Every such petition shall be in writing in the form or to the effect mentioned in the schedule hereunto annexed, and shall be signed by the petitioner or (in case the petitioner shall be absent from India), by an authorised agent, and shall state the name, addition and place of residence of the petitioner, and the nature of the invention.

II. Upon such petition the Governor General of India in Council may make an order authorising the petitioner to file a specification of the invention.

III. Before making such order the Governor General of India in Council may refer the petition to any person or persons for enquiry and report, and such person or persons shall be entitled to a reasonable fee for such enquiry and report, to be paid by the petitioner, the amount of such fee, in case of dispute, to be settled by a judge of one of Her Majesty's Courts of Judicature in a summary manner.

IV. If, within the space of six calendar months from the date of such order the petitioner cause a specification of his invention to be filed in manner hereinafter mentioned, the petitioner, his executors, administrators, or assigns, shall be entitled to the sole and exclusive privilege of making, selling, and using the said invention in India, and of authorising others so to do, for the term of fourteen years from the time of filing such specification, and for such further term (if any) not exceeding fourteen years from the expiration of the first fourteen years, as the Governor General of India in Council may think fit to direct, upon petition to be presented by such inventor at any period not more than one year, and not less than six calendar months, before the expiration of the exclusive privilege hereby granted.

V. An order authorising the filing of a specification, or for extending the term of such exclusive privilege as aforesaid, may be made subject to any such conditions and restrictions as the Governor General of India in Council may think expedient.

VI. Every specification of an invention filed under this Act shall be in writing, and shall be signed by the petitioner, and shall particularly describe and ascertain the nature of the said invention, and in what manner the same is to be performed.

VII. Every petition for leave to file a specification and every specification filed under this Act shall be left with the Secretary to the Government of India in the Home Department, and every petition and specification shall be accompanied by a declaration in writing, signed by the petitioner in the form or to the effect mentioned in the schedule hereunto annexed, marked A and B respectively; and if the inventor be absent from India, the petition and specification shall also be accompanied by a declaration signed by the agent who shall present or file the same, to the effect that he verily believes that the declaration, purporting to be the declaration of the inventor, was signed by him, and that the contents thereof are true, which declaration shall be in the form, or to the effect mentioned in the said Schedule. The date of the delivery of every such petition and specification shall be endorsed on the same respectively, and shall also be recorded at the office of the said secretary.

VIII. If any person who shall make a declaration under this act shall wilfully and corruptly make any false statement therein, he shall be deemed guilty of perjury, and shall be proceeded against, and upon conviction punished accordingly.

IX. No specification shall be filed until the petitioner shall have paid all fees payable under this Act, including the fees (if any) of the person or persons to whom the petition shall have been referred for enquiry and report.

X. At the time of delivering the specification for the purpose of being filed, the petitioner shall cause to be delivered to the said secretary five copies thereof, of which,—

One shall be sent to and filed by one of the Secretaries to the Government of Bengal;

One shall be sent to and filed by one of the Secretaries to the Government of Fort St. George;

One shall be sent to and filed by one of the Secretaries to the Government of Bombay; and

One shall be sent to and filed by one of the Secretaries to the Government of the North-Western Provinces.

A copy of such specification shall be open at all reasonable times at the Office of each of the said Secretaries to public inspection upon payment of a fee of one rupee.

XI. A book shall be kept in the office of the said secretary to the Government of India, wherein shall be entered and recorded every such petition and specification, and every order made upon such petition or relating to the invention therein mentioned. Every specification shall be numbered according to the order in which it is entered in such book; and a reference shall be made in such book, in the margin of the entry of each specification, to every order relating to the invention, and to every petition, memorandum, or amended specification, which shall be filed under the provisions of Section 14.

XII. Such book, or a copy thereof, shall be open at all convenient times for the inspection of any person upon payment of a fee of one rupee; and the said secretary shall cause a copy of any entry therein, certified under his hand, to be given to any person requiring the same on payment of the expense of copying.

XIII. Every such certified copy shall be *prima facia* evidence of the document of which it purports to be a copy.

XIV. If after the filing of the specification the petitioner shall have reason to believe that through mistake or inadvertence he has erroneously made any misstatement in his petition or specification, or included therein something which at the date of his petition was not new, or whereof he was not the inventor, or that such specification is in any particular defective or insufficient, he may petition the Governor General in Council for leave to file a memorandum, pointing out such error, defect, or insufficiency, and disclaiming any part of the alleged invention, or in case of any defect or insufficiency of the specification for leave to file an amended specification. The petition shall state how the error, defect or insufficiency occurred, and that it was not fraudulently intended, and shall be accompanied by a declaration in writing signed by the petitioner, and if he be absent from India by his agent, stating that the contents of such petition are true, to the best of his knowledge and belief. Upon such petition the Governor General in Council may make an order allowing such memorandum or amended specification to be filed. All the provisions of sections X., XI., XII., and XIII., applicable to the specifications, shall be applicable to the petitions, orders, and memoranda or amended specifications referred to in this section. An amended specification filed under the provisions of this Act shall, except as to suits or proceedings relating to the exclusive privilege which shall be pending at the time of the filing of such amended specification, have the same effect as if it had been the specification first filed; provided that nothing contained in an amended specification shall extend or enlarge any exclusive privilege before acquired.

XV. No person shall be entitled to any exclusive privilege under the provisions of this Act—

If the invention is of no utility; or

If the invention, at the time of presenting the petition for leave to file the specification, was not a new invention, or within the meaning of this Act; or

If the petitioner is not the inventor thereof; or

If the specification filed or the amended specification (if any) does not particularly describe and ascertain the nature of the invention, and in what manner the same is to be performed; or

If the original or any subsequent petition relating to the invention, or the original, or any amended specification, contain a wilful or fraudulent misstatement.

XVI. Every exclusive privilege under this Act shall cease if the Governor General of India in Council shall declare that the same, or the mode in which it is exercised, is mischievous to the State, or generally prejudicial to the public; or if a breach of any special condition on which the petitioner shall be authorised to file a specification, or upon which the term of the exclusive privilege shall be extended, shall be proved to the satisfaction of any of Her Majesty's Courts of Judicature, and if the Governor General of India in Council shall thereupon declare that such exclusive privilege shall cease.

XVII. The importer into India of a new invention shall not be deemed an inventor within the meaning of this Act unless he be the actual inventor.

XVIII. A foreigner, whether resident abroad or not, may petition for leave to file a specification under this Act.

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XIX. An invention shall be deemed a new invention within the meaning of this Act if it shall not, before the time of applying for leave to file the specification, have been publicly used in India, or in any part of the United Kingdom of Great Britain and Ireland, or been made publicly known in any part of India or of the United Kingdom by means of a publication, either printed or written, or partly printed and partly written. The public use or knowledge of an invention, prior to the application for leave to file a specification, shall not be deemed a public use or knowledge within the meaning of this section, if the knowledge shall have been obtained surreptitiously or in fraud of the inventor, or shall have been communicated to the public in fraud of the inventor or in breach of confidence: provided the inventor shall, within six calender months after the commencement of such public use, apply for leave to file his specification, and shall not previously have acquiesced in such public use: provided also, that the use of an invention in public by the inventor thereof, or by his servants or agents, or by any other person by his licence in writing, for a period not exceeding one year prior to the date of his petition, shall not be deemed a public use thereof within the meaning of this Act.

XX. If an inventor who, prior to the time of applying for leave to file a specification of an invention under this Act, shall have obtained Her Majesty's Letters Patent for the exclusive use of such invention in the United Kingdom, or any part thereof, shall, within twelve calendar months from the passing of this Act, or within twelve calendar months from the date of such Letters Patent, petition the Governor General of India in Council for leave to file a specification of such invention (which petition shall be in writing, in the form or to the effect mentioned in the schedule), the invention shall be deemed a new invention within the meaning of this Act, if it was not publicly known or used in India at or before the date of the petition for such Letters Patent, notwithstanding it may have been publicly known or used in some part of the United Kingdom or in India before the time of his petitioning, under this Act, for leave to file the specification: provided the petition for leave to file the specification shall state that such Letters Patent have been granted, and shall also state the date thereof and the term during which the same are to continue in force: provided also, that an exclusive privilege obtained under the provisions of this Act by an inventor who has obtained Her Majesty's Letters Patent for the exclusive use of such invention, shall cease to have effect if such Letters Patent be revoked or cancelled; and that no such exclusive privilege shall extend beyond the term granted by such Letters Patent unless the same shall be renewed, in which case the exclusive privilege may be renewed under this Act for the extended term or any part thereof.

XXI. No exclusive privilege obtained under this Act shall entitle the owner of such privilege to exclude any person from using the invention, who, prior to the 7th day of July, 1855, used the same in India.

XXII. An action may be maintained by an inventor against any person who, during the continuance of any exclusive privilege granted by this Act, shall, without the licence of the said inventor, make, use, sell, or put in practice the said invention, or who shall counterfeit or imitate the same: provided that no such action shall be maintained in any court other than the principal court of original jurisdiction in civil cases within the local limits of whose jurisdiction the cause of action shall accrue or the defendant shall reside as a fixed inhabitant.

XXIII. No such action shall be defended upon the ground of any defect or insufficiency of the specification of the invention, nor upon the ground that the original or any subsequent petition relating to the invention, or the original or any amended specification, contains a wilful or fraudulent mis-statement; nor upon the ground that the invention is not useful; nor shall any such action be defended upon the ground that the plantiff was not the inventor, unless the defendant shall show that he is the actual inventor, or has obtained a right from him to use the invention either wholly or in part. Any such action may be defended upon the ground that the invention was not new, if the person making the defence, or some person through whom he claims, shall, before the date of the petition for leave to file the specification, have publicly or actually used, in India or in some part of the United Kingdom, the invention, or that part of it of which the infringement shall be proved, but not otherwise.

(To be concluded in our next.)

NOTICES.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of insertions less than 13; for 13 insertions, 4d. per line; and or 52 insertions, 3d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

THE demand for Mr. E. J. REED'S paper—

ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY, IN RESPECT OF DIMENSIONS, FORM, MEANS OF PROPULSION, AND POWER OF ATTACK AND DEFENCE,"

has been so great that the Journal of the Society of Arts, the MECHANICS' MAGAZINE, and all other Scientific Journals in which it appeared in December last, are now out of print. The demand still continuing, it has been deemed desirable to reprint it in a separate form. An 8vo. edition of it, in large type, and on fine paper, has, therefore, been prepared, and may now be had at the Office of this Magazine, price 1s.

Our Weekly Gossip.

We stated last week that fifteen people had been saved by the use of Clifford's boat-lowering gear; it is now our painful duty to record the loss of three lives through the want of it. Her Majesty's new steam frigate Doris was on Thursday last trying her speed at Spithead when she ran into a smack and sank her, the two men and the boy in her at the time leaping out to save themselves from a worse fate. The boats hung in the old falls and tackles, and it was nearly ten minutes before one of them could be lowered. The two men were lost, and the boy taken on board in such an exhausted condition that he died almost directly. This occurred in broad daylight, in almost smooth water, with plenty of men to man the falls efficiently, and everything, on such an occasion we may be sure, in good trim. In the case we gave last week, when the people were saved, the collision took place at night, and in *ten minutes* after the first shock not a vestige of the ship from which the rescued persons were taken was to be seen, and yet all were saved. In one case an efficient means of lowering the boats instantly was at hand, in the other there was none. We but a few weeks since alluded to the disregard of life shown by the Admiralty for the seamen, and it gives us no little pain to have now to give so prominent an instance in support of what we then advanced.

On Thursday night some experiments took place at Devonport, in the presence of Port-Admiral Sir Barrington Reynolds, and a large party, for testing the use of "Robson's Patent Signal Lights," in conjunction with Redl's Code, an article on which appeared in the last number of this Magazine. These lights are of various colours, and may be made to burn with the most intense brilliancy for from three minutes to half-an-hour. The trial gave great satisfaction, and it was the unanimous opinion of the authorities present that these lights are invaluable in conjunction with the Redl signals. Communication was quickly obtained from the flag-ship Impregnable, lying off Mount Edgcombe, and the gunnery-ship Cambridge, in Hamoaze. Mr. Robson also exhibited some of his new rockets, made expressly for signalizing. These rockets throw out a brilliant ball of coloured fire, which floats in the air some time after the discharge. Mr. Robson's lights have been repeatedly brought to the notice of the Admiralty, and reported upon most favourably by their officers. We presume measures will now be taken to secure them for the use of the Royal Navy.

We have before us a report of a select committee of the American Institute of the city of New York, appointed "to examine the paying-out machinery on board of the United States steam frigate Niagara, and to furnish a report thereon concerning the design and construction thereof." The committee have arrived at the following conclusions:—1st. That the apparatus used in the first attempt to lay the Atlantic telegraph cable, composed of the paying-out instrument of four geared sheaves, and the brake used, failed, and that the use of them was wholly abandoned in the second attempt. 2nd. That although Appold's brake was attached to the apparatus used in the second essay, and made an integral and essential portion of it, yet it was very materially modified before it could be adapted to the peculiar purpose for which it was resorted to. 3rd. That the paying-out instrument by which this cable was laid, had but two sheaves, running independent of each other, and that in this essential feature it was wholly novel. 4th. That this instrument and the modification of Appold's brake was constructed from the designs of and under the direction of chief engineer Wm. E. Everett, U. S. N. 5th. That the entire apparatus was constructed by the authority of the Directors of the Atlantic Telegraph Company, and that its design and construction was confided to Mr. Everett alone. Finally, That if the apparatus had proved inadequate to the required purpose, that Mr. Everett could alone have been held professionally responsible, as the paying-out instrument of his design was essentially different from that recommended by the commission of engineers. In conclusion, the committee add that although without proper paying-out machinery in the vessels of transportation, it would not have been practicable to lay the cable, yet that the mere possession of such machinery did not constitute all that was requisite to attain this end, as the proper stowage of the cable and the manner of its delivery to the paying-out machine was equally necessary to success. The important duty of superintending both the stowing and the delivery on board of the Niagara and Agamemnon was delegated to Messrs. W. H. Woodhouse and Samuel Canning, civil engineers of London, to whose skill, ingenuity, and unremitting attention is to be ascribed in a large degree the successful issue of the laying of the Atlantic telegraph cable. Signed by "Chas. H. Haswell, Horatio Allen, Geo. W. Quintard, John A. Bunting, Joseph P. Pirsson, Chas. W. Copeland," and dated New York, March 3rd, 1859.

From a paper issued by the Crystal Palace Company we learn that the ensuing season at the Palace promises to be one of the most brilliant and important which it has ever had. It will be the year of the "Great Handel Festival," for which so many great preparations have been long making. But the Directors do not allow the great event to influence their efforts for, or to decrease the other attractions. It will be found that all the usual "events" are to come as usual. There will be four Flower Shows: the first—always one of the most brilliant ever seen, and on account of the season doubly charming—on May 18th. The second on June 8th, when the flowers are in their fullest luxuriance. The third, on September 7th, and following days, will be the show at which the Dahlias, Hollyhocks, and the beautiful autumn flowers are shown: and the fourth on Nov. 9th, for Crysanthemum Shows. There will be also a series of Six Opera Concerts by the Covent-garden artistes, and many other concerts beside. The programme contains a long enumeration of the permanent features of the Palace, which are equally interesting, and allusions are made to the great gatherings and fetes which always take place, apart from the fixed arrangements of the Company itself, such as the Early Closing Association Fetes, the gatherings of the Foresters, &c., which are features of themselves. The season opens formally on Monday next, with a Fete in commemoration of the Indian Rebellion, which will be important in many respects. In the neighbourhood of the Palace, even at this early period, we are told there is scarcely a house to let, or a lodging or hotel accommodation which has not been taken up, even at very high prices; during the times of the Handel Festival the throng of visitors in the neighbourhood will doubtless be very great. The Season Tickets will be of two classes; one at *two guineas*, which will admit to everything during the season, except to the performances of the Handel Festival; and one at *one guinea*, which will admit to everything (with the same exception) when the price of admission is under five shillings.

One of the last Acts passed in the late session was to amend and explain the statute 6th George IV., cap. 129, to repeal the laws relating to the combination of workmen, and to make other provisions in lieu thereof. It seems that different decisions have been given on the construction of the recited Act, and it is now enacted that no workman or other person, whether actually in employment or not, shall, by reason merely of his entering into an agreement with any workman or workmen, or other persons, for the purpose of fixing, or endeavouring to fix, the rate of wages or remuneration at which they, or any of them, shall work, or by reason merely of his endeavouring peaceably, and in a reasonable manner, and without threat or intimidation, direct or indirect, to persuade others to cease or abstain from work, in order to obtain the rate of wages or the altered hours of labour so paid or agreed upon, or to be agreed upon, shall be deemed or taken to be guilty of "molesta-

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tion" or "obstruction" within the meaning of the Act, and shall not therefore be subject or liable to any prosecution or indictment for conspiracy. There is a proviso to the clause that nothing contained shall authorise any workman to break or depart from any contract or authorise any attempt to induce any workman to break or depart from any contract he may have entered into.

A recent number of the *Revue des Deux Mondes* contains an interesting article on the Naval Arsenal at Cherbourg, says the *Athenæum*, from which it appears that the works have cost £7,611,000. They are thus divided:—

PERIODS.	Sea Works.	Fortifications and War Buildings.	TOTAL.
	Francs.	Francs.	Francs.
Ancient Monarchy, from 1783 to 1792	31,192,679	10,243,268	41,436,047
Republic, from 1793 to 1800	.....	.....	.....
Consulate and the Empire, from 1801 to 31st March, 1814	29,466,387	8,971,296	38,377,683
Restoration, from 1st April, 1814, to 31st July, 1830	10,336,115	1,587,494	11,923,609
Government of July, from 1st August, 1830, to 24th February, 1848	40,656,139	8,467,556	49,123,695
Republic, 25th February, 1848, to 2nd December, 1852	16,113,001	2,892,433	19,605,434
Government of Napoleon III., from the 3rd December, 1852, to 31st December, 1857	25,940,201	4,468,093	30,308,294
	153,644,522	36,630,240	190,274,762

Water-pipes have been made of almost every conceivable material—wood, metals, gutta-percha, india rubber, stone ware, glass, &c., but paper pipes are novelties. The new pipes, a Parisian invention, are made of paper dressed with bitumen; they are capable of resisting a pressure of 15 atmospheres, and made to bear much more by increasing the thickness of their walls. They are, of course, very light, very homogeneous, inoxidable, perfectly wholesome, and remarkably cheap. The bitumen is mixed with a certain quantity of chalk, not given, and is heated in a boiler to melting; a roll of paper is then made to pass through the liquid bitumen, and immediately afterwards it is rolled upon an iron mandril of the size desired for the interior of the pipe, to the thickness required. When this is done, the mandril is placed into another cauldron, which contains pure bitumen, and afterwards rolled upon a flat stone sprinkled with fire; the mandril is then drawn out, and the inner surface of the pipe dressed with pure bitumen. These pipes are four times cheaper and five times lighter than cast-iron. Joints are made with perfect ease, and altogether this novelty promises to be useful.

M. Morren has recently been occupied in investigating the phenomena produced by electricity on various gases, and has published the results of some of his experiments, which deserve attention. Having introduced a mixture of hydrogen and nitrogen from two mercurial gasometers, into a receiver, in which the electric spark from a Ruhmkorff's apparatus was received between two platinum wires, he produced ammoniacal gas; a solution of sulphuric acid took up the newly-formed gas and left the components in the best condition for producing a further amount; two slips of litmus paper became blue in a minute when introduced into the receiver. In a short time M. Morren was enabled to produce 13 cubic centimetres of ammonia. With a charcoal conductor and hydrogen gas, M. Morren produced carburetted hydrogen. He is now experimenting upon cyanogen, which, he says, he has repeatedly produced by his electric current alone, which seems to bring together the necessary molecules; one of the poles appearing to have a greater power than the other in this respect.

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated March 3, 1859.

572. W. Mitcalfe, of the Coal Exchange, Gentleman. Improvements in discharging cargoes, and in raising and lowering bodies.

Dated March 5, 1859.

588. R. Leake and M. Sykes, of Barnsley. Improvements in furnaces for consuming smoke and generating heat, parts of which improvements are applicable to furnaces generally.

Dated March 9, 1859.

616. J. Cooke, of Cheltenham. Improvements in apparatus for giving signals on railways and vessels, and other such like uses.

Dated March 16, 1859.

662. H. Ambler, of Halifax. Improvements in breech-loading ordnance, and in the means of producing part or parts thereof, which improvements are also applicable to what are called small arms.

Dated March 17, 1859.

680. A. Mein, Glass Bottle Maker, of Glasgow. Improvements in making glass bottles, and in the apparatus connected therewith.

Dated March 23, 1859.

740. B. Browne, of King William-st., City. A new method of working or operating switches and signals on railways by improved apparatus for that purpose. A communication from V. A. Prou.

Dated March 26, 1859.

762. W. Redgrave, of Tavistock-st., Tailor. An improved pillow travelling cap.

764. S. Dreyfous and G. Richer, Civil Engineers, and E. Cornier, Merchant, all of Paris. Improvements in preserving eggs.

Dated March 30, 1859.

792. J. W. Hadwen, of Halifax, Cotton Spinner. A new art or manufacture for converting certain kinds of silk waste into yarns or threads.

Dated March 31, 1859.

806. T. Ivory, of Edinburgh, Advocate. Improvements in steam boilers, and furnaces for the same.

Dated April 2, 1859.

824. A. Riply, of Bridge-st., Blackfriars, Engineer, and J. Roberts, of Nelson-sq., Bermondsey, Engineer. Improvements in machinery for striking or scraping leather and tanned or untanned hides.

826. A. Bessemer, of Tavistock-terrace, Upper Holloway, Gentleman. Improvements in furnaces to be employed in the manufacture of iron and steel.

828. J. Skertchly, of Ashby-de-la-Zouch, Engineer. Improvements in apparatus for regulating the pressure of gas.

830. A. Paget, of Loughborough, Manufacturer. Improvements in machinery or apparatus for the manufacture of looped fabrics, and in the manner of constructing the same.

832. M. Coupland, of Haggerstone, Engineer. Improvements in furnaces.

Dated April 4, 1859.

836. J. Eccles, of Blackburn, Cotton Manufacturer. Improvements in machinery for making bricks, tiles, and other articles formed of plastic materials.

840. J. H. Burton, of Enfield-lock. Improvements in the manufacture of barrels for small fire-arms.

842. W. E. Newton, of Chancery-lane. An improved construction of retarding apparatus or break for railway carriages. A communication from A. Castellir.

844. M. A. Crooker, of New York, Engineer. Improvements in paddle wheels for steamers.

846. E. Morewood, of Enfield. Improvements in coating metals.

Dated April 5, 1859.

850. E. Fairburn, of Mirfield, of York, Card Manufacturer. Improvements in machinery for carding wool and other fibrous substances.

854. B. Browne, of King William-st., City. Improvements in propelling ships or other vessels through water. A communication from P. K. Skinner.

858. F. M. Crichton, of Stoke-bishop, Gloucester, Gentleman. Improvements in clocks or time keepers.

Dated April 6, 1859.

862. W. Owen, of Rotherham, Engineer. Improvements in the manufacture of railway wheels and tyres, and in the apparatus employed therein. Partly a communication from R. Owen.

864. J. Scoffern, of Barnard's-inn, Bachelor of Medicine. Improvements in lubricating projectiles and cartridges.

Dated April 7, 1859.

866. A. Chaplin, of Glasgow, Engineer. Improvements in steam boilers.

868. R. Wardell, of Stanwick, York, and H. Kearsley, of Ripon. Improvements in reaping machines.

870. J. Lakin, jun., of Hall-end, near Tamworth, Farmer. A new or improved agricultural drill.

872. J. Rawlings, of Carlton-hill East, Gentleman. An improved construction of boot tree.

Dated April 8, 1859.

874. W. H. Smith, of Philadelphia, M.D. Improvements in the construction of cartridges, and in the fire-arm for using the same.

876. W. Campion, of Nottingham, Machine Builder. Improvements in machinery for the manufacture of looped fabrics.

878. M. A. F. Mennons, of Paris. An improved articulated joint for water, gas, and steam pipes. A communication from V. Doré.

880. N. A. Grumel, Ink Manufacturer, of Paris. Improvements in dycing cotton, wool, silk, flax, and other fibrous materials or fabries.

882. W. Hooper, of Mitcham, India Rubber Manufacturer. Improvements in re-working or re-manufacturing compounds of india rubber and sulphur.

Dated April 9, 1859.

888. T. Barnett, of Oldham, and H. T. Sourbuts and W. Lovnd, of Hyde, Engineers. Improvements in steam engines.

890. J. Hawkins, of Lisle-st. Certain improvements in the manufacture of stirrups, bits, spurs, buckles, and other such like articles connected with harness and saddlery.

892. R. J. Derham, of Bristol, Cooper. Improvements in cheese vats.

894. C. F. Vasserot, of Essex-st., Strand. A new motive power applicable to tanneries. A communication from J. P. Lucet.

896. H. P. Gardner, of Boston, United States. Improvements in machinery for blocking or crimping the uppers of boots and shoes, and in treeing boots. Partly a communication from W. Willmott and P. Shaw.

Dated April 11, 1859.

904. A. Bower, of Liverpool, Cotton Broker. Improvements in or applicable to keels of navigable vessels.

906. R. A. Brooman, of 166 Fleet-st., Patent Agent. Improvements in candle moulds. A communication from A. Godchaux.

908. W. H. Barlow, of Great George-st., Westminster. Improvements in beams and girders.

Dated April 12, 1859.

910. W. Clark, of Langhaugh, Galashiels, Lieut. R.N. An improved safety block to be used for lowering ships' boats, the same being applicable to other like analogous purposes.

912. P. Aitchison, Brass Founder, of Sheffield. Improvements in taps.

914. E. T. Noualhier, of Paris, Manufacturer. An improved ventilator.

916. P. Hill, of Manchester, Weaver, and J. Moore, of Salford, Small Ware Manufacturer. Improvements in weaving double pile fabrics.

918. M. Castay, of Paris, Clergyman. Improvements in metallic bridges.

920. J. Ward, of King's Norton, Machinist. An improvement or improvements in working fly presses used for raising metals, coining, and other like purposes.

922. S. Tatton, of Leek, Silk Dyer. Improvements in preparing and treating silk, and improvements in dyeing silk.

Dated April 13, 1859.

924. W. A. Martin and J. Purdie, of Woolwich, Engineers. Improvements in fire bars.

928. W. Craft, of Hammersmith, and T. Wilson, of Chiswick. Improvements in the manufacture of pinafores and bibs for children.

932. J. L. Stevens, of Fish-street-hill, Civil Engineer. Improvements in the fire grates of locomotive, marine, and other furnaces.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

935. J. Luis, Welbeck-st. A new cooling apparatus for liquids, especially beer. A communication from J. L. Baudelot. Dated April 14, 1859.

988. A. W. Williamson, of University College. Improvements in making extracts from liquorice root. Dated April 19, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, April* 26, 1859.)

2845. P. Robertson. Shuttles. A communication.
2847. M. Schaffner. Smelting zinc ores.
2851. R. Whittam. Tracing designs.
2866. F. Jossa. Furnaces.
2876. J. Wardill. Controlling the running out of ropes.
2886. J. W. Friend. Flow of liquids, &c.
2887. A. Mackenzie. Sewing machines.
2888. J. J. Margaix. Galvanic batteries.
2890. R. A Brooman. Plating forks, &c. A communication.
2893. W. B. Johnson. Railways.
2902. J. Taylor. Pumps.
2920. R. Clegg, F. Angerstein, and G. Ferry. Imparting reciprocating motion.
2924. M. Kenney. Bridges.
2929. F. Ransome. Rubbing surfaces.
2952. W. B. Johnson. Generating steam.
2963. H. Lowe, W. Trueman, and J. L. Pitts. Axle.
2975. W. Taylor and W. D. Grimshaw. Regulating temperature.
2976. R. D. Kay. Colouring fabrics.
3000. R. Robin. Reaping machines.
3005. F. W. A. Casper and G. H. Schmahl. Seats.
7. J. Oliver. Lubricators.
38. W. Draper. Printing.
42. W. Corfield, jun. Chains.
59. W. E. Newton. Winding, twisting, &c. A communication.
153. R. Garrett, jun., and J. Kerridge. Thrashing and dressing machine.
177. W. E. Newton. Meter. A communication.
647. T. Patstone. Shades for lamps.
662. H. Ambler. Ordnance.
734. J. Macintosh and G. Rhodes. Tents.
765. M. Firth. Grinding saws, &c. A communication.
876. W. Campion. Looped fabrics.
935. J. Luis. Cooling apparatus. A communication.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

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LIST OF SEALED PATENTS.

Sealed April 21, 1859.

2398. J. Luis.
2391. A. P. A. Beau.
2392. J. Kinsey.
2395. G. Speight.
2408. B. Foster and P. Smith.
2410. J. Smith.
2412. P. Brunon.
2413. W. Kirrage.
2427. E. T. Hughes.
2438. M. A. F. Mennons.
2463. G. P. Evelyn.
2478. S. Davey.
2359. J. Webster.
2898. I. Ketchum.
282. J. Hosking and T. Cock.
348. T. Moss.
404. H. Gardner.
481. J. Grimond.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

945. W. Crossley and G. Goldsmith.
953. W. Maugham.
958. A. Symons and E. Burgess.
994. C. Swift and J. J. Derham.
997. R. Lakin, J. Thompson, E. G. Fitton, and F. A. Fitton.
1003. C. A. Arnaud.
1006. T. Heiffor.
1058. I. Holden.
1097. G. J. Firmin.

PATENT ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

1852. 452. J. Carnaby.

LIST OF SPECIFICATIONS, &c.

Published during the week ending April 21, 1859.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s d		s d		s d		s d		s d		s d
2091	0 7	2099	0 10	2105	0 6	2110	0 5	2116	0 8	2121	0 3
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2098	0 7	2104	0 3	2109	0 9	2114	0 6	2120	0 3	...	...

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LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Dates of Registration.	Nos. in Register.	Names and Addresses.	Subjects of Design.
1859.			
Mrh. 26,	4159	Breckuell, Turner, and Sons, Haymarket ...	Candle shade.
April 4,	4160	Moore, Adams, & Pead, Friday-st.	Wrapper.
„ 5,	4161	Parker and Fell, Birmingham	Earring.
„ 12,	4162	Taylor and Alvey, Eddingley	Drill.
„ 12,	4163	H. Parrish, Birmingham.....	Pin or skewer.
„ 13,	4164	G. Jeffries, Norwich ...	Mach. for charging cartridges.
„ 14,	4165	W. W. Rouch, Strand...	Photog. tent.
„ 20,	4166	H. A. Hotden, Birmingham.....	Lamp.
„ 21,	4167	G. H. Ellis, Malton.....	Washing mach. or churn.
„ 27,	4168	J. Young, Ayr	Apparatus for sowing.
		PROVISIONAL REGISTRATIONS.	
Mrh. 25,	1062	Mason and Richards, Birmingham.....	Table expander.
„ 26,	1063	J. Newman, Birmingham.....	Tag, or fastener.
„ 29,	1064	E. Hawthorn, Ratcliff Cross	Support for lanthorns.
April 1,	1065	G. Morgan, Kingsland Road	Lens.
„ 1,	1066	A. G. De. R. Hely, Oxford-street.....	Aquarium tank.
„ 8,	1067	J. Greenish, Dorset-square.....	Photographic apparatus.
„ 20,	1068	J. Braxier, Wolverhampton.....	Lock vice.
„ 21,	1069	C. Mansel, Plymouth...	Slipper case.
„ 26,	1070	R. P. Harris, Bradford	Stool.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINES, &c. *None.*
BOILERS AND THEIR FURNACES. *None.*
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 2089, 2002.
SHIPS AND BOATS, including their fittings, 2061, 2079.
CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 2035.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 2060, 2076, 2114.
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 2058, 2064, 2069, 2071, 2072, 2080, 2086, 2099, 2106, 2109.
BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c., 2107, 2118.
LIGHTING, HEATING, AND VENTILATING, 2087, 2088, 2119, 2120.
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 2068, 2077, 2078, 2093, 2104, 2105, 2122, 2123.
METALS, including apparatus for their manufacture, 2075, 2115, 2116.
CHEMISTRY AND PHOTOGRAPHY, 2067, 2070, 2121.
ELECTRICAL APPARATUS, 2110.
WARFARE, 2085, 2095, 2108, 2112, 2113.
LETTER PRESS PRINTING &c., 2103.
MISCELLANEOUS, 2059, 2060, 2063, 2065, 2066, 2073, 2074, 2079, 2081, 2082, 2083, 2084, 2090, 2091, 2092, 2096, 2097, 2098, 2100, 2101, 2106, 2111, 2117.

2058. D. CHEETHAM. *Improvements in machinery or apparatus for preparing for spinning, and spinning cotton, wool, and other fibrous materials.* Dated September 10, 1858.

This relates to an arrangement of rollers used in drawing frames, &c., and consists, 1, in raising the centres of the front pair above those of others; and by this arrangement the patentee is enabled to employ a top roller of larger diameter which will serve as a weight in itself. He also, in like manner, raises the level of the back pair. 2. In weighting the intermediate rollers. This is done by placing the weights above their axes and resting thereon. To these weights he joints levers, by which they may be raised. 3. In causing the cam, after it has revolved in one direction, to turn in the other, a traversing motion being at the same time imparted to the delivery. 4. In the application of a spring between the eccentric or crank and the comb, for bringing the connecting part back, so as to keep it in contact with the crank-pin or analogous part, whereby the concussion, which ordinarily takes place when the connecting parts become worn, is divided. *Patent completed.*

2059. W. TOSHACH. *Improvements in pile-driving machines.* Dated September 10, 1858.

These consist in so arranging them that the lift of the hammer is effected by an endless chain or chains, such chain or chains having continuous motion imparted to them (or it may be intermittent) and lifting the hammer by the contact and hold of certain parts, which parts are caused to withdraw their hold from the hammer when the required elevation has been attained, and thus producing the fall and blow required to drive the pile. Immediately the hammer has fallen the parts are in position to raise the hammer again, and this without loss of time or trouble in overhauling the chain, as in ordinary machines. *Potent completed.*

2060. P. JOURNET. *An improved toy.* Dated September 11, 1858.

This consists of a closed-up semi-circular flat box. At each of the upper flat sides there is a hole provided with a corresponding trap-door, which a spring tends to keep shut. There is a small cross bar at each end with a pin inserted in the two opposite sides of the box towards the centre: from this bar an arc or semi-circular or curved plate, or strong wire provided towards the middle of its length with a counter weight, is hanging by a wire, whereas at each end of this arc is fixed a grotesque figure, so that by the effect of the see-saw motion that may be imparted to the arc the said figure will alternately strike against the doors, and thus opening them alternately present themselves to sight. *Patent abandoned.*

2061. L. HILL. *Improvements in apparatus for lowering or paying out ships' chains and anchors.* Dated September 11, 1858.

The patentee constructs the windlass purchase or capstan so as to give out chain under the regulation when desired of a brake or friction strap. *Patent completed.*

2062. W. BAKER. *Improvements in preparing food.* Dated September 11, 1858.

This consists in combining the following ingredients:—Indian meal, locust beans, oatmeal, rice, carbonate of soda, tumeric, carraways, ginger. *Patent abandoned.*

2063. F. GIESBERS. *Improvements in the manufacture of coke.* Dated September 11, 1858.

Here peat is employed, which, when dry, is saturated with coal tar or pitch, or Trinidad pitch. The peat thus saturated is first subjected to a moderate heat (say from 700 deg. to 800 deg. of Fah.) in retorts or ovens, for some length of time, and then the heat is increased up to a low cooking heat by which the mass is converted into coke. *Patent abandoned.*

2064. J. M. COURTAULD. *An improvement in clearing and preparing silk crapes, aerophanes, and other like fabrics, lisses and other gauzes and lace, and in machinery employed therein.* Dated September 11, 1858.

This consists in bringing the surface of the fabric to be "cleared" in contact with another part thereof, or of a similar fabric, and then separating the surfaces by the following machinery. Upon a frame the patentee mounts two rollers clothed with india-rubber; the bearings of one roller are fixed, while the bearings of the other are free to move towards and from the fixed bearing; a weight or spring is employed to keep the rollers together. One roller is driven, while the other revolves by frictional contact. He introduces perforated gas and steam pipes under the rollers, to obtain heat or moisture under the crapes. A piece of crape, &c., is mounted upon one roller, and one end connected to the other roller, and the machine set in motion; the crape unwinds from one roller and winds upon the other roller, and the contact and separation of the surfaces of the crape perform the clearing. *Patent completed.*

2065. H. PAGE. *An improved crown or round glass, and apparatus for manufacturing the same.* Dated September 11, 1858.

This consists in manufacturing crown or round glass without the "bullion." *Patent completed.*

2066. J. L. HINKS. *A new or improved tap or cock for drawing off and filtering liquids.* Dated Sept. 11, 1858.

The patentee describes a tap or cock in which the liquid, before being drawn off, is made to pass into a chamber divided by a diaphragm, or partition of filtering material, a pipe and valve being connected with each of the two parts into which the chamber is divided by the filtering material, so that by opening one or other of the valves, the liquid may be drawn from the said chamber either without filtration, or be made to pass through the filtering material. *Patent completed.*

2067. H. WIKOFF. *A new tonic medicine for the cure of coughs, and diseases of the chest.* (A communication.) Dated September 11, 1858.

This consists in extracting the sap from the maritime pine, and administering it as a tonic medicine in given quantities, either in its natural state, or when clarified, or after having been made into a syrup. *Patent abandoned.*

2068. W. H. MANNING. *Improvements in candlesticks or holders.* Dated September 11, 1858.

This consists in having a moveable binding plate suitably curved and shaped, placed within and at one side of the socket, and so arranged that it can be made to press the end of the candle against the opposite side of the socket of the candlestick or holder, and so to hold it secure. *Patent completed.*

2069. L. KABERRY and T. MITCHELL. *Improvements in machinery or apparatus for preparing for spinning, and spinning cotton, wool, and other fibrous materials.* Dated September 11, 1858.

This relates, 1, to the differential motion of slubbing or roving frames, and consists in the use of an extended boss for carrying the wheels. 2, in forming the bobbins for preparing machinery of metal; 3, in a method of balancing the lifting rail of slubbing or roving frames; and, in reference to machines of the male class, causing the material to be delivered by the rollers in a variable degree, as the cop increases in size, and particularly for that purpose the employment of a travelling inclined plane. The parts of the invention are not described apart from the drawings. *Patent completed.*

2070. W. GOSSAGE. *Improvements in the manufacture of soda and potash.* Dated Sept. 11, 1858.

This relates to a previous patent dated 21st August, 1857, and consists in a method of extracting sulphur from alkali waste by the agency of carbonic acid gas; also in a method of obtaining the carbonic acid gas. *Patent abandoned.*

2071. W. THOMSON. *Improvements in bleaching yarn, warps, or similar materials.* Dated September 13, 1858.

The patentee passes the yarn or warps, previous to being sized, through a weak solution of chloride of lime, or chloride of soda, and then either over hot cylinders to dry the material, or through a steam chest, either of which will cause the bleaching liquor to act on the yarn, and bleach it. He then passes it through rollers in water to wash off the lime, soda, or other agent, and the yarn is ready for sizing. *Patent completed.*

2072. G. FLAGEOLLET. *Improvements in self-acting mules.* Dated September 13, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

2073. J. B. A. DUCLERE. *A new method of separating solids from liquids for disinfecting purposes.* Dated Sept. 13, 1858.

This consists in the employment of magnesia, salts, metallic precipitates, and phosphoric and amoniac acids, the said products being employed for manure or other useful purposes. *Patent abandoned.*

2074. C. W. SIEMENS. *Improvements in refrigerators, and in the treatment of the freezing or cooling material or materials used therewith.* Dated September 13, 1858.

These have reference to that description of apparatus in which the freezing is produced by dissolving chloride of calcium, &c., and consists in constructing such refrigerators of a series of vessels fitting one within the other, and of an annular form, so arranged that the solution shall be gradually produced by a current of fresh or salt water passing upwards through a tube, and distributed from the top of such tube, so as to spread itself amongst, and afterwards descend through the body of the salt, and gradually pass away from the apparatus; and so that in its circulation it shall, 1, come in contact with removeable vessels containing the liquids or material to be frozen, and, 2, in contact with a compartment through which water, &c., may circulate for being cooled, and further in contact with removeable articles, such as bottles, or jars, or solid objects for cooling them also. It also consists in constructing the vessels above mentioned of a long and narrow taper form, circular or otherwise in section, covered at the upper end and closed at the bottom with a moveable cork or elastic plug to prevent bursting when solidification ensues, and allow the contents to be removed. *Patent completed.*

2075. S. HANBURY. *An improvement in the manufacture of tubes of copper, brass, and other metals.* Dated Sept. 13, 1858.

This consists in making tubes thicker at both ends than in the centre, to afford facility for fixing them. *Patent completed.*

2076. R. FROST and A. RIGG. *Improvements in apparatus for cleaning grain or seeds and bran.* Dated Sept. 13, 1858.

Here the screen or riddle of a machine is made of a corrugated form, and the grain is caused to meet a blast of air in an upright or vertical spout. The direction or action of the air-blast is governed as it enters the upright or vertical spout by louvre boards, and the quantity of air admitted to the fan or blower is regulated by flap doors over the inlet openings. These doors are controlled in their action by balance weights, so that by the combined action of the air and the apparatus applied to the doors the admission of air is regulated. The grain or seed is equally distributed to the blast by a fluted roller. The inner coating of flour is removed from bran by metallic scourers, roughed in the

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manner of an ordinary grater, and is formed on a flat surface. *Patent completed.*

2077. J. TURNER. *Improvements in the manufacture of hats.* Dated September 13, 1858.

Here the patentee uses for the "tip" or "brim" prepared grass, or straw, or the article known as Brazilian chip, or palm leaf, not making the side of the hat of this material, but of the materials usually used. *Patent completed.*

2078. J. W. TOWELL. *An improved helmet.* Dated Sept. 13, 1858.

This consists in forming the same of two or more layers of cork united by intermediate layers of cloth coated with gum, shellac, &c., a block or mould being employed for producing the desired shape, whereby a union of the cork and intermediate cloth is effected, and the necessary strength and durability obtained, in connection with which the head-leather or lining, with suitable perforations, is so arranged as to admit air passing through the same into the body of the helmet for ventilation. *Patent abandoned.*

2079. C. J. REDPATH. *Improvements in ships' and other pumps.* Dated Sep. 14, 1858.

This invention is not described apart from the drawings. *Patent completed.*

2080. W. RILEY. *Certain improvements in looms.* Dated Sep. 14, 1858.

These consist, 1, in a warp-break or series of rollers for carrying and guiding the warp. 2, in the addition of a measuring apparatus. *Patent completed.*

2081. L. VIDIE. *Improvements in apparatus for measuring the pressure of fluids by the flexion of diaphragms.* Dated September 14, 1858.

This consists 1, in using two corrugated tubes soldered at their lower ends to a stationery plate, and closed at their upper ends by an annular plate, by which the pressure is lessened on tubes of a given diameter, and such tubes may be made thinner or more flexible. 2. In combining flexible plates with corrugated tubes (forming the covers or closings) if a great deflexion is required. The invention also includes other improvements which are not described apart from the drawings. *Patent completed.*

2082. J. LUIS. *Coke and gas kilns.* (A communication.) Dated September 14, 1858.

This invention is not described apart from the drawings. *Patent completed.*

2083. J. LUIS. *A new system of moulding without foundry pattern.* Dated September 14, 1858.

This is applicable to the moulding of cog-wheels, and consists principally in hollowing out in sand, by a revolving plane table turning round a fixed centre, a circular space, having for depth the height of the wheel, and for thickness that of the felloe of the wheel, reckoning the teeth. In this hollow are placed several cores, moulded separately, and having the form of the openings between the teeth at equal distances one from the other by means of an apparatus similar to a graduating machine. *Patent completed.*

2084. W. J. HOYLE. *Improvements in arrangements and mechanism or apparatus for signalling by sound.* Dated September 14, 1858.

This relates to that system of sound signals produced by an instrument having the character of the whistle, and consists—1, in applying to the ordinary steam whistle reflectors similar to those used in reflecting light, for concentrating and throwing out the sound vibrations produced by the whistle all round in a horizontal plane; 2, in applying to the ordinary steam whistle a reflector for concentrating and throwing out the sound vibrations in one direction, the reflector being arranged on a vertical axis, so that it can be rotated by hand, or self-acting mechanism; 3, in self-acting arrangements for producing sounds or signals by a whistle of any given duration, and at any given intervals. *Patent abandoned.*

2085. G. C. GRIMES. *Improvements in fuses, and in the means of manufacturing fuses.* Dated Sept. 14, 1858.

This relates—1, to forming the paper, &c., upon which the ignitable composition is applied of a disc, square, lozenge, or other form, upon the end of a short length of wire, so that whilst the head of prepared matter is capable of being held by the wire as a stem when friction is applied thereto, such stem may be readily pushed through the head to serve as a means of connection to a cigar either before or after ignition; 2, to means by which lengths of wire may be applied as stems or holding means to fuses; 3, to forming fuses of that kind produced of slips of prepared paper or such like material, with part of the length of such slips thinner than the other for obtaining elastic pressure thereto when in use; 4, to the composition or matters applied to the ends of splints of wood, &c. *Patent completed.*

2086. R. LAKIN and J. WAIN. *Improvements in spinning mules, and other machines of that class, used for spinning cotton and other fibrous substances.* Dated Sept. 14, 1858.

These consist—1, in a means of causing the driving strap to be partially traversed on to the fast pulley, at the time when the friction cones used for backing-off are taken out of contact with each other, and of regulating the time of the strap remaining on the fast pulley; 2, in an apparatus for varying the speed of the backing off; 3, in attaching a cam to the faller-shaft to act on one end of a lever connected to the counter faller finger, so as to regulate the motion given from the counter faller for governing the winding-on; 4, in the application of a spring or weight to the pulley on which the cord or strap for regulating the winding-on moves, for keeping the cord or strap at an uniform tension; 5, in an improvement in the self-acting mules known as Robert's mules, so that during the outward run of the carriage the driving strap may be traversed from being partially on the fast and partially on the loose pulley to be on the loose pulley only, without the intervention of the cam shaft. The invention is not fully described apart from the drawings. *Patent completed.*

2087. A. H. J. BARIABLE. *Improvements in apparatus employed in the production of light.* (A communication.) Dated September 14, 1858.

This relates to apparatus for the production of light in which jets of ignited gas are projected against a surface of lime, &c., to which a slow motion is given. The patentee encloses a column of lime, &c., in a case or guard, along which the column of lime, &c., may be impelled, the case or guard extending above as well as below the opening at which the jet or jets of flame strike the lime, &c. At this opening in the case he fixes wires, so that the lime, &c., upon which the flame or flames may happen to be impinging shall not fall down or out of the case when it happens to crack or depreciate by the action of the flame. By these means he is enabled to prevent a great deal of the irregularity in the light which would be occasioned by the breaking away or the decrepitating of the lime, &c., by the action of the flame. *Patent completed.*

2088. S. S. MASSIA. *Improvements in stoves, or fireplaces.* (A communication.) Dated September 14, 1858.

Here certain openings at the sides and back of the grate are so situated and arranged as to conduct the smoke with certainty into the chimney. The stove or fireplace is set in an inclosed chamber, and there is no opening into the chimney except through a tubular passage which rises from an upper opening. *Patent abandoned.*

2089. Hon. W. E. COCHRANE. *An improvement in the fastenings of railways.* Dated September 14, 1858.

This consists in the introduction of pins or rods of a hard material which will not sink transversely through the wood fastenings, so that the ends of the pins or rods may come flush with the sides of the wood fastenings. By these means, when a wood fastening is driven in between the cheek of a railway chair, and a rail or rails therein, the the ends of the pins will come in contact with the inner surface of the chair and with the rail or rails therein, and will, notwithstanding the shrinking of the wood, still retain the rail or rails secure. *Patent completed.*

2090. F. FOWKE. *Improvements in fire-engines.* Dated September 15, 1858.

This invention is not described apart from the drawings. *Patent completed.*

2091. E. SMYTH. *Improvements in swimming belts and life preservers.* Dated September 15, 1858.

This consists 1, in employing a hollow inflated belt or float, composed of vulcanised india-rubber, and provided with suitable bands, or straps, to attach it to the body. 2, in employing several separate belts or floats, each inflated by a separate flexible tube, the other or mouth ends of these tubes being traced side by side to each other, and to the mouth-piece of a float worn by the person in charge of the compound float. *Patent completed.*

2092. E. DORSETT. *A portable carriage tank and furnace, to be employed for the purpose of creosoting hop-poles or other timber.* Dated September 15, 1858.

The inventor employs a portable carriage for carrying the tank, creosote, and furnace to any desired spot, so that the poles can be dipped and creosoted, and the carriage or machine afterwards moved onwards to the next position where creosoting is required *Patent abandoned.*

2093. W. G. TAYLOR. *Improvements in the manufacture of gloves.* Dated September 15, 1858.

This consists in the manufacture of gloves from rabbit or hare skins. *Patent completed.*

2094. Provisional protection for this invention was refused.

2095. G. REDFORD. *Making cartridges of metal, or gutta percha, with or without bullets, and for other purposes.* Dated September 16, 1858.

Here pieces of metal or gutta-percha, are first struck in a die so as to produce the requisite shape of the bullet or blank cartridge, and to form part of the tubular portion, which is afterwards elongated by being placed in a steel bed, and forced through by a plunger. When it is required to produce cases for containing various substances, a neck and opening are given, by changing the form of the die and punch accordingly. *Patent abandoned.*

2096. R. ALLISON. *Improvements in apparatuses for boring and sinking.* Dated September 16, 1858.

Here the boring head or tool is hollow, and of wrought or cast-iron, furnished at bottom with a series of chisels. Inside the tool, and near the end where the cutters are fixed, is a valve of india-rubber, &c., the edges of which rest upon a ledge fixed on the inside of the tool. To the side of the tool a door or trap is fitted, the bottom of which is in a line with the valve seat. The top of the tube carries an ordinary bow sling, whereby to connect it to the rope or chain for imparting motion to the tool. Wooden blocks are fitted to the outside of the tool to act as fenders. For raising the débris the inventor employs a vessel consisting of two cylinders, one over the other, and the upper cylinder capable of sliding inside that under it; the bottom cylinder has a valve opening inwards, and over the top of the upper cylinder there is a similar valve. The cylinders are held in a frame, and are connected to a rope or chain. Upon the pump being lowered, the upper cylinder will fall within the lower; then upon this upper cylinder being raised, a partial vacuum will be formed, whereupon the debris will flow into the lower cylinder, and be there retained by the bottom valve falling back upon its seat, and closing egress from the bottom of the cylinder. A joint in the frame permits of the lower cylinder being tilted, to empty its contents. *Patent abandoned.*

2097. W. P. STRUVE. *Improvements in apparatus for indicating strains on engine ropes or chains.* Dated Sept. 16, 1858.

Here a pulley or sheave is mounted in a frame which slides freely in two upright guides. The pulley or sheave frame has a chain or rope attached to it which passes over two guide pulleys, and it has two counter balance weights attached thereto by which the pulley or sheave and frame are raised. The weights are sufficient to cause the engine chain or rope when working at the proper strain to be raised or deflected a few feet out of the straight line. At the lower, and also at the upper part of the upright guides in which the frame slides, is applied a lever having a wire communicating with a bell. In the event of the engine rope or chain being subjected to any excess of strain, whether when the waggon is ascending or descending the plane, it ceases to pull on the rope, the bell will be sounde by the frame which carries the sheave coming against th lower or upper lever. *Patent abandoned.*

2098. J. R. SCARTLIFF. *An improved burglars' detector.* Dated Sept. 17, 1858.

This consists of apparatus which, being placed in any part of a house, and made to communicate by a series of cords or wires passing from it with other portions of the building, such as doors, windows, safes, drawers and boxes, will, upon any of these being opened, or tampered with, be thrown into action in such a way as to give an alarm, and, striking a light when such is necessary, indicate accurately the portion of the building or article within it so acted upon. The invention is not described apart from the drawings. *Patent completed.*

2099. C. F. VASSEROT. *Machinery or apparatus for dressing and finishing fabrics.* (A communication.) Dated Sept. 17, 1858.

This consists in passing the fabrics 1st, over rollers where it receives the dressing liquor, and next submitting it to the action of the "beetle." For dressing linen or cotton fabrics the patentee suppresses the beetle, and substitutes a pair of copper rollers (hollow), so that the material, having first received the dressing solution, is caused to pass between the two rollers, which are heated by steam, and is by them pressed and dried. *Patent completed.*

2100. G. PRAX. *Improvements in apparatus for separating the liquid from the solid portions of fecal matters.* Dated September 17, 1858.

This relates to a moveable apparatus to be applied to the pipe by which the fecal matters from water-closets are conducted to the sewers, thereby allowing the liquid portions only to run off in the sewers, whereas the solid parts remain in the apparatus, which latter may be removed and replaced by an empty one. *Patent abandoned.*

2101. E. WELCH. *An improved tobacco press.* Dated September 17, 1858.

This relates to pressing tobacco by a hydraulic press. The patentee fits the press with a railway, upon which the mould traverses. Secured to the head of the press is a block which fits the mould loosely. Immediately below this block the ram of the hydraulic cylinder is situated, and over it is placed the mould. As the ram rises under the action of the fluid injected into the hydraulic cylinder, it will lift the mould from the railway, and cause the tobacco therein to be pressed into a cake by the block on the press lead. *Patent completed.*

2102. C. HADLEY. *Improvements in omnibuses, cabs, railway carriages, waggons, and other similar vehicles.* Dated September 17, 1858.

This consists, 1, in constructing the above mentioned vehicles with a lower centre of gravity than hitherto, and of forming a separate compartment on the roof of (or underneath) the present carriage; 2, in modifications of the springs, axles, wheels, and other parts of carriages. *Patent completed.*

2103. J. H. GRESHAM. *Improvements in copying letters, invoices, and other writings.* Dated Sep. 17, 1858.

Here the writing to be copied is written in any suitable copying ink, and the copying paper damped with water, and the letter placed in juxtaposition to it, and the oiled sheets are employed for preventing the ink from spreading to other parts of the book or paper. The book or copying sheets being thus prepared, and the letter, &c., deposited in its place thereon, the pressure is applied by a roller, the inner part of which may be free to revolve on a centre, whilst the ends are held in the hands of the operator. After this roller has been passed once or twice over the copying paper the letters will be found to be perfectly copied. *Patent completed.*

2104. G. OSTERMOOR. *Ornamenting boas, victorines, and muffs.* Dated September 18, 1858.

Here the ornamentation of the said articles made of velvet or plush is executed by pressing or embossing figures, ornaments, or devices on them in the ordinary way; or the inventor performs the same during the process of printing or weaving by printing the figures on them or weaving them in during their manufacture. *Patent abandoned.*

2105. J. LUIS. *Improvements in the application of gutta percha for clogs, goloches, shoes, and boots, and for the apparatus connected therewith.* Dated Sep. 18, 1858.

The gutta-percha is put in a boiler placed on the fire, where it becomes nearly liquid or half fluid; in this state it is run into a mould, when by a common screw press adapted to the moulds, the matter is obliged to spread itself equally in all the empty parts. The whole is then allowed to cool for about ten minutes, the gutta-percha solidifies, and the shoe, boot, or goloche is thus made in one piece and at very little expense. *Patent completed.*

2106. J. LUIS. *A new manner for applying centrifugal force in the manufacture of the fecula of potatoes, of starch, of yeast, of porcelain paste, of paper pulp, and ultarmarine, and the apparatus for carrying out the same.* (A communication.) Dated September 18, 1858.

On the interior mantle of the drum of the apparatus the patentee applies a thickness of metallic coarse cloth. A tissue of ozier or wicker can be used as well. If the drum is of sheet iron pierced with holes in the vertical mantle, these holes can have about one-eighth of an inch in diameter. On this surface is applied a metallic cloth, and on this sheet iron is put a tissue made of linen, wool, or cotton sufficiently fine to retain the fecula or starch while the water filters through. There are modifications included. *Patent completed.*

2107. J. G. N. ALLEYNE. *Improvements in the manufacture of wrought-iron beams and girders.* Dated Sep. 18, 1858.

The patentee makes wrought-iron beams and girders in two or more pieces, united by scarfed, or notched, or lapped, or diagonal joints. Thus he rolls two pieces of wrought-iron, each of which has a flange or enlargement at one edge, and has its other edge bent or formed so as to fit to the corresponding edge of the other piece of iron. *Patent completed.*

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2108. J. B. BEASLEY. *Improvements in the construction of sporting and all other guns.* Dated September 18, 1858.

The patentee attaches to the stock of the gun, rifle, or musket, a sliding bolt or stop, which is always kept forward by a spring. The end of this sliding bolt or stop projects forward sufficiently far to catch the hammer of the lock of the gun, rifle, &c., to which it is attached, and thus prevents the hammer from striking the cap upon the nipple when by accident or neglect it falls. In connection with the sliding bolt or stop is a depressing lever or plate. This lever or plate is let into that portion of the stock which is held by the hand, the first finger of which pulls the trigger, and is so arranged that when the hand grasps the stock it is depressed, the consequence of which is that the bolt or stop is withdrawn, and the hammer is free to strike the cap placed on the nipple. *Patent completed.*

2109. A. TURNER. *Improvements in looms for weaving.* Dated Sept. 18, 1858.

This relates to a mode of constructing the shuttles used in weaving narrow fabrics, and also the planks, batten, or slay in the grooves of which the shuttles work. *Patent completed.*

2110. H. W. GRYLLS. *Improvements in apparatus employed in submerging or laying down electric telegraph cables.* Dated Sept. 18, 1858.

Here the cable is passed through a strong metal guide-ring, which is suspended to the stern of the vessel by chains, &c., of any required length. To this guide-ring is attached a second ring formed of two or more segments connected together by hinges, and constructed so that when a chain or rope attached to one segment is drawn tight by means of this apparatus on board the vessel, the segments collapse and grasp the rope firmly between them. The portion of cable so held may then be drawn on board to be spliced or repaired. By these means in case of fracture the submerged portion of the cable would not be lost. *Patent completed.*

2111. T. VICARS, sen., and T. VICARS, jun., T. ASHMORE, and J. SMITH. *Improvements for the consumption of smoke in moveable furnaces or chauffers for heating bakers' and other like ovens.* Dated September 18, 1858.

Here the box or ash-pit of the chauffer is surrounded by air passages, which supply air that passes between a shell or box that surrounds the chauffer or fire-box; this outer shell is about half the height of the chauffer. The air ascends along the outer sides of the chauffer, and mingles at the top with the gases from the fire, and thus prevents smoke. *Patent completed.*

2112. J. L. CHESTER. *An improved cartridge opener and ramrod fastener.* (Partly a communication.) Dated Sept. 20, 1858.

This consists in constructing a flat spring with an edge bent nearly at right angles, with its flat surface serated or toothed, and attaching one end of it to some convenient place on the stock or barrel near the muzzle of the gun or pistol, while the other end is only controlled by a pin formed on it at right angles to the flat face, which here is made broader and suitable as a thumb-piece. This pin, the purpose of which is to keep the spring steady and in place, plays into a slot or socket in the gun. When the cartridge is to be opened, its proper end is inserted between the barrel and the toothed edge, which, by the pressure of the thumb on the spring, closes upon and holds it fast, while the paper is being torn away so as to expose the powder. *Patent abandoned.*

2113. H. BARROW. *An improvement or improvements in cartridge-boxes.* Dated Sept. 20, 1858.

The patentee claims, placing a partition or diaphragm in the said boxes, the said partition or diaphragm having holes or perforations capable of expanding when the cartridges are forced therein, in which holes or perforations cartridges of various sizes are held so securely as to be prevented from falling accidently out of the box, but which cartridges may be readily removed from the box without risk of injury thereto. *Patent completed.*

2114. H. FIRMIN. *A machine for cleansing chaff and other food for horses and cattle.* Dated Sept. 20, 1858.

This machine is intended to clean chaff, &c., when cut for food for horses and cattle, from dust and dirt, and consists of a perforated zinc, or other open work metal cylinder, open at both ends, inside which a shaft armed with brushes, or other agitators, is made to rotate, whereby the chaff, &c., will be stirred, so as to remove the dust and dirt therefrom, which, by the action of the brushes, will be forced or sent through the perforations out of the cylinder. The cylinder should be placed at a slight angle from the horizontal line. *Patent completed.*

2115. E. RIEPE. *An improvement in the casting of steel.* Dated September 20, 1858.

This invention is an improvement upon two inventions formerly patented by E. Riepe, 9th July, 1853, and consists in heating the mould prior to pouring in the steel. For hard and soft steels different degrees of heat will be required. *Patent abandoned.*

2116. G. M. LEVI. *Improvements in the manufacture of iron in the blast furnace.* (A communication.) Dated September 21, 1858.

By this invention the blast which may be hot or cold, is alternately stopped and put in action at regular intervals, and the charge of fuel is subsequently reduced; and it has been found by experiment that a very considerable saving of fuel is the result. The reducing action of the fuel continues while the blast is stopped. The ordinary blast furnace may be used, but if the tuyeres are at or below the level of the dam they ought to be raised so as to prevent the cinder from entering them when the blast is stopped. *Patent completed.*

2117. T. COOK. *Improvements in the method of preparing and securing bankers' and other crossed cheques against fraudulent erasure or removal.* Dated September 21, 1858.

This consists in piercing or puncturing the paper wherever any writing occurs. *Patent abandoned.*

2118. G. DOWLER, and T. T. CHELLINGWORTH. *An adjustable torsion spring for doors or other purposes.* Dated September 21, 1858.

This consists in applying a rod of steel attached at one end to a bracket of brass or iron fixed to the door-post or frame. The other end is fixed to a similar bracket attached the door. When the door is opened the steel rod is twisted, the twist acting as a spring. At the end of the rod that is fixed to the bracket attached to the door frame or post is a small wheel, or round nut, with notches formed in it, and a catch is attached to the bracket which fits into any of the notches on such wheel or nut. A key or handle fits to the end of the rod that is filed square for the purpose. *Patent abandoned.*

2119. L. DE PARIENTE. *Improvements in apparatus to be applied to gas burners, with the object of increasing the lighting power of the gas flame.* (A communication.) Dated September 21, 1858.

This relates to the adaptation to gas-burners of an apparatus for increasing the illuminating power of the gas-flame, by dividing this latter, and causing an introduction of air into the flame, thereby imparting a greater heat to the lower or blue part of the frame, whereby the lighting effect is increased without increasing the consumption of gas. The invention is not fully described apart from the drawings. *Patent completed.*

2120. J. C. E. MALVEZIN. *Improvements in the manufacture of tubes, pipes, or mains for conducting liquids or gas, or for other similar purposes.* Dated September 21, 1858.

This consists in manufacturing such tubes of tissue or yarn of cotton, impregnated with bituminous matters. *Patent abandoned.*

2121. J. BETHELL. *Improvements in treating pyrites.* Dated September 21, 1858.

This consists in obtaining of sulphuret freed from the coal, and other matters, and in nearly a pure state of sulphuret, and he produces this result by grinding the sulphurets into small pieces with a pair of iron rollers, and then washing such ground materials with water in any of the machines now used for washing coals and ores. *Patent completed.*

2122. A. V. NEWTON. *An improved machine for sweeping carpets and floors.* (A communication.) Dated September 21, 1858.

This relates, 1, to the combination of a cylindrical brush, the bristles of which are by preference inclined at an angle of about 45 deg. from a radial line passing directly outward from the centre of the axis of the brush, with a traction-roller in the construction of a machine for sweeping carpets and floors. 2, to a peculiar construction of traction-roller, by which a certain and efficient traction and adhesion, combined with smoothness of action, is secured at a trifling expense. *Patent completed.*

2123. J. DEWRANCE. *An improvement in the construction of pianoforte frames.* Dated September 21, 1858.

This relates to a construction of pianoforte frames, whereby the tendency of the frames to twist under the strain of the strings will be effectually counteracted. It applies both to metal and wooden frames, although the patentee prefers the use of metal frames, as they contract and expand, like the strings, under differences of local temperature. *Patent completed.*

IRON AND OTHER METALS.

[FROM OUR OWN CORRESPONDENT.]

The Iron Trade Generally; how influenced by politics.—The South Wales District.—The Districts of Yorkshire, Derbyshire, and Lancashire.—Glasgow Market.—South Staffordshire Trade.—On 'Change at Wolverhampton and Birmingham; the question of Future Prices.—The Hardware Trades in the Midland and Sheffield.

NOTHING satisfactory can this week be reported of the iron trade beyond a somewhat stronger hope on the part of masters than existed last week in the future peaceful attitude Great Britain in relation to the war in Italy. The effects of the disturbed state of the Continent, and of the political unrest at home, is being felt in all the districts to the disadvantage of each, as well in the decrease of the numbers and value of orders, as of an expectation by most consumers that their orders will be executed at lower rates.

A tolerably favourable account, however, continues to arrive from South Wales; where it is stated that the leading works have recently been put in possession of orders that will afford employment to most of the machinery for some time to come.

In the united districts of Derby, York, and Lancaster counties, as in South Wales, considerable quantities of railway iron are being turned out; but in other respects a slackness prevails. An ordnance commission has been received by a Yorkshire house.

At Glasgow, on Tuesday, all descriptions of pig iron were nominal at 51s. The quantity shipped in the previous week was an increase upon that of the corresponding period last year, the figures being this year 16,500 tons; last year, 15,100 tons.

At Birmingham to-day (Thursday) and at Wolverhampton yesterday there was marked inactivity. The war about to open on the continent and the elections at home are all-powerful to prevent the transaction of any amount of business that can be quoted. Masters and agents have pretty well made up their minds to receive this state of things as philosophically as possible. An utterance of loud complaint is, therefore, voluntarily stifled. The only point which calls for remark is the probability of the future. On every hand there is a deep feeling in favour of neutrality, with consequent satisfaction at the peaceful assurances of the noble Premier at the Mansion-house on Monday night. His Lordship's remarks on Monday night, it was evident at Wolverhampton and Birmingham, had allayed some little of the anxiety which was beginning to manifest itself at those places last week, as the result of the tone of Lord Derby's remarks just prior to the dessolution. There is a steadiness in the demands of some of the best customers of the first class houses, but the quantities are smaller than usual, without, however, a demand for the accepting lower rates, These favourable instances are not, however, universal. On the part of speculators there is an evident expectation that malleable iron will be got for less money before the end of the quarter than that now asked. American continues slow in her demand. There are a few instances in which pigs have realised £3 15 0, but they cannot at present be quoted at above £3 12 6 for mine iron.

The holidays and the elections have come to the relief of some employers in the hardware trades of Birmingham and Wolverhampton, who will thereby be enabled to spin out the few orders that are in hand until it is trusted that others will have been received.

In Sheffield there is an indisposition on the part of manufacturers to enter into large contracts from other than houses respecting whom whatever may be the consequences of the continental struggle there is no room to doubt. Some of the rolling mills are tolerably well off for steel of small samples, and the edge-tool makers have recently received some good orders.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

DOCK WORKS, *Hull.*—For increasing the depth of water in front of the Corporation-pier. Plans, Office of Captain Cator, R.N., Pilot office, Hull, to May 4. Tenders, May 5, to the Dredging Committee.

GAS-WORKS, *Lindfield, Sussex.*—Plans with the Lindfield Gas-light and Coke Company. Tenders, May 10.

WATERWORKS AND SEWERAGE OPERATIONS, *Stoke-upon-Trent.*—Including the providing of iron tank. Plans, &c., at Parish-office. Tenders, May 4.

WORKS, *Woolwich.*—For renewing lead-gutters and roofing at the Royal Military Academy. Plans to May 10. Tenders to May 12.

ROADS, *Brackley and Towcester.*—For lowering Furfordhill and Burcott Wood-hill. Sections, &c., Messrs. Charles and G. Cave, surveyors, Banbury. Tenders, May 3.

ROADS, *Worcester.*—For lowering Broadheath-hill, Henwick district, about 500 yards. Plans, Mr. Martin Curtler, Sansome-place, Worcester. Tenders, May 4.

IRON GAS-PIPES.—The Dakinfield Gas Company want a supply of 7-inch cast-iron main-pipes. Apply to Mr. Dore, at the Works.

COALS, *Navy.*—For her Majesty's Dockyards and Victualling-yards, Naval Hospitals, Royal Marine Barracks and Infirmaries, and the Admiralty Marine and Coast Guard Offices. Tenders to 2 o'clock, May 3.——South Wales coals also required for her Majesty's steamvessels, St. Vincent, Cape de Verde. From June 1, 1859. Tenders, May 10.

GREEN HEART TIMBER, *Mersey Dock Estate.*—60,000 feet of large scantling. Application for particulars to the engineer, Mr. B. Hartley, Dockyard, Coburg Dock. Tenders to June 18.

ROAD MATERIALS, *London.*—The Commissioners of the Metropolitan Roads want materials. Particulars, 22 Whitehall Place. Tenders, May 10.

SEWERAGE WORKS, *Preston.*—922 yards of brick sewer, and 850 yards of 18-inch pipe sewer.

CONVENT, *Ireland.*—At Kenmare, county Kerry. Plans, &c., from May 2, at Very Rev. J. O'Sullivan, P.P., Kenmare; or to the architect, C. Hansom, Esq., Clifton. Tenders to May 14, to Rev. John O'Sullivan.

POLICE-STATION, *Gainsborough.*—With magistrates' room, &c. Plans, &c., Michael Drury, architect, 1 Bank-street, Lincoln. May 17.

THE SAME, *at Torpoint, St. Cleer, and Menheniot.*—Together or separately. Plans, &c., for Torpoint, from the Serjeant of the County Police there; from St. Cleer and Menheniot, from the Inspector of County Police, Dalwalls, near Liskeard. Tenders, May 7.

CEMETERY CHAPELS, &c., *Darlaston, South Staffordshire.*—Consecrated chapel, with tower and spire, and vestry-room; an unconsecrated chapel, with vestry; a sexton's house, &c. Tenders to Clerk of Burial Board, Darlaston, May 6.

SCHOOLS, AND TEACHERS' RESIDENCE, *Newmarket.*—Drawings, &c., Mr. R. Lloyd Williams, architect, Hulian Place, Denbigh, until May 2. No date given.

THE SAME, *Rudham.*—Plans at Crown Inn, East Rudham; or at the offices of Messrs. Clowes and Howerdew, Bank Chambers, Norwich. Tenders, May 4.

RECTORY HOUSE, *Carsington, Derby.*—Near Wirksworth. Plans, Rev. J. H. Brett, Wirksworth. Tenders, May 7.

SHOPS, *Burslem.*—Four shop premises. Plans, &c., Messrs. Ford and Mayer, architects, Burslem, on and after May 4. Tenders to May 9.

FARM BUILDINGS, *Stafford.*—At Redhill. Plans, &c., Mr. Kenderdine, Brook-house, Stafford. Tenders, May 4.

HOUSE, *Harrowgate.*—Dwelling-house, stables, &c., Belmont. Plans, &c., Messrs. John Child and Son, 24 Park-row, Leeds, to May 3, and at Tenter Lodge, Knaresboro', from 4th to 10th May. Tenders to May 11.

COTTAGES, *Redhill.*—The time for receiving tenders for the cottages for the Redhill and Reigate Cottage Improvement Society has been extended to May 5. Drawings, &c., at office of architect, Mr. E. Baxendell, 7 Beaufort-buildings, Strand, London, W.C.

CEMENT AND PLASTER KILNS.—The Marple Mineral Company want a contractor to build cement and plaster kilns at their works, Marple, near Stockport. Address to J. Ryde and Co., Great Marlborough-street, Manchester.

WORKING FOREMAN OF MECHANICS to superintend boilers, engines, mill gearing, &c., Pristolee New Mills, Farnworth, near Manchester.

DESIGNS FOR SCHOOL BUILDINGS.—Premium of £25 for the most approved design for school buildings, &c., for the accommodation of 300 children, with master and mistresses' residence. Particulars of Mr. J. H. Cox, 17 Victoria-road, Old Charlton, S.C.

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, MAY 6, 1859.

ENGINES AND ENGINEERS IN HER MAJESTY'S NAVY.

THE Report of Admiral Ramsay and Messrs. Nasmyth and Ward, although an extremely weak solution of useful information, necessarily opens up questions of very great importance in themselves—questions which we cannot pass over silently. These we must take up week by week, as opportunities may serve, with the desire of stating the views of the Committee and the replies of the Surveyor of the Navy as fully as may be desirable, and as fairly as may be possible. Our own comments will be offered only when they appear necessary, and then without any partiality save love of truth and fairness.

At the outset of their report the committee state they are desirous of expressing an opinion on the great importance of having all the documents which relate to the steam navy, and which are kept in the steam department of the Admiralty, in a state as accessible as possible for constant and ready reference; and further, that all the information necessary for an immediate comparison of the performances of the different vessels and their engines with one another, should be rendered practically available for immediate consultation. "The "committee conceive that this would supply a "sure method of judging of the efficiency of en- "gines employed; and when it is considered "how large are the sums annually expended upon "engines, they conceive that a full and accurate "knowledge of results produced, by the sums "thus expended, must be a check upon extra- "vagance." They say they have met with the greatest difficulty in investigating particular subjects, and found "a want of clear method "and classification in following the details "through the various books and records where "the information is to be found." They then direct attention to the quarterly returns of the performances of steam-vessels and their engines. It is proper first to explain that it was resolved by the committee to take specimens of different classes of steam men-of-war, propelled by the screw, the engines of which were made by different makers, to put them into a tabulated form, and thus institute a complete investigation of their comparative performances. To fill up this tabulated list of steam-ships, it was necessary for ascertaining some points to have recourse to the steam quarterly returns, and the documents belonging to each ship had to be examined separately. "But unfortunately," say they, "probably under the impression that little "use would be made of these returns, they "proved to be extremely imperfect. For in- "stance, in many cases, that most important "point, the number of miles obtained from a "ton of coals, is not inserted; and in too many "of the entries it is evident that little reliance "can be placed upon the accuracy of different "items in details." The committee are convinced that the beneficial effects upon a knowledge of steam engineering would be considerable if some intelligent person was appointed to examine these returns, to report when there were any important omissions, and to register with regularity and precision the most essential particulars. In order, therefore, to improve the mode at present adopted in the steam department of the Admiralty of tabulating the expenses and performances of steam-vessels, the committee considered several plans, and finally recommended that one suggested by Mr. Munday (their secretary) should be adopted. To carry out these arrangements they propose certain changes, of which the chief are, "that for "each steam-vessel in Her Majesty's service, a "separate book should be kept at the Surveyor's "office attached to the Admiralty;" and "that "a naval officer of long experience in steam- "vessels, accustomed to making calculations, "should be attached to the steam department of "the Surveyor's office, to keep up the book as "proposed, entering therein from the quarterly "reports the various items."

To all this the Surveyor replies that money accounts, properly so called, are not kept, and were never intended to be kept, in the Surveyors's department, except as far as may be necessary for conducting the business of the office and for furnishing the Board with such general information as they may call for: that no intimation was given by the committee implying that their object was, not only to ascertain facts, but to suggest improvements in the method of keeping the accounts and records and of tabulating their contents; and that if such an intimation had been given, the committee would have seen that some of their ideas had been anticipated, for from certain returns abstracts were made and recorded of the distance steamed by every ship in the navy, and of the coals expended, while for every large ship a separate book was kept, in which to record such particulars of her machinery and its working as it seemed desirable to keep together; and to ensure greater accuracy and completeness of returns from ships, the Board had been frequently moved to call the attention of commanders-in-chief and others to instances of comparatively great neglect and error in filling them up.

"To cause, however," says the Surveyor, "all returns from ships, such as those referred to by the committee, to be filled up on technical and scientific points in a perfectly reliable manner, would, it is well-known to persons experienced in such matters, be an utter impossibility, nor would the attempt, attended as it must be with correspondence without, be tolerated by any Board, unless the object was more important than it is. Such returns generally answer the principal ends for which they were framed,—periodical statements of the condition and working of machinery and boilers for the information and guidance of the department, and permanent records, to be referred to at all times like the logs of a ship; but, as was before stated, the most important matters are extracted, and recorded so as to be readily available. Looking, however, at the committee's recommendations, there is no objection to the above suggestions, or to adding to the present quarterly reports additional columns to contain all the information which the committee propose to collect. . . . . The additional labour thus entailed would not be such as to render necessary any increase in the establishment."

In our judgment the foregoing remarks, both of the committee and of the Surveyor, betray an insensibility to the great benefits which might be conferred upon science by a fuller observation and registration of the facts which our steam navy might easily be made to furnish. But as this is a subject which is but very lightly touched upon in the report before us, we shall not here drag it into prominence. It should be remarked, however, that the great suggestion of the committee on these documents appears to be the introduction of a model quarterly return, which is to show, in a tabular form, the efficiency of the machinery by the number of miles run since defects were last made good, and all particulars necessary for enabling the officers who had the responsibility of repairing the engines to form a judgment of the wear on the bearings and other parts. Now, we should like to know what practical engineer would like to form an opinion of the repairs necessary from such data? Such a document might be useful as a means of judging or determining the efficiency of different engines by comparing their actual condition with one another and the work performed. But the obvious inference from the report is, that the wear on the bearings and working parts of engines will always be in some known relation to the number of miles the vessel has run, whatever be the form or quality of the materials employed, or the size and shape of the body propelled, and whatever the skill and care of the engineer in charge may be. If any relation independent of all these conditions exists, the committee are, no doubt, the discoverers; no one else has ever suspected it. The present practice may not be perfect, but it certainly looks much more reasonable than the improvement proposed. When a vessel comes into port from a foreign station the engineer in charge makes out a list of defects known to himself, which list is forwarded through the captain of the steam ordinary to the inspector of machinery afloat, who, being a professional officer, ascertains by actual examination whether these defects require to be made good, and reports to the Admiralty accordingly; and it not unfrequently happens that the Surveyor of the Navy refers this report to the factory officers for further examination and professional report. What is there in all this to disapprove of? It is not a little singular, in connection with this subject, that the secretary of this committee is not only permitted to submit a plan for these tabulated records, but that it is recommended by them to the Admiralty in preference to a more comprehensive plan by some one else. The committee also propose that "an intelligent naval officer" be added to the steam department for making these tabulated records, altogether overlooking the fact that there are already, in the Surveyor's own department, and under his control, men most competent for the purpose, both theoretically and practically.

In the next subject treated by the committee—the care and preservation of the steam-engines and boilers on board Her Majesty's ships—we are plunged into that very interesting and important question of the condition of the Engineers of the Royal Navy. As a preliminary observation, the committee record that upon inquiries being made, it appears that, with a few exceptions, the machinery of our steam men-of-war employed on foreign stations has generally been kept in good order.

"This fact is an abundant proof, and perhaps the only satisfactory proof that could be adduced, of the strict attention which must generally have been paid on board these vessels after they left home by the chief engineers, and those placed immediately under them. And this fact has at the present time suggested that the committee should now record their opinion, that the efficiency of the engines on board men-of-war must mainly depend upon the skill, industry, and zeal of the chief engineers. In further support of that view, the committee would strongly urge, that all instances of wilful neglect should meet with certain punishment; but they would at the same time as strongly urge, that proper means should be adopted for fostering and encouraging that zeal and energy which never ought to be allowed to die away. That engineers in charge of steam-engines should not be removed from one ship to another, except under peculiar circumstances, has been much urged upon the committee. It must be admitted, however, there are many difficulties in the naval service, which will prevent the same chief engineer from remaining permanently attached to the same ship. One of these difficulties has lately been removed by the equalization of the pay of engineers, irrespective of the classes to which they formerly would have belonged. And, on the whole, the committee would rather direct attention to the subject, than advise a positive rule, although they do recommend that changes should not be made, as had heretofore sometimes been done, to all appearance, on very slight grounds."

In his reply to these remarks the Surveyor

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says the committee justly state that no rule can be laid down on this subject. "Had the committee referred to any individual change, doubtless ample reasons could be given for it; this, however, had not been done, and therefore no specific reply can be made; but it is evident that the large number of chief engineers required for the screw ships built and converted within the last few years could only be obtained from our paddle-wheel vessels: hence arose the necessity for many of the removals." Due regard must also be had, he says, to their qualifications, to the length of their sea-service, and to the reasonable expectations of being appointed to larger ships, which is unquestionably looked upon by them as one of the rewards for long and meritorious services. The committee in making the statement that "changes should not be made, as had heretofore sometimes been done, to all appearance, on very slight grounds," refer to page 26 of their minutes of proceedings; "not one word, however, is here or elsewhere to be found," says the Surveyor, "to justify such an imputation."

"This is another example of imputations being made without a shadow of evidence. Indeed, the committee did not apply to the only source from which authentic information could be obtained, viz., the department of the Surveyor, notwithstanding they were expressly directed to do so by their instructions; and for anything which appears, they applied nowhere else. They refer, as before remarked, for proof to a part of their proceedings which has no reference whatever to the subject. Nearly the same observations apply to the very obvious recommendation of the committee, 'That a regular system of reward and promotion for zealous and diligent engineers, of reprimand and warning for the underserving, should at once be adopted and made known to the service.' It must be assumed that their reason for thus laying down the principle upon which rewards and punishments should be distributed was an impression on their minds that in some cases it had been departed from. No instance can be pointed out in which a complaint against an engineer has been improperly disregarded, or of superior merit being overlooked."

In connection with this subject we may remark that it would not be unreasonable to expect, after the great expense the country has been put to in visiting the various steam ordinaries, and in trying the numerous vessels' engines mentioned in the report, that some suggestions should have been made under this head as to the best means of preserving the valuable machinery on board ships in ordinary. But not a single idea do we find, nor a hint of any kind in reference to this most important matter. The whole thing seems to be ignored by them:—"It is not expedient that they should enter into minute detail as to the best means of preserving engines and boilers laid up in vessels in ordinary;" they would rather advise "a full confidence in the captains and engineers of steam reserves at the different ports." We do not dispute for a moment the soundness of this advice, but we do very much question whether it is worth the price the country has paid for it.

The committee next recommend that deserving assistant-engineers should be promoted, and that such promotion should be so made as to prevent the natural wish for advancement being too long delayed; and the committee believe the number of assistant-engineers might with advantage be diminished, and the place of a portion of the promoted engineers be supplied by a superior class of stokers, in order that by decreasing the number of assistant-engineers, promotion to a higher grade may be rendered more rapid. They further state that several are admitted as engineers into the navy who are practically of little service when any repairs of engines are required; and that this deficiency in a part of our assistant-engineers might in future be obviated by requiring from all candidates for admission, not only general certificates of their having been artificers, but further certificates of their having actually worked so long in a Government factory as to test their abilities.

The Surveyor admits the importance of the subject renders this suggestion worthy of consideration. The main question is, he says, are the existing regulations under which engineers are admitted into the Royal Navy practically sufficient to answer their intended purpose? And, he adds, it will be seen from the following statement that they are clear and somewhat stringent:—

"Every candidate must produce satisfactory certificates from the manufacturers in whose factories they have worked of their practical skill.

"Also of good conduct.

"He must pass a satisfactory examination before the chief engineer of Woolwich, Portsmouth, or Devonport Dockyard, who either rejects the candidate at once, or certifies him to be fit for entry; and the passing certificate of examination is marked as 'ordinary,' 'creditable,' or 'highly creditable,' and shows where he has been employed, and other particulars.

"These examinations are kept up to the highest point which the varying pressure for additional engineers renders practicable.

"He is also examined by a medical officer as to his bodily fitness for entry.

"The successful candidate is not then entered for permanent service; he has to pass at least one year on probation; and no engineer on probation is ever made an assistant-engineer, even of the third-class, until he is recommended for that rank by the commanding officer under whom he may be serving."

That the regulations work satisfactorily is proved, he says, by the three-monthly reports from all steam-ships and vessels, on the qualifications, character, and conduct of the engineers: some exceptions of course occur: in such cases, the individual is discharged or reprimanded, according to the nature of the report. Under these circumstances, the suggestion of the committee does not appear to him calculated to realise much benefit. If it did, the inconvenience and expense of applying a factory-test—for the young men must of course be paid—ought not for a moment to be regarded. But that these would not be inconsiderable will be evident when it is borne in mind that during the last six years no less than 2,101 candidates have offered themselves, and that 886 have been passed. The Surveyor further says it is not unreasonable to expect that the application of such a practical test might have the effect of deterring many modest and promising young men from offering themselves as candidates. In explanation of this view he says:—

"A rejection under the present system is doubtless accounted for by the candidate to his friends as the result of his being unable to perform some difficult arithmetical operation, or in some other way which in their estimation does not humiliate him; but a rejection, after he had complied with all other conditions, upon a practical, and it may almost be called a public test, on the ground of a want of ability in his own art, would be far more serious to him, and give rise to a feeling of greater dissatisfaction; a result which it is obvious ought to be avoided unless some important object is thereby gained. But it may be said that few would be thus rejected, and those few would be persons whom it would not be desirable to enter. This, it is apprehended, is not the true view of the case. At present, if a candidate presents himself with unsatisfactory testimonials, he is told he must obtain better; if he can do so, he presents himself again; if not, there is an end; he is excluded. But if testimonials were no longer the admitted and sole proof of practical fitness, and the examining officer were authorised to employ him in the factory to ascertain the fact, he could not, morally speaking, hesitate to grant the appeal of the candidate for a practical test; and thus the number rejected by this process would be far from inconsiderable, which alone would outweigh any benefits which could possibly result."

The Surveyor further informs us that at this moment there are in the three steam ordinaries 192 assistant-engineers; and the inspectors of machinery afloat have recently been ordered to report if they have discovered any of them to be inefficient workmen. One only has been reported, and this person is on probation. One assistant-engineer, who was formerly at Sheerness, is also reported against; and three who were formerly at Portsmouth, two of whom have been discharged from the service; seven formerly at Devonport, but now on board various ships, are also reported against; but all these, with one exception, are on probation. "It will thus be seen," he says, "that there are only very slight grounds for the recommendation of the committee to send hundreds of candidates through our factories every year to be tested, but none whatever for entrusting the duties hitherto performed by engineers to a very inferior class of men, namely, stokers. For even supposing the service now suffers, as seems to be implied by the committee, in consequence of the inefficiency of engineers, how this is to be remedied by the employment of stokers in their room the committee do not explain."

Upon the general question at issue here—the advisability of supplying the place of certain engineers with stokers—we do not feel competent, at present, to offer an opinion. There is certainly much to be said in favour of both views. On the committee's side it is apparent enough that the handiwork and drudgery which the assistant-engineers have to perform in keeping the engines in good order is of such a nature that its transfer to stokers would tend greatly to improve the position of the engineers. But then it cannot be doubted that the effect of the change would be to dissociate engineers from their most important duties, and lift them away from those very operations which it is their express function to carry out. On the other hand, we think the Surveyor's assertion that the present system works satisfactorily is not to be relied upon; nor are the reasons which he assigns for it. It is all very well, from an official point of view, to say that the "official" reports of commanding officers afford but little ground for dissatisfaction with the class of engineers lately brought into the service. And the same remark applies to what is said of the stringency of the existing regulations under which engineers are admitted into the navy. But it is useless to shut one's eyes to manifest facts. Many young men of a thoroughly inferior class *have been* entered, and *are* retained in the service, as every one intimately acquainted with the navy knows; and some remedy should be found for this evil. All we can affirm is, that either the present regulations are not stringent enough, or else they are not carried out faithfully. On the other hand, it should be remarked that (as the Surveyor states further on) there have been times when all efforts and expedients have failed in providing a sufficient number of engineers to meet all the demands of the service. This, however, seems to point to the necessity of adopting more efficient means than the present of training a sufficient supply of men for the service. There ought to be no difficulty in doing this now the want is understood.

It must, however, after all be remembered, say the committee, that much of the care and preservation of the machinery must still rest with the commander of the vessel; he ought to be constant in his duty, inspecting the engine-room, and giving encouragement and direction to those belonging to that department. The commander can also preserve the engines and boilers by sparing all unnecessary use of them. On board men-of-war, in a great variety of cases, the length of a passage is of little moment. In these cases let the sails alone be

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used; but of course, in all other cases, when it is of importance that the voyage should not be protracted beyond a certain time, then a judicious conjoined employment of steam and sail is of consequence; and it is at such times especially that the commander who has carefully studied the subject has an opportunity of turning his knowledge to advantage. The committee are anxious to direct attention to this subject; they are aware, they say, that in itself it is plain, and, indeed, simple, but still they are convinced it is often misunderstood; and they are further induced to notice this matter from observing, that one of the best practical books on the marine steam-engine which is supplied to the navy, and which lays down the right principles involved in this question, yet gives an account of a voyage intended to show the advantage of using the sails and steam combined, and although attention is drawn to the small quantity of coal thereby consumed, yet, upon examination, there can be no doubt that the vessel would often have gone faster if the steam had not been used at all, and in such cases there would have been a saving of the whole of the coals.

"The principles involved are as follows: with a fair wind, the number of miles obtained from a ton of coals is the number of miles that the engines increased the speed of the vessel above that which she would have gone with sails alone; that is to say, suppose a steam-ship goes nine knots, with a fair wind, under sail alone, steam is applied, and the ship goes ten knots; the consumption of coal is, say, two tons per hour, then 0·5 knot is obtained from each ton of coal. But now, under the same circumstances, suppose that a comparatively small amount of steam is applied, then it will follow that, unless a sufficiency of coal is used to keep up the revolutions of the screw to a speed equal to what would be the rate of the ship under sail alone, the way of the ship is less under sail and this small supply of coal than it would have been under sail alone; in short, the coal used in such a case would only retard the ship: and from this it may be deduced, that although fore and aft sails, and in light winds, when the wind is not too far aft, square sails also, with the steam, may often be useful, and save coal; so that when the object is to make quick and economical passages, steam and sail ought certainly to be combined; still it is advisable that steam and sail be generally used separately. This is given only as an illustration how necessary it is for the naval officer, not only to have some knowledge of the agency of steam, but also a kind of knowledge not generally acquired by the engineer."

On this the Surveyor, somewhat archly, we fancy, remarks that it no doubt is highly important that all naval officers should be well acquainted with the principles of steam navigation, and a sound knowledge of them is doubtless fast spreading; "it may well be "doubted, however, how far the committee "have laid down principles which would bear "the test of examination, but it would be out of "place to discuss them here, as they are in-"tended only as illustrations to show the ad-"vantage of officers possessing a knowledge of "sailing and steaming, which is questioned by "no one." On a future occasion we shall take further notice of the doubt which the Surveyor here casts upon the scientific soundness of the committee, and show what ground he has for casting it. But we must stop here for the present.

THE IMPROVEMENT OF OUR COINAGE.

PURSUING the important question of introducing into this country a system of coinage on the decimal principle, we have now to offer some further remarks on the unsatisfactory state of the existing metallic currency—especially the copper portion of it—and the causes which have led to its deterioration. There are at present circulating in the British islands, and making up the aggregate quantities given in our last week's impression, four distinct kinds of pence, with their satellite halfpence or farthings. In the first place there are the heavy pieces, popularly known from the broad band surrounding both obverse and reverse as "ring" pence. Of these, which were struck at the old Soho Mint by Messrs. Boulton and Watt, between the years 1797-1799, 16 go to the lb. avoirdupois, and they have certainly worn remarkably well, although they must have worn out a vast number of pockets in the sixty years of their existence. At the close of 1799, pence, halfpence, and farthings of respectively 18, 36, and 72 to the lb. were struck by the same firm, and these circulated alone with their weightier brethren until 1805, when a further improvement, as it was deemed, took place. In that year, 24 pence, 48 halfpence, and 96 farthings to the lb. weight were considered fair proportions for the copper coinage, and new dies having been got up for the purpose, Boulton and Watt again set to work in producing these comparatively light coins. It will be seen thus that within a space of eight years three kinds of inferior coins were stamped into vitality and became current. This was not, however, considered sufficient, and an Irish coinage of great extent, and in which the 1 lb. weight was divided into 26, 52, and 104 pence, halfpence, and farthings respectively, took place in 1806, and continued to go on simultaneously with the last-named English variety up to 1823. In that year the Irish coinage was abandoned, and although there have been distinctive copper tokens struck since for the Isle of Man and for the States of Jersey, of like proportions to those for Ireland, yet it may be said that the arrangement of 24 pence, 48 halfpence, and 96 farthings to the lb. weight has prevailed throughout Great Britain ever since 1823, and is that of the present day.

It will be admitted from this record of facts in connexion with the copper coinage that there is a sufficient medley of recognised and legal pieces of money in circulation among us; but there is in addition to these, as most people know to their cost, a very large per centage of non-recognised and illegal discs of copper, of which the public can "make neither head nor "tail," and which are altogether discreditable to an enlightened community. Is it not high time then, we ask, that, whether the decimal system be adopted or not, the whole confused jumble of copper coins, nearly six thousand tons in weight, should be sent once more into the foundry, there to be united with some more spiritual, or at least more valuable metal, and then re-issued in a uniform and handsome shape?

By judicious combinations of metals, lightness, beauty, and value may be attained; and these are the desiderata for a new coinage. In the United States' Mint experimental pieces have been issued of nickel and copper. How these will stand wear, time will reveal, but their dull grey colour is not pleasing to the eye, and they are of dumpy form—too thick for their small diameters. The bronze coins of the Napoleon III. and those of the Victoria Canada Mintages are, indeed, models in this last respect. For ourselves, we believe that the new clay metal, aluminium, which promises to revolutionise in other respects the world of metals, will be found a most excellent material for admixture with copper for the purpose in question. It is true that its properties are not yet fully developed, but enough is known to augur for aluminium a brilliant and useful future. Melted with copper in different proportions, any shade of colour between those of zinc and fine gold may be obtained, and we look forward to the day when Dr. Graham of the Mint, or some of his scientific *confrères*, shall arrive, by experiment or otherwise, at an amalgamation of aluminium and copper, from which may be cast a new coinage—decimal or duodecimal—that, with the aid of the engraver's art, and the skill of the machinist, shall surpass, in proportions, colour, and practical utility, the coinage of every other country. This matter has been dwelt upon at some length because it is right that the public should comprehend it thoroughly, and be thus enabled to bring the force of their opinion to bear upon the Government in effecting a wholesome and necessary reform. Mr. Disraeli professes to bow to public opinion, and declares that it is the most potent of all agencies. If we can enlist it, therefore, in behalf of a decimal coinage, the good work in introducing it may be said to be begun.

SUBMARINE TELEGRAPH CABLES.

WE have heard much lately of the substitution of india-rubber for gutta percha in the insulation of the wires of electric telegraph cables. Messrs. Silver and Co., of North Woolwich, have made themselves very prominent in connection with this matter, and by virtue of a wide-spread invitation to their works, and to a liberal feast afterwards, obtained very flattering notices of their experiments in almost all journals but our own. We fear, however—judging from the specimens of Messrs. Silver's cable which have been shown to us—the practice of submarine electric telegraphy has but little to expect from that quarter. We did not attend the experiments at North Woolwich, although invited; we could not make it convenient to attend them; but specimens of the Silver cable have, as we have intimated, reached us from various sources, and they really appear to us to be of a most unpromising character. The comparatively untenaceous substance with which the wire is coated can only have produced insulation with the kindliest electricity. That it would stand the wear and tear to which a long line of submarine cable is likely to be subjected, even in the laying, we do not for a moment believe. We write this without the least shade of antagonism to Messrs. Silver, whom, for many reasons, we very much respect; a simple desire to express what we cannot but think, is the only motive that prompts these observations. If the fact be, as we believe, we do not blame Messrs. Silver either for their experimental exertions in the matter, or for their endeavours to give all possible publicity to what they doubtless believed to be a valuable improvement. On the contrary, we regret that their good intentions have resulted in no better success. The failure is to be attributed, not to themselves, nor to the newspaper reporters who did so much for them in the way of eulogium; but to those laws of nature which often stubbornly resist even the sturdiest endeavours of individuals, and the liveliest efforts of gentlemen of the press—however liberally the one may be feasted by the other.

That india-rubber may, and will, under some circumstances, supersede gutta percha seems, however, exceedingly probable. We believe, moreover, that the means of applying it efficiently for the purpose have been fully attained in the invention described and illustrated on another page of this number. The inventors—Messrs. Hall and Wells, the well-known manufacturers of elastic fabrics—have had very great experience in the manipulation of india-rubber, and appear to have brought all that experience, with its corresponding skill, to bear upon this matter in the invention before us. In the construction of the apparatus to be used in the actual manufacture of cables of great length, they have further availed themselves of the

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ability of Messrs. Easton and Amos, the celebrated engineers, at whose works they have a very large machine nearly completed. Their method of forming the cable may be briefly stated as follows:—They commence by covering the conducting wires with a spiral layer of grey or unbleached cotton, as being the most pure. They then cover the cotton with strips of rubber cut from the bottle or other form in which it is imported, without being masticated or otherwise operated upon, laying on the strips spirally, and with overlap. This employment of "pure" rubber for the first coating of the wire is a very important point, and evinces the practical knowledge of the inventors. They then wind round outside of the spiral layers of rubber a thread of vulcanised rubber covered with cotton. The effect of this elastic thread is most remarkable. Being always in tension, owing to its elasticity, it so effectually compresses the layers of pure rubber beneath it as to firmly consolidate them into one substance, incapable of being again separated without great difficulty, and sometimes not at all. They perform all the coverings at one operation, and employ for the purpose a spiral covering machine to lay on the several coverings in the order above described. In some cases, in place of the covered thread of vulcanised rubber before mentioned, or in addition thereto, they apply further spirally-laid coverings of pure rubber laid on alternately in opposite directions, and envelope the whole in a similar covering of vulcanised rubber or not as may be desired. The whole of these operations may be performed in one machine. Having thus effectually insulated the wires, they further protect them by applying a coating of gutta percha of the ordinary kind, where that may be found desirable, and surround this gutta percha with plain hemp (free from oil, tar, and grease) braided on. Where gutta percha is not used, the plain fibre is laid immediately upon the insulating material. Then they braid or wrap on a coating of spun yarn saturated with tar or other preserving substance. The spun or tarred yarn or wrapping of rubber is then protected by wires laid on by means of a cleverly-arranged hollow-tube braiding machine at one operation, whereby one set of wires is laid longitudinally without any twist, while another set forms the braiding, and encloses the longitudinal wires. The advantage in using a braiding machine of their construction for covering telegraphic cables is beyond dispute, as by means of it cables can he made of any strength required, and of almost any required lightness, and at the same time be free from twist, and have all the strain taken off the conducting wires during the paying out of the same into a deep sea. It appears, also, that scarcely any strain whatever is brought upon the core during the application of the external iron covering, which is by no means the case in cables covered with spiral wires. In them the core is subjected to a very great strain, and the insulation is thereby seriously damaged. The inventors, of course, lay no claim to the use of india-rubber for the insulation of telegraph wires, but limit their claims to the improved methods and means of applying it.

Specimens of cables manufactured by Messrs. Hall and Wells have been submitted to us, and we say, with no kind of hesitation, that the insulation of the wires of the same is as good as it is possible for it to be—and that is much more than we can say of many specimens that come before us. Nor is the insulation only good; the cable is also light, very strong, very elastic, and very little liable to derangement of any kind during the handling of it, either in shipping it or in paying it out. We shall not urge its merits upon telegraphic engineers and companies, as they must win for it a speedy and extensive adoption. What its cost may prove to be we do not know; but, other things being as we have stated, the cost of it is a matter of minor importance.

THE NEW IRON STEAMSHIPS FOR THE NAVY.

At a discussion which took place at the Society of Arts, on Wednesday evening (May 3), after the reading of a lecture by Mr. Leonard Wray, on timber for ship-building, Mr. E. J. Reed, one of the Editors of the Mechanics' Magazine, (whose paper on the ships of the Navy recently excited much attention) made the following remarks:—"However unfit the iron ships which have hitherto been constructed for war purposes may have proved, we are undoubtedly about to return to the use of iron in the construction of such vessels. It will be in the recollection of the gentlemen present that nine or ten weeks ago Sir John Pakington announced in the House of Commons that, whatever may be their cost, we had no option but to commence the construction of iron-coated vessels. The reason alleged by him for this was twofold; in the first place, he said, the experiments made with Sir William Armstrong's gun had shown that thick iron might be employed with advantage as a defence for the sides of ships; and in the second place, that the French had two ships thus defended fast approaching completion. Since that speech of Sir John Pakington's was made, we have received a report made to the Treasury in January last, from which I draw the authority to state that the French were then actually preparing four of these iron-sided vessels. These vessels, it is stated, are to be substituted for line-of-battle ships. Their timbers (for they are built of wood) are of the scantling of a three-decker. They are to carry 36 heavy guns, most of them rifled 50-pounders, which will throw an 80-lb percussion shell. We are told in the report that the naval men of France seem to be so convinced of the irresistible qualities of these ships that they are of opinion that no more ships of the line will be laid down, and that in ten years that class of vessels will have become obsolete. We have still further information to the effect, that no less than eight of the ships are in contemplation by the French Emperor, the construction of six of them being fully determined upon. These vessels will not prove very efficient ships in many respects. With engines of 900 horse power only, they cannot be very fast; nor can they be expected to prove very handy. But the important fact to be observed with reference to them is, that they may fairly be expected to prove proof to both Paixhans and Armstrong shells, and you may judge for yourselves what would be the effect of half-a-dozen shell-proof frigates making their appearance among a fleet of our wooden ships. In order to avert such a disaster as this Sir John Pakington obtained a grant of money from the House of Commons to enable him to build a few shot-proof ships for our own Navy, and called upon private ship-building firms, and also upon his own master shipwrights, to furnish designs for such vessels. As soon as these designs were received, if not before, it became perfectly evident that the most efficient method of constructing the shot-proof frigates would be to build them wholly of iron. This has been fully decided upon. I believe the main reason of this is to be found in the fact that it is not practicable to cover the whole of the exposed portion of the ship with thick iron, on account of the weight, and it would not, of course, do, in these days of explosive shells and liquid fires, to leave any portion of a wooden ship exposed. Consequently, the resort to iron alone became absolutely necessary. That the uncoated portion of the ship will be open to what the lecturer of the evening has denominated the 'disastrous liabilities of a thin iron structure' is most certain; but the difficulty is got over by so proportioning the volumes of the defended and undefended portions of the vessel that, should the latter become riddled by shot, and water-logged, the vessel would still be sufficiently buoyant to float, and maintain the action in which she happened to be engaged. I am very sorry to say the Admiralty have lost time in proceeding with this great and most necessary undertaking. Sir John Pakington promised the House of Commons that he would not lose a moment in bringing these ships into existence. But two months and more have passed since then, and yet no contract for building a single iron coated ship has yet been issued. I fear we must impute to the extravagantly imaginative speech of Lord Clarence Paget a part of this delay, for the Admiralty departments have had much to do in the way of vindicating themselves from his unmerited attack. It takes much time to go over the ten years' accounts of such a department as the Admiralty. Still for my part, I think delay on such grounds is scarcely justifiable. It would be better for such a speech as Lord Paget's to go unanswered altogether, than to withdraw our strength for months from an undertaking by which alone we can maintain an equality with France. In the hope that my words may find their way into the public papers, and thus reach the eyes of our Government, I bring this subject to your attention. It appears to me scarcely fair to this great iron-ship-building country to allow it to fall behind France in this matter."

Proceedings of Societies.

UNITED SERVICE INSTITUTION.

April 29.—General Portlock delivered a lecture in the theatre of the above institution "On the Advantage of cultivating the Natural and Experimental Sciences, as promoting the social comfort and practical utility of Military Men," before a numerous audience, among whom were Sir William Gomm, K.C.B., Generals Cameron and Drummond, and other distinguished visitors. In the course of the lecture General Portlock spoke of the ill consequences of adhering to the narrow view adopted by many, of considering every branch of knowledge useless which cannot be shown to have a direct practical bearing either in the production of wealth or in the special business of a profession. It is impossible, he observed, to lay down as a rule that any knowledge once acquired may not prove the means in after life of overcoming difficulties otherwise insurmountable, but further than that, education must always be considered as not only intended to supply the knowledge actually required in the prosecution of some definite profession, but also to supply the mind with a wholesome nutriment which should keep it from preying on the body.

INSTITUTION OF ENGINEERS IN SCOTLAND.

April 28.—The anniversary dinner took place in the Queen's Hotel, George square; Dr. W. J. Macquorn Rankine, President, in the chair, and Walter Neilson, Esq., President elect, acting as croupier.

The Chairman, in proposing the Army and Navy, referred to the fact that in former times there existed no distinction between military and civil engineering, both branches being practised by the same individuals. It was worth remarking that the great military commanders of antiquity were engineers—a circumstance to which, in a great measure, their success and skill as soldiers was owing. Julius Cæsar was a consummate engineer, as would be seen from his "Commentaries," a great portion of which he devoted to the description of the engineering works erected by himself. Leonardo da Vinci was a skilful engineer, as also was Michael Angelo, and Benvenuto Cellini was a military engineer of the highest merit. In modern times, however, owing to the division of labour, and to the cultivation of the arts of peace, civil and military engineering were generally regarded as distinct professions, but there was, nevertheless, a strong connection between them; and he was glad to see that recently the intimacy between both was beginning to be recognised again. Civil and mechanical engineers of the highest eminence had lately conferred the greatest benefit upon the military art by their improvement of implements of war, such as those introduced by Whitworth and Sir W. Armstrong, which had brought the art to a degree of perfection never attained before. For this reason civil and mechanical engineers should look upon those who professed the

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military art with interest and sympathy. Then as regards the navy, he need scarcely remind them of their intimate connection with that branch of the service, since they must all be aware that the success of our fleets must depend on the construction of swift and strong ships, and the machinery for their propulsion.

THE SOUTH WALES INSTITUTE OF ENGINEERS.

April 26.—The third annual meeting was held in Newport last Tuesday, under the presidency of Ebenezer Rogers, Esq., F.G.S., &c. There were present a considerable number of scientific gentlemen engaged in the various industries of the district. The Mayor of Newport and other gentlemen of the town were also present as visitors. By a regulation of the institute we are unable to give a report of the proceedings; but we learn from the *Star of Gwent* that the discussion chiefly turned on the combustion of coal, in the course of which the comparative values of English and Welsh coals were discussed—the opinion of the members being adverse to the merits of English coal for steam purposes. A paper by Mr. Wilson, of Sheffield, on Steel Manufacture brought out the fact that the trade had been materially stimulated by the demand for crinoline hoops. The discussion of this paper was postponed to the next meeting. A paper by Mr. Murphy, of Newport, on Railway Wheels was also postponed, on account of want of time for its reading and discussion. The dinner was held at the Westgate Hotel at half-past four o'clock. The chair was occupied by Ebenezer Rogers, Esq., F.G.S., president, supported by H. Sheppard, Esq., Mayor of Newport, Sir T. Phillips, F. Levick, Esq., Blaena, Warrington Smyth, Esq., &c. The vice-chair was filled by W. S. Clark, Esq., of Aberdare. About eighty gentlemen were present, including those who were not members of the institute, but who were interested in its welfare.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

April 19.—W. Fairbairn, F.R.S., President, in the chair. The following gentlemen were elected members of the Society: As honorary members: W. J. Macquorn Rankine, LL.D., F.R.S., &c.; Baron Carl T. von Reichenbach. As ordinary members: T. Heelis, T. R. Wilkinson, A. Ransome, B.A., M.B., M.R.C.S. The annual report was then read by Dr. Schunck, one of the secretaries. In their report the council express their conviction, that at no period of its existence has the Society been in a more flourishing condition. It has been considered advisable to postpone the preparation of a new catalogue of the library until the result of a correspondence now in progress with a great number of scientific societies and institutions, for the purpose of introducing a mutual exchange of publications, shall be known, and the system of such exchanges shall thus have been more completely developed. The library is gradually emerging out of the insignificance in which it had remained until within the last few years. The improvement is almost entirely owing to the exchanges referred to; but an improvement on that basis, to whatever extent it be carried, can never bring the library to a desirable state of completeness. The transactions and other publications of learned societies and institutions, which are thus obtained, are undoubtedly of the greatest value, and of course absolutely necessary in a scientific library; but still, they constitute only one of its chief elements. Scientific periodicals and separately printed works—the other elements—must, as a rule, be bought. A project for supplying the necessary funds has been submitted to the council, and, if approved of, will no doubt be recommended to the attention of the members. After some remarks by Mr. Chadwick, the report was adopted on the proposal of Mr. Curtis, seconded by Dr. Clay. The annual election of officers then took place, when the following gentlemen were elected:—President: W. Fairbairn, F.R.S., Vice-Presidents: J. Prescott Joule, LL.D., F.R.S., F.C.S; T. Hopkins, M. Brit. Met. Soc.; Joseph Cheeseborough Dyer; Robert Angus Smith, Ph.D., F.R.S., F.C.S. Secretaries: Edward Schunck, Ph.D., F.R.S.; Richard Copley Christie, M.A. Treasurer: Henry Mere Ormerod. Librarian: Charles Fredrik Ekman. Of the Council: Rev. Wm. Gaskell, M.A.; Richard Roberts, M. Inst. C.E.; Joseph Baxendell, F.R.A.S.; Edward William Binney, F.R.S., F.G.S.; Peter Spence; Joseph Atkinson Ransome, M.R.C.S. Mr. Dyer moved, and Dr. Joule seconded, a vote of thanks to Mr. Ekman, the librarian, for the valuable services rendered by him to the Society. The meeting was then adjourned to Tuesday the 3rd of May.

SOCIETY OF ARTS.

May 4.—Mr Leonard Wray read a paper on Timber for Shipbuilding. A report of this lecture will appear in our next number.

MEETINGS FOR THE ENSUING WEEK.

MON.—*London Inst.*, "On Commercial Law," by G. W. Hastings, Esq., at 8 p.m.
Geographical Society—I., "Notes on the Lower Danube," by Major Stokes, R.E., communicated by Captain Collinson, R.N.; II., "Observations on the Geography of Central Africa," by James McQueen, Esq., F.R.G.S.; III., "Remarks on the Seychelles," by Lyon McLeod, Esq., F.R.G.S., at 8 30 p.m.

TUES.—*Royal Inst.*, "On the general facts and leading principles of Geological Science," by J. Morris, Esq., F.G.S., at 3 p.m.
Inst. Civil Engineers—I., Discussion upon Mr. Kingsbury's paper "On the Victoria Docks," and upon Mr. Harrison's paper "On the Tyne Docks;" II., "Short account of the Wrought-iron Girder Bridge over the Spey, on the Aberdeen and Montrose Railway," by Mr. W. Fairbairn, M.Inst. C.E.; III., "Description of the Government Water-works, Trafalgar-square, by Mr. C. E. Amos, M. Inst., at 8 p.m.
Zoological, at 9.

WED.—*Society of Arts*, "On the Recognition of Music among the Arts," by Mr. Henry F. Chorley, at 8 p.m.

THUR.—*Chemical*, at 8 p.m.
Society of Antiquaries at 8 p.m.
Royal Inst., "On the Seven periods of Art," by Henry Layard, Esq., at 3 p.m.
Linnean, at 8 p.m.

FRID.—*United Service Inst.*, "On the history of Gun-locks," by Mr. Robert Pritchett, at 3 p.m.
Royal Inst., "On the changes of terrestrial temperature at different geological epochs," by W. Hopkins, Esq., M.A., F.R.S.

SAT.—*Royal Inst.*, "On Modern Italian Literature," by J. P. Lacaita, Esq., at 3 p.m.

EXPLOSIONS AT GUNPOWDER WORKS.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—Every question has its "pro" as well as its "con," and the question of gunpowder works and their owners is no exception to the rule. In your last number are some rather severe strictures which I think need some reply. With the disgrace reflected upon chemical progress, I have now nothing to do, but I think I can prove that powder manufacturers are not quite so insensible to improvement as you seem to imagine. Has nothing been done (say during the last 25 years) towards improving the machinery necessary for the manufacture of gunpowder? Has no improvement been made in "Mixing-houses?" Has nothing been done towards improving the "Incorporating Mills?" Are the "Press-house," the "Caming-house," the "Drying-house," the "Dusting-house," what they were thirty years ago? These changes, I confess, are not blazed abroad to the world; but every one conversant (and very few are) with the manufacture of powder knows that the number of hands requisite in the houses is greatly diminished, and that the risk to which these are exposed is also greatly diminished. Surely you will not grudge the manufacturers their due meed of praise for these improvements—improvements the carrying out of which has cost large sums of money, but all has been cheerfully done where any good was likely to be attained. I cannot account for the lowness of wages given to men employed in powder works, and would fain hope there is some misinformation upon the matter; but I can say that *all* do not pay so badly as is represented. At the largest manufactory in England (perhaps in the world) the men employed in the more dangerous parts of the business earn weekly from 35s. to 44s., and with pride I acknowledge that a case of drunkenness is never known; and never does a man (and there is a great number) ever stay from work unless from sickness. Give men good wages and you may generally get good men. At the factory abovementioned not a fatal accident has occurred for more than twenty years. True, every care is taken both in the choice of men and machinery, but if, as is thought, these accidents are attributable to the state of the atmosphere, who shall cast censure upon the unfortunate manufacturer because he cannot cope with the elements?

Pray permit the subject to be fully discussed in your valuable journal, especially any information respecting the state of the atmosphere at the times of explosions. The lives of many depend upon this business, and if anything should be discovered by which these lives may be preserved, blessings will rest on the head of the discoverer. I am, &c.,

POLVORA.

THEORY OF NAVAL ARCHITECTURE.

No. VII.

IN the two preceding articles we have shown where ordinates should be drawn in a curvilinear figure, to give a tolerably correct approximation to the area. As the examples there taken are of the same character as ordinary midship sections, it will be seen to be necessary, when operating upon the draught of a ship, to place the ordinates closer in the neighbourhood of the keel, than in the other portions. Again, all ships, except those designed for high speeds, have the greatest amount of curvature in their horizontal sections at their extremities; consequently, when placing the ordinates to calculate the areas of these sections, it will be necessary to put them closer at the extremities than in the other parts.

We must now hasten to apply the rules to the calculations of the displacement of a ship, reserving all further discussion of the relation between the ordinates and areas until it is required from the nature of the calculations.

Our first example will be the simplest case which can be given, namely, a ship in which the constructed load-water line is parallel to the keel, and iron is the material of which she is composed. In this case the sections of the ship can be chosen so as to introduce no appendages which may not be safely neglected; the calculations will therefore be direct. The length of this ship between the perpendiculars is 156 feet; breadth extreme, 20 feet; depth, from the upper part of beam to lower part of the keel, 11 feet 6 inches; burthen, builders' measurement, 310 tons; draught of water forward and aft, 6 feet 6 inches; keel below the lower edge of rabbet, 6 inches.

Let Fig. 14 represent the sheer draught of a screw ship; *L WL*, the constructed load-water line; the length of the part *C D* between the stem and the foremost stern post is 151·2 feet. Divide *C D* into twelve equal portions of 12·6 feet each; through the points of division let vertical transverse sections be drawn; these are represented by the vertical straight lines 1, 2, 3, &c., and in order to meet the greater curvature, usual in ships at their extremities, let sections 1½, 2½, 11½, and 12½ be drawn parallel to these midway between 1 and 2, 2 and 3, 11 and 12, 12 and 13 respectively.

Again, the depth from the load-water section to the intersection of the side of the keel and the curved surface of the ship is 6 feet; let this depth be divided into four equal portions, each of which is 1·5 feet, and at the points of division let the water sections 2 *WL*, 3 *WL*, and 4 *WL*, be drawn parallel to the load-water section; and to meet the greater curvature in the neighbourhood of the keel let the sections 3¼ *WL*, and 4¼ *WL* be drawn parallel to these midway between 3 *WL* and 4 *WL*, and 4 *WL* and 5 *WL*, respectively. All these sections are represented in the sheer plan by horizontal lines.

The plane, *LWL*, of the load-water line—the transverse vertical plane through (1), the after part of the stem—and the plane through the middle line of ship, all at right angles to each other, are taken as the co-ordinate planes.

Now, it is evident that the transverse vertical planes intersect each of the horizontal or water sections, in lines perpendicular to the longitudinal plane through the middle of the ship, and therefore perpendicular to the middle line; consequently, the intersections of each horizontal section by the transverse sections may be regarded as ordinates to the curve in which that horizontal plane cuts the ship. Also since the vertical sections 1, 1½, 2, 2½, and 3; 13, 12½, 12, 11½, and 11, are drawn at 6·3 feet apart, the corresponding ordinates of the horizontal sections are 6·3 feet apart, and the number in each case is odd, therefore the area of these parts may be found by Rule 2. Also the ordinates between sections 3 and 11 are 12·6 feet apart, and the number is odd, therefore the whole area of any horizontal section may be found as has been already described.

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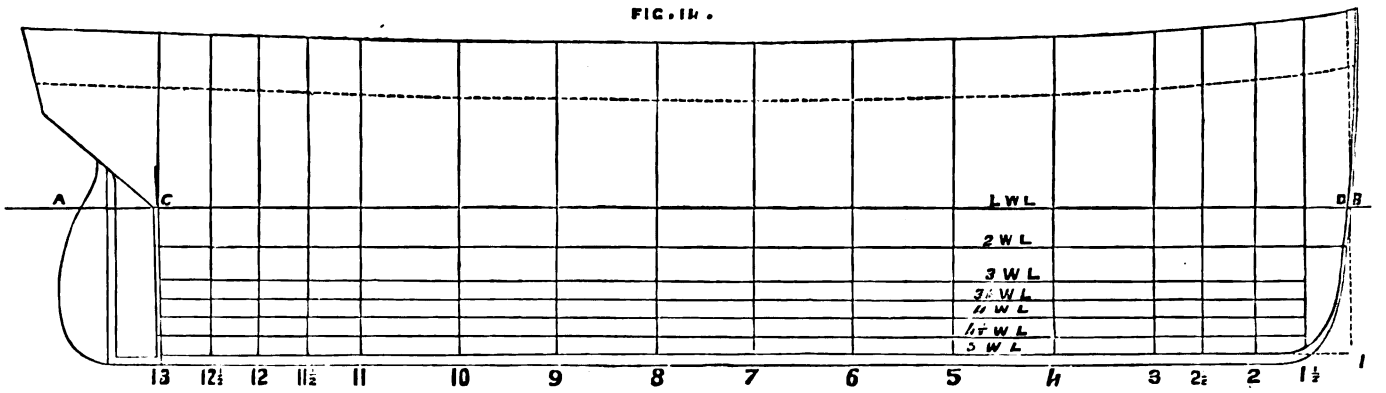
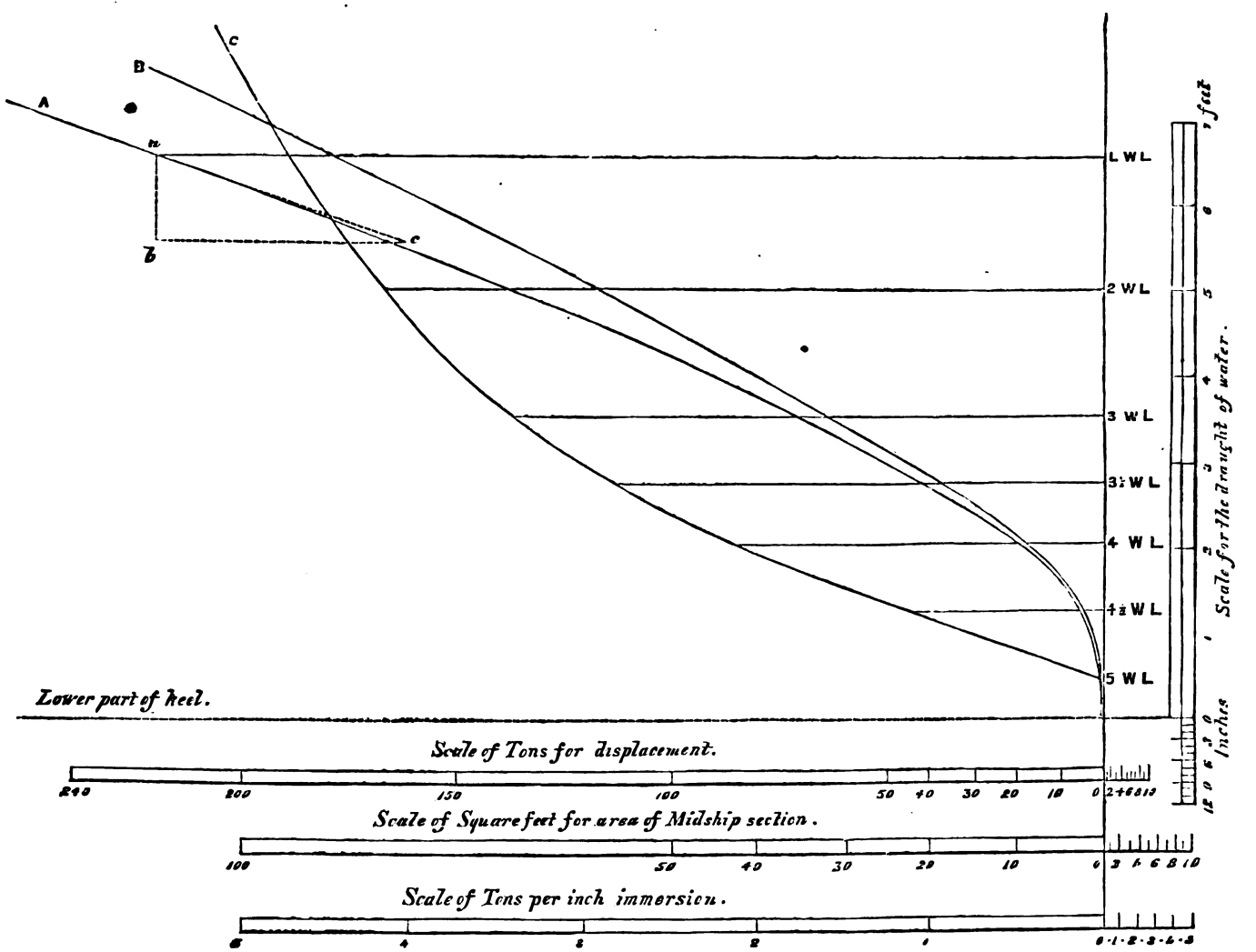
FIG. 14.



SCALES: Of Displacement, *A*; Area of the Midship Section, *B*; and Tons per Inch Immersion, *C*.



Regarding any transverse vertical section in the same manner, it will be seen that the intersection of it by the horizontal sections may be regarded as ordinates to the curve; that the ordinates corresponding to the intersections of it by *L W L*, 2 *W L*, and 3 *W L*, are 1·5 feet apart; and those corresponding to those of 3, 3½, 4, 4½, and 5, are ·75 feet apart; in each of these cases the number of ordinates is odd, and the area of the entire transverse section may be obtained by the method described in our former articles. The load-water section being parallel to the keel, all the water sections are drawn in their true forms in the half-breadth plan, and their intersections by any transverse section are represented by a line perpendicular to the middle line; also the intersections of the transverse sections, and any water section in the body plan, are represented by a horizontal line, as explained in the articles on "Laying Off." The lengths of the ordinates may therefore be obtained from either the half breadth or the body plan.

Suppose these measured off for each separate transverse vertical section, the areas of these sections may be found as before described. If, again, these areas be regarded as the ordinates to a curve at the corresponding sections in the half-breadth plan, the area of the figure of which this curve is the boundary will represent the displacement.

Were we to proceed in this manner, nothing further would be required if our calculations were confined to a few ships; but if our examples were numerous, we should find it necessary to have recourse to some method by which the labor would be abridged, and the space occupied by the calculations be reduced. Various forms for this purpose have been adopted by Naval architects, and that which we give on the next page, now published for the first time, was devised by the late Mr. John Wilson, who was for many years the chief draughtsman in the Surveyor's department at the Admiralty.

It will be seen to contain the whole of the calculations relating to the displacement, as well as to the positions of the centre of buoyancy and

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metacentre; all of which, for a ship of any class, may be placed on one page of ordinary paper. On the other side of the page are usually drawn the scales of displacement, area of the midship section, and sometimes that of the tons per inch immersion; so that on half a sheet of paper the whole of these important calculations may be registered.

The table will be found almost self-explanatory. In the upper line are written in order the horizontal sections, with vertical lines separating them; under them are written the numbers by which the corresponding ordinates of the transverse sections are to be multiplied to obtain the areas by Rule 2. In the extreme left column are written in order the transverse sections with horizontal lines separating them; and immediately to the right are written the numbers by which the corresponding ordinates of the horizontal sections are to be multiplied to obtain their areas.

These vertical and horizontal lines drawn on the table divide a portion of it into 17 × 7, or 119 compartments. Also since by the intersection of the horizontal and vertical planes 119 ordinates are obtained from the half-breadth or body plan, as before described, these may be respectively inserted in the corresponding compartments. In the table these ordinates are printed in different characters, so as to distinguish them from the other figures, in the compartments.

Ordinates.	Multipliers.	Keel or 5 W. L.		4½ W. L.		4 W. L.		3½ W. L.		3 W. L.		2 W. L.		L. W. L.		Vertical Sections. Areas.	Multiples of areas.	Multipliers.	Moments.	Metacentre. Cubes.	Multiples of cubes.
		½		2		1		2		1½		4		1							
1	½	·1 ·05	·05	·1 ·2	·05	·1 ·1	·05	·1 ·2	·05	·1 ·15	·05	·1 ·4	·05	·1 ·1	·05	1·2	·6	0	0	0	0
1½	2	·1 ·05	·2	·1 ·2	·2	·2 ·2	·4	·3 ·6	·6	·4 ·6	·8	·7 2·8	1·4	·9 ·9	1·8	5·35	10·7	½	5·35	·73	1·46
2	1	·1 ·05	·1	·2 ·4	·2	·4 ·4	·4	·6 1·2	·6	·8 1·2	·8	1·3 5·2	1·3	1·9 1·9	1·9	10·35	10·35	1	10·35	6·86	6·86
2½	2	·1 ·05	·2	·4 ·8	·8	·7 ·7	1·4	1·0 2·0	2·0	1·4 2·1	2·8	2·1 8·4	4·2	2·9 2·9	5·8	16·95	33·9	1½	50·85	24·39	48·78
3	1½	·1 ·05	·15	·6 1·2	·9	1·2 1·2	1·8	1·7 3·4	2·55	2·2 3·3	3·3	3·1 12·4	4·65	4·0 4·0	6·0	25·55	38·325	2	76·65	64·00	96·00
4	4	·1 ·05	·4	1·4 2·8	5·6	2·3 2·3	9·2	3·2 6·4	12·8	3·9 5·85	15·6	5·1 20·4	20·4	6·2 6·2	24·8	44·0	176·0	3	528·0	238·33	953·32
5	2	·1 ·05	·2	2·0 4·0	4·0	3·6 3·6	7·2	4·8 9·6	9·6	5·8 8·7	11·6	7·1 28·4	14·2	8·0 8·0	16·0	62·35	124·7	4	498·8	512·00	1024·00
6	4	·1 ·05	·4	2·6 5·2	10·4	4·8 4·8	19·2	6·3 12·6	25·2	7·5 11·25	30·0	8·7 34·8	34·8	9·3 9·3	37·2	78·0	312·0	5	1560·0	804·36	3217·44
7	2	·1 ·05	·2	2·9 5·8	5·8	5·6 5·6	11·2	7·4 14·8	14·8	8·7 13·05	17·4	9·6 38·4	19·2	10·0 10·0	20·0	87·7	175·4	6	1052·4	1000·00	2000·00
8	4	·1 ·05	·4	2·9 5·8	11·6	5·7 5·7	22·8	7·7 15·4	30·8	9·0 13·5	36·0	9·9 39·6	39·6	10·0 10·0	40·0	90·05	360·2	7	2521·4	1000·00	4000·00
9	2	·1 ·05	·2	2·6 5·2	5·2	5·0 5·0	10·0	6·8 13·6	13·6	8·0 12·0	16·0	9·2 36·8	18·4	9·7 9·7	19·4	82·35	164·7	8	1317·6	912·67	1825·34
10	4	·1 ·05	·4	1·8 3·6	7·2	3·5 3·5	14·0	4·9 9·8	19·6	6·0 9·0	24·0	7·7 30·8	30·8	8·7 8·7	34·8	65·45	261·8	9	2356·2	658·50	2634·00
11	1½	·1 ·05	·15	1·0 2·0	1·5	1·9 1·9	2·85	2·7 5·4	4·05	3·6 5·4	5·4	5·3 21·2	7·95	6·9 6·9	10·35	42·85	64·275	10	642·75	328·50	492·75
11½	2	·1 ·05	·2	·6 1·2	1·2	1·2 1·2	2·4	1·7 3·4	3·4	2·4 3·6	4·8	3·9 15·6	7·8	5·5 5·5	11·0	30·55	61·1	10½	641·55	166·38	332·76
12	1	·1 ·05	·1	·3 ·6	·3	·6 ·6	·6	1·0 2·0	1·0	1·4 2·1	1·4	2·5 10·0	2·5	3·8 3·8	3·8	19·15	19·15	11	210·65	54·87	54·87
12½	2	·1 ·05	·2	·1 ·2	·2	·2 ·2	·4	·4 ·8	·8	·7 1·05	1·4	1·2 4·8	2·4	2·0 2·0	4·0	9·1	18·2	11½	209·3	8·00	16·00
13	½	·1 ·05	·05	·1 ·2	·05	·1 ·1	·05	·1 ·2	·05	·1 ·15	·05	·1 ·4	·05	·1 ·1	·05	1·2	·6	12	7·2	·00	·00

	3·6 ½	55·2 2	103·95 1	141·5 2	171·4 1½	209·7 4	236·95 1	1632·0 ·5	11689·05 12·6	16703·58 4·2
1632·00	1·8 4	110·4 3½	103·95 3	283·0 2½	257·1 2	838·8 1	236·95 0	916·00 4·2	7013430 14026860	3340716 6681432
2765·95 1·5	7·2	386·4	311·85	707·5	514·2	838·8	0	1832 3664	1632)147282·03	70155·036 2
1382975 276595					3·6 165·6	236·95 838·8	1184·75 1677·6	3847·2 2	80·39 ft.	3) 140310·072
1632)4148·925		18·0 441·6	1·8 110·4	311·85 141·5	171·4	2862·35 171·4	7) 7694·4	Cr. of Buoyancy abaft (1).	7694·4) 46770·024	
2·264 feet.		459·6 103·95	51·975	622·55 1 5	1247·15 ·5	2690·95 4·2	5) 1099·2	236·95 4·2	6·0784 ft	
Cr. of Buoyancy below L.W.L.		355·65 1·5	161·175 ·5	933·825 4·2	623·575 4·2	11301·99 1·5	Tons 219·84	47390 94780	Metacentre above Centre of Buoyancy.	
		533·475 4·2	82·0875 4·2	3922·065 3	2619·015 2	6) 16952·985	Displacement to L.W. Line.	995·19 2		
		12) 2240·595	344·7675 2	8) 11766·195	7) 5238·03	7) 2825·4975	90·05 ·5	7) 1990·38 area of L. W. Section.		
		7) 186·7162	7) 689·535	7) 1470·7743	5) 748·29	5) 403·6425	45·025 2	5) 284·34		
		5) 26·6737	5) 98·505	5) 210·1106	149·658 219·84	80·7285 219·84	90·05 feet.	12) 56·868 Tons per ft. Immersion.		
		5·3347	19·701	42·0221	70·182	139·1115	Mid-Section to L.W.L.	4·739 Tons per in. Immersion.		
		Dispt. to 4½ W.L.	Dispt. to 4 W.L.	Dispt. to 3½ W.L.	Dispt. to 3 W.L.	Dispt. to 2 W.L.				
Dispt. per In. at Lines		1·104	2·079	2·830	3·428	4·194				
Mid-Section at Lines		2·25	8·70	18·90	31·45	60·00				

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MESSRS. HALL AND WELLS' IMPROVED ELECTRIC TELEGRAPH CABLES.

FIG. 1.

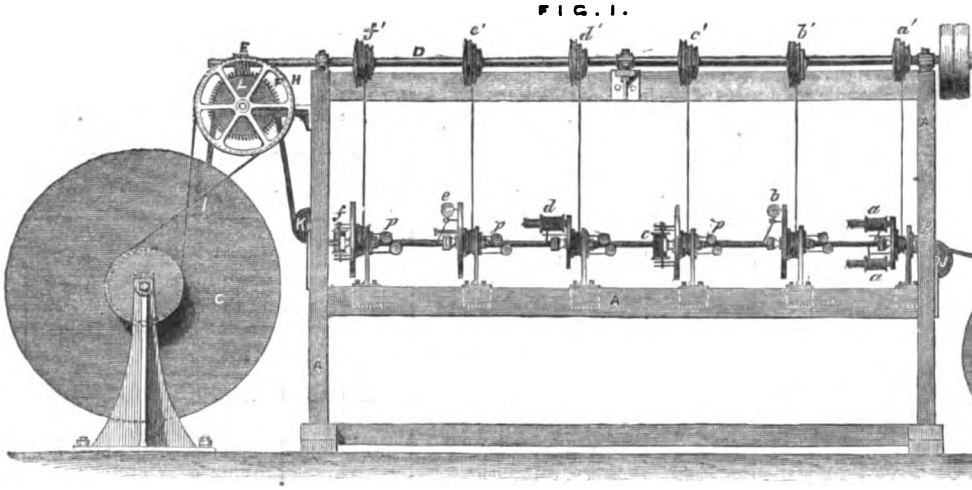


FIG. 2.

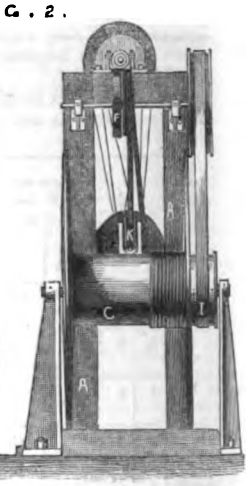


FIG. 5.

FIG. 3.

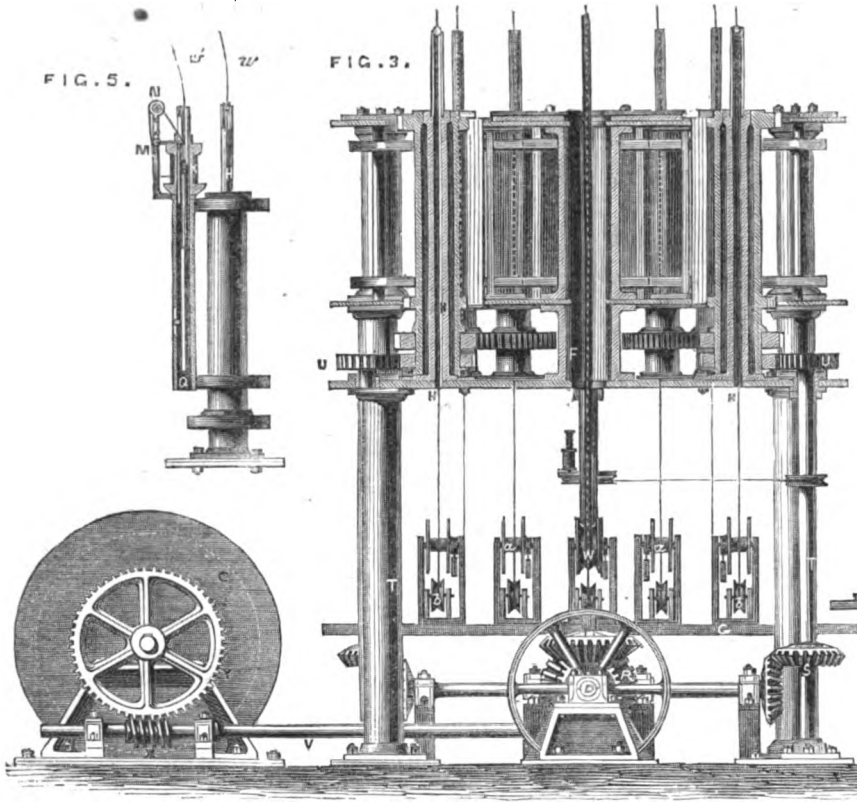
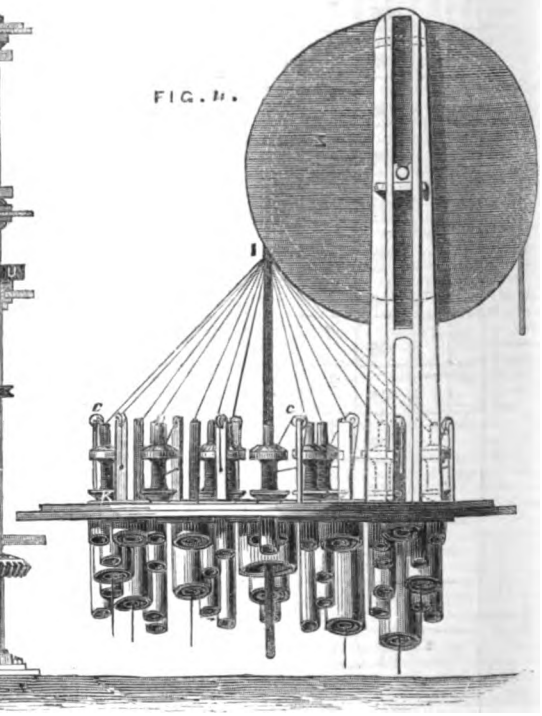


FIG. 4.



MESSRS. HALL AND WELLS' IMPROVED ELECTRIC TELEGRAPH CABLES.

THE following is the specification of Messrs. Hall and Wells' Improved Electric Telegraph Cables, to which reference is made in our leading article upon the subject, page 295: "Our Invention consists, First, in perfectly insulating the conducting wire or wires as follows:—We commence by covering the conducting wire or wires with a spiral layer of cotton, and we prefer to use grey or unbleached cotton, as being the most pure. We then cover the cotton with a strip or strips of rubber cut from the bottle or other form in which it is imported, without being masticated or otherwise operated upon; we lay on this strip or strips spirally, and with overlap. We then wind round outside of the spiral overlapping layer or layers of rubber a thread of vulcanised rubber covered with cotton or other like suitable fibre. We perform all these coverings at one and the same operation, and employ for so doing a spiral-covering machine calculated to lay on the several coverings in the order above described. In some cases in place of the covered thread of vulcanised rubber before mentioned, or in addition thereto, we apply further spirally-laid coverings of pure rubber laid on alternately in opposite directions, and envelope the whole in a similar covering of vulcanised rubber or not as may be desired. The whole of these operations may be performed in one machine. Our invention further consists in projecting insulated wire or wires, whether insulated in the manner hereinbefore described or otherwise, in the following manner:—We commence by applying a covering of gutta percha of the ordinary kind, where that may be found desirable, and this gutta percha we surround with plain hemp or other fibre free from oil, tar, and grease, braided or spirally laid on. Where gutta percha is not used, the plain hemp or other fibre is laid immediately upon the rubber or other insulating material. Then we braid, wrap, or lay a coating of spun yarn or other fibre saturated with tar or other preserving substance. We apply these two wrappings at one and the same operations by a machine similar to that which we employ in performing the first part of our invention, or by any equivalent means. The spun or tarred yarn or wrapping of rubber is then protected by wires laid on by means of a hollow-tube braiding machine at one operation, whereby one set of wires is laid longitudinally without any twist, while another set forms the braiding, and encloses the longitudinal wires.

"In the annexed engravings we have represented a spiral-covering machine, with the parts of it arranged in a manner suitable for carrying the earlier operations of our invention into effect. This machine is so constructed as to lay on the hemp-spun yarn, or other fibre for the protection of the insulated wire, simultaneously with the insulation of the same. Fig. 1 is a side elevation, and Fig. 2 an end elevation of the said machine. *A* is the framework of the machine; *B* is a drum on which the conducting-wire which is to be operated upon is wound, and from which it is delivered as the covering proceeds, being put in tension, if desired, by means of the weight *W* and the counter-weight *w*; *C* is a drum on which it is received and wound when the winding-on of the spiral coverings is completed; *D* is the main driving-shaft, which is driven by pulleys on its extremity, and upon which at its other extremity, is fitted

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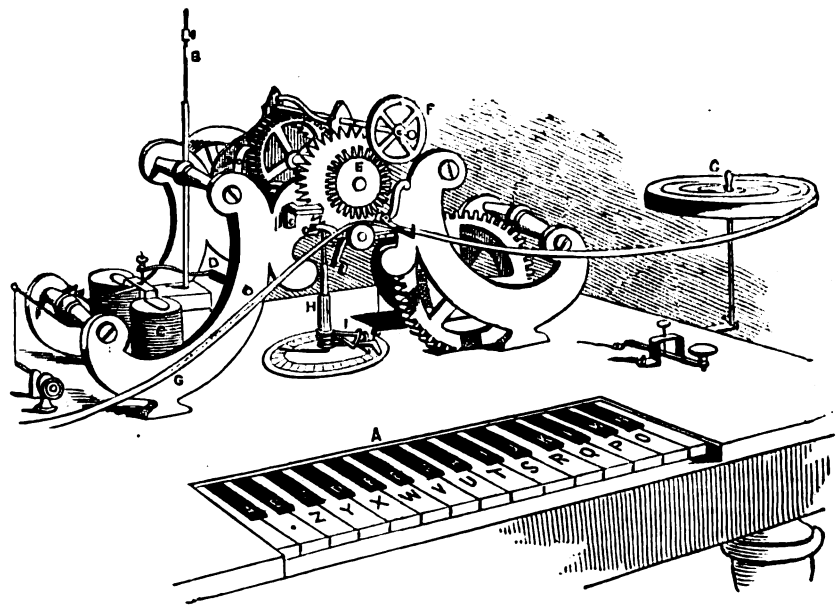
the worm *E*, gearing into the worm-wheel *F*. The shaft *G*, on which the worm-wheel *F* is mounted, carries at its extremity the belt pulley *H*, round which passes the belt *I*, which also passes round the drum *C* and drives it, thereby drawing the conducting-wire through the machine from the drum *B*. When the drum *C* becomes full the belt *I* slips, and thus acts as a friction belt, as is well understood. The wire, after it leaves the drum *B*, passes over the pulley *J* and under a small friction-pulley into the machine. *a*, *a*, *b*, *c*, *d*, *e*, and *f* are revolving bobbins mounted and fitted in the manner shown, and driven by cords passing round the pulleys *a'*, *b'*, *c'*, *d'*, *e'*, *f'*, on the shaft *D*. The bobbins *a*, *a*, which are attached to one head, carry unbleached cotton; the bobbins *b* and *c* carry the thin strip rubber; the bobbin *d* carries the vulcanized india-rubber thread, covered with cotton or other fibre; the bobbin *e* carries thin strip rubber; and the bobbin *f* carries spun-yarn or other fibre, either saturated with tar or other preserving substance or not as may be preferred. All these are successively laid over the wire by the bobbins as they revolve. As is well understood, between the bobbins pairs of friction-pulleys *p p* are fitted to prevent jibbing or other motion during the manufacture. After it has received the last covering from the bobbin *f*, the wire passes under the pulley *K*, over the pulley *L* (on the shaft *G*) and down to the drum *C*. If it is thought desirable to apply coatings of india-rubber or other solutions or substances between the successive coverings as they are laid on, gauges supported on standards may be fixed for the purpose between the bobbins. The wire having been insulated, and partly protected, with successive coverings in the manner and by the means above set forth, is next conveyed to the hollow-tube braiding machine to receive a wire covering consisting of one set of wires laid longitudinally without any twist, and of another set which encloses them and forms the braiding. In the annexed engravings we have represented a hollow-tube braiding machine, with the parts of it arranged in a manner suitable for effecting this operation. Fig. 3 is an elevation, partly in section, of the machine with the upper portion thereof removed, that portion being shown separately in Fig. 4. Fig. 5 is a detached view, partly in section, of one of the pipes and hollow tubes shown separately. *A* is the frame of the machine; *B* is the drum on which the insulated wire to be covered is wound; *C* is a pulley round which the finished cable passes after it leaves the machine. *D* (Fig. 3) is the main driving shaft which carries the pulleys *E E*, by means of which a steam engine or other prime mover imparts motion to the whole of the machine through the various shafts and wheels shown in the several figures. The insulated wire *W* as it leaves the drum *B* passes under a pulley, and then descends in the centre of the machine, passing into and up through the central tube *F*. The wires *w*, which are to be laid longitudinally along the cable without twist are wound on bobbins *a*, *a*, *a*, supported on the lower platform *G*. After leaving these bobbins they pass respectively under the pulleys *b*, *b*, *b*, and then ascend through the various hollow tubes *H*, *H*, *H*, passing out over the small pulleys *c*, *c*, *c*, and meeting the cable at the centre, as at *J*, Fig. 4. Instead of a single wire passing through each of these tubes, two, three, or more such wires may be led from one or more, or from as many bobbins. Further, in addition to the wires *w* just described the set of longitudinal wires may also comprise others led up through the central tube of the machine alternately between the former ones, so as to be braided in upon the spun yarn or other fibrous covering of the wire to increase the strength. The braiding wires *w'* are carried upon the bobbins *K*, the construction of which will be best understood by reference to Fig. 5. The bobbin *K* runs loose upon the tube *L*, and the wire *w'* as it leaves the bobbin passes through a steel eye or through a slot in the tail-piece *M*, and, ascending, passes over the pulley *N*, on the upper end of the same and down through a hole in the latch *O* which is jointed to the tail-piece. It then passes down under a pulley, which pulley is secured to the upper end of the weight *Q*. From the weight pulley it again ascends, and after passing through the latch *O*, leaves the tube *L* through a hardened steel eye. The action of this part of the apparatus is in all respects similar to the action of similar parts in the ordinary braiding machine, and, therefore, needs no description. When the shaft *D* is put in motion by means of a belt on the pulley *E*, the bevil wheel *R* on the said shaft communicates motion through the bevil wheels *S*, *S* to four vertical shafts *T*, *T*, which carry at their upper parts the toothed wheels or spur gear *U*, *U*, by which the braiding tubes are driven. We have adopted four upright driving shafts and separate spur gear for each, in order to ensure a better working and more uniform wear than could be obtained if a single upright shaft and one set of spur gear only were employed as in the ordinary light machines. The shaft *D* carries a worm taking into a worm wheel on the shaft *V*, which shaft also carries a worm *X*, which drives the worm wheel *Y* on the axle of the pulley *C*. As motion is imparted to that pulley through these parts, the wire which passes around it is drawn through the machine, descending over the great pulley *Z* to the pulley *C*, as it leaves the machine in its finished state. By this arrangement of the receiving pulley *C*, and this method of driving it, we avoid producing that excessive friction and wear which would be occasioned in portions of the machinery if the power for driving it were taken off at any point remote from the main shaft *D*, whereby the bevil wheels and other gear would be unequally worn, and the working of the machine thus deranged.

"In addition to the wire covering which this machine is intended to lay upon the cable, it may also be furnished with an arrangement for laying on a final covering of spun yarn or other fibres saturated with tar before the wire is braided on. This may be done by means of a revolving bobbin *B'* mounted upon a platform *P'* in the central part of the machine, as shown at Fig. 2. This bobbin may be driven by a small belt leading from a pulley on any one of the upright shafts *T*, or in any other convenient manner."

PROFESSOR HUGHES' ELECTRIC TELEGRAPH APPARATUS.



A Key Board; *B* Vibrating Spring; *C* Electro-Magnet; *D* Detent; *E* Type-Wheel; *F* Ink Roller; *G* Paper printed upon; *H* Revolving Shaft; *I* Revolving Arm or Circuit Closer.

IN a former volume we published as full a description of Professor Hughes' system of type-printing telegraphs as we could at that time obtain, and also an account as full as we were permitted to make it known, of the means adopted by that gentleman for rendering feeble currents effective for communicating signals. More recently Professor Hughes has brought forward an improved method of insulating submarine telegraph wires. As these inventions have excited considerable attention, and as Professor Hughes claims very large and important advantages for his systems, we avail ourselves of a paper recently read at the Society of Arts, by Mr. H. Hyde, as a means of giving a more detailed account of them than has yet appeared in our columns. Mr. Hyde is intimately associated with Professor Hughes in his electrical undertakings, and his description may therefore be taken as reliable. Slightly condensed it is as follows:—

INSULATION.

Gutta percha has been found to be the best insulator for long submarine lines. This substance, however, is more or less porous; minute flaws may exist, which do not show themselves until some time after the immersion of a cable. This was exemplified by Mr. Henley, who discovered a flaw in his submarine cable, which did not show itself until it had been three or four days under water. To meet those defects, to fill up any minute pores in the gutta percha, and also to cure any accidental fracture or puncture of it, Professor Hughes introduces a viscid semi-fluid substance, of a non-conducting character, between the conducting wire and the gutta percha, or the wire may first be coated with gutta percha, and the viscid fluid introduced between the layers of gutta percha. As soon as a puncture is made in either of the gutta percha coatings, the semi-viscid fluid oozes out. It is of such a nature, that it hardens when it comes in contact with the surrounding water. This hardening or coagulating property allows no more of the fluid to ooze out than is necessary to fill the fracture, and at the same time to glue and unite the separated parts of the gutta percha. The first feature in this form of cable is its self-restoring power; but it has another, and perhaps more important one. It has been shown, I think by Professor Faraday, that a fluid which cannot be decomposed by electricity is the most perfect insulator. Should this be demonstrated in practice, the invention of this form of cable must be valuable as a means for greatly increasing the non-conducting power of the medium surrounding the conducting wire. It is well known that cables become defective in insulation after being submerged for some time. It has been supposed that the forces of the electric current burst the gutta-percha covering under certain circumstances. It has also been urged that, in consequence of this tendency, battery power should be used instead of induced currents. Professor Hughes has demonstrated that voltaic currents exert no mechanical force whatever upon the insulating coating of a conducting wire. If there be a defect in the coating it may be enlarged by strong currents, either voltaic or induced. But if there be no pore or crack through which the current can first commence its work of destruction, no voltaic current would exert sufficient force to tear a piece of paper. This has been shown by putting a piece of cable, three feet long, made upon Professor Hughes' plan, into a bath of salt water. Its complete insulation was tested by a delicate galvanometer and a battery of 500 cells. A fracture, an inch long, was then made through the gutta percha and the viscid substance, allowing the salt water to reach the wire; the galvanometer immediately was deflected from zero to 90°, showing dead earth. In the course of five or ten minutes the viscid substance worked its way around the uncovered wire, and oozed out to the water through the fracture. It then coagulated, and thus repaired the injury, and completely restored the insulation. The whole force of the current from the 500 cells was kept constantly passing into the wire during the whole of this operation. In illustration of the varied effects of different descriptions of fractures upon submerged cables, it may be instructive to note that if the conducting wire be made bare by a fracture of considerable size, having breadth as well as length, the immediate effect will be dead earth, or the instantaneous deflection of the needle to 90°. If the fracture be fine or narrow, the effect will be a deflection of the needle to a greater or less extent, say from 70 or 90°, with a constant vibration of from five to ten degrees, or even more. This deflection and the vibrations will continue as long as the current is kept upon the wire, and often resemble the vibrations produced by a manipulator. This peculiar phenomena may, in some degree, account for the peculiar vibrations which so much puzzled the electricians during the short life and last moments of the Atlantic cable. These vibrations are probably produced by the decomposition of water by the electric current. The hydrogen gas escaping from the point of contact with the wire in an elongated bubble fills the fracture while passing through it, thus alternately opening and closing the circuit.

INSTRUMENTS.

The needle, the Morse, and the House instruments, as well as all minor ones hitherto worked with one wire, require an average of five or more electrical impulses or waves, or the time equal to this number, to transmit one letter. The recording in Roman type each letter of a message by a single wave, upon one wire, is the triumph of the Hughes' system. To accomplish it, several requisites are necessary, which it may be proper to state, and then proceed to show how they are each obtained, and united in one harmonious whole, producing that life-like automaton

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present to demonstrate before you what is advanced, and practically speak for itself in plain English. These requisites are, first, synchronous motion; secondly, an electro-magnet, by which the timing of the electrical wave may be accurately measured; thirdly, a writing apparatus, by which the message may be correctly, rapidly, and easily transmitted; fourthly, a printing apparatus, by which the operator can record the message unerringly upon his own instrument, as well as upon the one at the distant station. Many inventors have attempted to make an instrument by which a letter could be sent by one wave, but without success. One reason was, that they had no governor of sufficient velocity and accuracy to produce rapid synchronous motion. Professor Hughes applies a vibrating spring to govern his instrument. It is a well-known law that a certain number of vibrations produces a certain musical tone; therefore, if two or more springs have the same tone they must necessarily have a similar number of vibrations in the same time. The instruments are kept in motion by a weight acting upon a train of wheels, the spring governor acting upon them by means of an ordinary escapement. These vibrations may succeed each other with any degree of rapidity required. They are regulated by a small weight attached to the spring, and raised or lowered until the number of vibrations or desired tone is produced. This can be done easily and quickly, although the instruments may be any number of miles apart—say between London and Paris, or Ireland and America. The type-wheels of the instruments now exhibited, revolve at the rate of one hundred and twenty revolutions per minute, and the governor makes fifty-six vibrations for each revolution of the wheel.

The Magnet.

The Hughes' magnet is of peculiar construction. A permanent magnet polarizes the cores of an electro-magnet, and holds an armature in contact with its poles. A spring is attached to this armature, and so adjusted as to exert a counteracting power a little weaker than the force of the magnetic attraction. If, therefore, the magnetic force be diminished, the armature is removed from the poles of the magnet by the force of the spring. The arrangement is such that the current of electricity passing through the coil when the circuit is completed, induces an opposite magnetism to that of the permanent magnet. The electrical force, therefore, which works this instrument need not be sufficient to induce such a degree of magnetism as to render the core sufficiently magnetic to attract an armature to its poles—the practice in all other recording telegraphs. For instance, if the cores of the electro-magnet, polarised by the permanent magnet, have a holding force upon the armature of ten, and the spring attached to the armature be adjusted with an opposing force of nine, then a current of one reducing the force of the electro-magnet would cause the spring to rise with the force of nine. This arrangement can in practice be so nicely adjusted as to work with a very feeble current, and accurately measure the timing of the electrical wave. The armature being mechanically restored to contact with the poles, has the advantage of being acted upon by the maximum power of the electro-magnet, instead of a power lessened by more than the square of the distance the armature has to be attracted, as is the case in the relay magnets used in connection with the Morse and other systems.

Transmitting Apparatus.

The letters of the alphabet, as well as a dot and a blank, are marked on twenty-eight keys, arranged like those of a piano, save that they are alternately black and white. These keys correspond to twenty-eight holes arranged in a circle on the horizontal floor or table of the instrument, immediately in front of the keys. Each key is connected by a lever with a little steel knob, which, when the key is pressed down by the finger, rises up through one of the holes. An arm, connected with a vertical shaft, sweeps over the twenty-eight holes. If a key marked with a particular letter be touched, the knob corresponding with this letter rises, the revolving arm passes over it, and for the instant closes the circuit, and allows an electrical impulse to be transmitted. This impulse, by arrangements which will be described in the printing apparatus, causes the particular letter to be recorded on a slip of paper in printer's ink. The instant the arm passes over the little raised knob the circuit is broken, and if the finger were held a hundredth part of a minute on the key, the hand would pass again over the knob, and the letter would be repeated. To prevent this the hand carries, after the portion of it which rides over the knob and completes the metallic contact which closes the electrical circuit, a little inclined plane, which throws the knob out of its position, so that the hand cannot pass over it on any future revolution after the first contact. This arrangement is rendered necessary to prevent the repetition of letters, on account of the extreme rapidity of the revolving arm and recording apparatus.

Printing Apparatus.

A shaft, which revolves seven times faster than the type-wheel, has a fly-wheel upon it to overcome the inertia of a small shaft which moves the printing press. This shaft is locked to the fly-wheel shaft by means of a clutch, which rests upon a small inclined plane. Whenever this clutch is kept upon the inclined plane, by means of a detent, the fly-wheel shaft revolves independently of the small printing shaft; but as soon as the detent is moved by the action of the armature of the electro-magnet, the clutch locks both shafts together, and the small shaft is made to revolve one revolution, when the clutch again rests upon the inclined plane, which lifts it off the fly-wheel shaft. A cam is attached to one end of this shaft, which lifts the press and the paper upon which the message is to be printed against the type-wheel. The time of the locking of the shafts depends upon the arrival of the electrical wave, and thus, with two instruments in perfect harmony, the operator has the printing apparatus of the distant instrument as completely under his direction as the one before him. But to correct any minute variation in time between the instruments in circuit, there is a corrector or wheel attached to this shaft, with hook-shaped teeth, which mesh into corresponding cavities in the type-wheel. The latter being loose upon the shaft, or only held by friction, is removed backwards or forwards by the corrector to exactly the same position as the type-wheel on the instrument from which the message is being sent. This correction takes place in the act of printing every letter. There is also upon this shaft a cam, so arranged that the moment the armature falls off the electro-magnet and opens the detent, it forces the detent up, and restores the armature to its original position upon the poles of the magnet.

Another new feature in this instrument is its power of cutting off at will all offices except the one to which it is desired to communicate. This is accomplished by a flange on the type-wheel—this flange having a space cut out opposite a certain letter, and each office having the flange cut out at different letters from each other. A bolt is made to slide through the space, and moved through by the action of the instrument. If this bolt is sent through at the moment the space is opposite, it permits the instrument to run, if not, it goes against the flange and locks the type-wheel. The operator, knowing at what letter a certain instrument will be unlocked, touches that key. This allows the instrument he wishes to communicate with to run; and he can send the message to that one, the other offices being unable to get it, as they would be locked, and could not bring their instruments into unison with the one sending the despatch. Thus, it is absolutely secret in its transmission, and, if necessary, anyone could send his own message, as it is only necessary, to insure its safe arrival, to touch the right keys, which are all lettered.

The electrical circuits are extremely simple. The earth-wire connects with the steel pins or knobs on the keys of the transmitting apparatus, and from the revolving arm through the electro-magnet, and thence through the line and distant magnet to the earth. Reversed currents are not necessary, except on long submarine wires. There may be as many instruments in circuit as may be desired. The European news, consisting of about 3,000 words, by the arrival of each Transatlantic steamer, is transmitted by this instrument from Boston to New York, a circuit of about 300 miles, at the rate of 2,000 to 2,500 unabbreviated words an hour. There are 25 stations on the circuit which receive copies of the news, all of which are printed in plain Roman type by the Boston operator, all the instruments receiving the message at the same time, the receiving clerks at each station having simply to hand the copy as it arrives to the party entitled to receive it.

The mode of operating with this instrument is extremely simple, and easily acquired. The office desiring to transmit a message, calls the station by touching the keys in a pre-arranged order, the distant office at once returns the signal "O.K.," or all right. The manipulator then commences the message, first striking the zero key to start the distant type-wheel in unison with his own. If the message is received correctly he is allowed to finish, and then the operator at the distant office gives the return signal of all right; if there is a mistake the receiving office touches his key-board, which throws extra letters to the transmitting station, and he then commences again from the point where he made a mistake. There can be no mistake, however, if the operator touches the right key, and manipulators become so expert that they seldom touch the wrong one; if they do, the error is shown by the copy of the message on their own instrument, and immediately corrected.

If I have succeeded in conveying a clear and intelligible impression of the principle of the Hughes' system, it may be proper to invite your attention to what appear to me to be natural deductions. *Accuracy* is secured by unerring mechanical laws, and not by the skill of the operator, as in the needle or Morse systems. Not only this, but in all other systems, if one of the symbols be missing, another letter is formed by the remaining symbols. *Rapidity* is secured by reducing the labour to its minimum. A single touch of a key prints the letter, instead of three or four vibrations of a needle, or a similar number of motions of a key, as in the formation of symbols to represent letters. Accuracy and rapidity being thus secured, ease and simplicity of manipulation must of necessity follow, and, consequently, the young operator readily acquires his or her education. The instrument, however, is specially adapted to females. The one-wave system is specially important on long submarine circuits, where electrical impulses are limited, one wave being sufficient for a letter instead of five. Great difficulty has been experienced on long cables by the variation of time in the transit of the wave. By this correct timing instrument, simple and perfect compensation is mechanically attained for any length of wire or extent of variation. The sensitiveness of the magnet also enables this instrument to record more waves upon a long circuit than any I have yet met with. The rapidity of an instrument, however, does not consist only in the fact of its extreme sensitiveness, but also in its power to free itself from the influence of a current so soon as the effect of the current has caused the instrument to record the signal or letter sent. This property, attained by the electrical and mechanical combination of scientific laws, embodied in the design and construction of the instrument, and demonstrated by the results produced, must in time remove all doubt of its superiority, while its English tongue represented in plain printed Roman characters, will tend to make it the favourite of the Anglo-Saxon race.

SPENCE'S PATENT IMPROVEMENTS IN THE MANUFACTURE OF STEEL.

The specification of Mr. James Spence's Patent for "Improvements in the manufacture of steel, and in the furnaces employed in such manufacture," about which there was recently much disputing, both at an opposition at the chambers of the Attorney-General, and afterwards, is now before us, and is as follows:—

"My invention consists, firstly, in producing steel from pig iron or other cast iron in a puddling furnace, by regulating the quality or chemical condition of the air (passed into the furnace) by the means hereafter described; and, secondly, in an improvement in the puddling furnace whereby such regulation is effected.

"Ordinary pig iron, or other cast iron, contains an excess of carbon, whilst common wrought iron contains merely a trace of the same. As steel contains an intermediate amount of carbon, the object in steel puddling is to decarbonize the pig or cast iron down to the limit of steel, and upon reaching that limit strenuously to avoid further decarbonization, otherwise the product will be converted more or less into wrought iron. Now, as the principal agent in the process of decarbonization is the oxygen contained in the air passing into and through the furnace (which, having a chemical affinity for the carbon, combines therewith, and removes it in a gaseous form), it follows that in the first stage of this process a full supply of oxygen is required, and that in the second stage none should reach the metal. In other words, in steel puddling the first stage requires heat with oxygen, and the second heat without oxygen. To effect objects thus differing and opposed, requires an apparatus having different modes of action. The common puddling furnace hitherto used in this manufacture has only one mode of action, and in consequence steel has been made therein with difficulty and uncertainty by the aid of large quantities of cinder or other materials, and by the closing of the damper at the latter stage of the process, and thus the uniformity of the product depended greatly on the judgment and dexterity of the puddler, and, moreover, the closing of the damper caused a reduction of the temperature, which had an injurious effect upon the working of the metal in the after processes of collecting, welding, and balling. In order to obviate these difficulties, and to obtain a more uniform product, I construct

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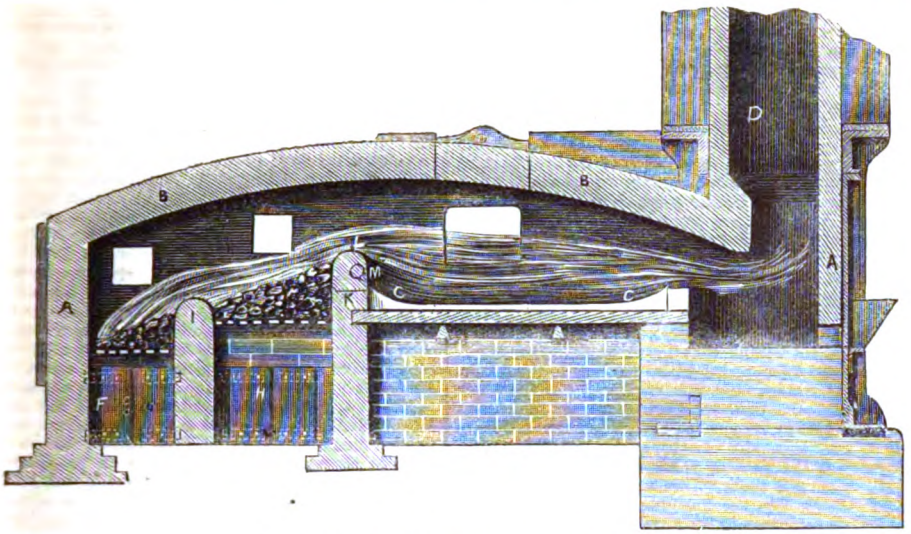

Longitudinal Section of Mr. Spence's Steel Furnace.

and work the puddling furnace in the following manner:—I build my puddling furnace with two grates (one behind the other), divided by a bridge, the ash-pit of each grate being entirely enclosed, and having a door or doors in the front or side. The grates being both of the same length (about three feet three inches), I prefer to make the inner one about two feet four inches in width, and the outer or end grate about one foot nine inches in width. I also place the fire-bars of the first or outer grate about four inches below the level of the bars of the second or inner grate. It will be seen that by this arrangement when the door of the inner or second grate is closed, no air can pass through that fire, whilst the air which has escaped combustion in passing through the first or outer grate before it can reach the metal must pass over the incandescent fuel on the second or inner grate, and will be thereby deprived of its remaining oxygen. The fire-bridge of the ordinary puddling furnace is a low wall of fire bricks extending across the furnace behind the grates. The first bridge, or that which divides the two grates, I construct in the ordinary manner, but the second or that which divides the inner grate from the sole of the furnace, I construct as follows:—Instead of the upper course of bricks I fix a ⊓-shaped tube of refractory clay, closed at one end and connected at the other with a supply of air which may be given under pressure. The side of this tube next to the metal is furnished with a longitudinal opening, through which such air will pass directly on to the metal."

In order more clearly to illustrate this part of his invention, Mr. Spence adds a drawing, from which the accompanying engraving has been prepared. It represents a longitudinal section of a puddling furnace constructed according to his invention, and is thus described by him:—

"*A*, *A*, are the exterior walls of the furnace; *B*, *B*, the dome; *C*, *C*, the sole, and *D*, *D*, the chimney. *E* is the first or outer grate with its ash-pit *F*, which is enclosed on all sides and furnished with a door or doors; and *G* is the second or inner grate with its respective ash-pit *H*, also enclosed and furnished with a door or doors; *I* is the first bridge which divides the two grates; and *K* is the second bridge, the upper course of which is formed of a tube of refractory clay *L*, *L*, closed at one end, the inner side of which, or that next the sole of the furnace, is furnished with a narrow longitudinal opening *M*, *M*; into this leads a pipe in connection with a supply of air. In operating with this furnace, I proceed to charge it with about four hundred and eighty pounds of pig iron or cast iron. Whilst this is melting, I keep the doors of both the ash-pits, *F* and *H*, open, or nearly open, in order to bring both fires into a state of activity. As soon as the iron is melted, the object is to remove the excess of carbon, and in order to effect this, I close the door of the outer ash-pit *F*, and keep that of the inner ash-pit *H* quite open, and also admit the supply of air through the hollow bridge *L*, on to the surface of the metal. I puddle or work the fluid metal in the usual manner, thoroughly exposing every portion of it to the decarbonizing action of the oxygen. When the metal begins to solidify (technically called "coming to nature") the carbon is reduced to the proportion constituting steel, and as steel is less fusible than cast iron, it passes from the fluid to the solid state. The commencement of this transition is indicated by the appearance of grains above the fluid surface. On observing these grains, I shut off the supply of air through the hollow bridge *L*, open the door of the ash-pit *F*, and close the door of the inner ash-pit *H*. This being done, the necessary heat is maintained by the outer fire for the further work of collecting, welding, and balling the metal, whilst the air which may have passed unconsumed through that fire, having to traverse over the incandescent fuel on the inner grate, is thereby deprived of the remainder of its oxygen, and rendered inert. It will be found that great advantage arises from the use of this method, as it substitutes mechanical contrivance for the very uncertain skill of the puddler, and thus greatly reduces the difficulty and uncertainty of the manufacture. When the balls are formed they are taken to the hammer, and worked out as usual. In place of making the outer grate to draw or open to the front, it may be built to open at the end, to suit the convenience of the works. It is also not absolutely essential to enclose the ash-pit of this fire, but in practice I find it desirable, as it gives a more perfect control over the process. The complete enclosure of the inner ash-pit, as described, is absolutely necessary, and forms an essential feature of my invention. The dimensions above given for the grates are those which I prefer, but they should be regulated to suit the particular description of coal used as fuel. When steel of a full degree of hardness is required, I find it expedient to use but one sort of iron, and I prefer that made from the hematite ore, or that of the Forest of Dean; but when a soft steel is desired, I find it preferable to work a mixture of different sorts of iron. It is the common practice to introduce fluxes or salts into the furnace to assist in this manufacture, but their use is not absolutely necessary or essential to the production of steel in the furnace described, and their benefit is more or less uncertain and contingent on their equal and thorough diffusion throughout the entire mass. When this equal diffusion can be depended upon, the puddler may use as a flux an alkaline base, which will unite with and abstract the impurities of the iron. If the quality of the steel to be produced be the first consideration, I prefer to employ the muriate of ammonia as a flux, which I consider the best, the next best being the sesquicarbonate of soda; but when economy of cost is the leading consideration, the chloride of sodium (common salt) may be used with some advantage. The precise flux to be used beneficially can only be determined by the character and quality of the particular kind of iron or mixture of iron with which it is to be employed, as no two kinds of iron contain exactly the same impurities. In all cases the flux should be reduced to a fine powder, and be introduced into the furnace, and thoroughly incorporated and diffused throughout the mass of metal at the commencement of the boil."

It is stated that a sum of £31,000 will be annually saved in the Ordnance Department by the introduction of photography for the purpose of surveying.

MR. SCOFFERN'S BOOK ON NEW RESOURCES OF WARFARE.

(From the *Engineer*.)

We have given the title of this work in full, in order that our readers may be enabled to form a judgment as to the relations between promise and performance in Dr. Scoffern's book. An advertisement with the title *in extenso* would naturally lead one to expect an exhaustive treatise on the subject: the book itself is a lanky and meagre affair of seventy pages of leaded type, containing scarcely any original matter, with a good deal of argumentative and theoretical exposition concerning the comparative effects of vertical and horizontal shell-firing. Dr. Scoffern is known as a chemist of some repute, who has, for some time past, been engaged in experimenting upon explosive compounds, and who, if he has not added to our store of information on that subject, has at least popularised and systematised what was already known. The book has evidently been hastily written to meet the present demand for information concerning the specialities of the Armstrong gun, of which there is a figure and description, differing in some trifling details from that given in the MECHANICS' MAGAZINE of the 25th February. With regard to the theoretical and argumentative matter, it reminds us not a little of Captain Fluellen's didactics anent the "disciplines of war;" but there is too much of "tiddle-taddles and pibbles-pabbles" which the valorous Welshman so emphatically condemned.

Dr. Scoffern opens with the following "dreadful note of preparation:"—

"At no period since the discovery of gunpowder has the application of science to purposes of destruction been more arduously attempted, or more successfully achieved, than during the past ten years; and as to afford another illustration of the providential co-ordination of all things, some of the most deadly applications of science to swell the resources of warfare are (so to speak) matters of to-day, just when Europe seems destined to be set on fire, for the purpose of throwing a new light on some disputed readings of the treaty of Vienna. Perhaps never in the whole history of projectiles has an arm of destruction, large or small, awakened for itself so great an amount of popular or lay attention as the Armstrong cannon now formally adopted in our service. *I am able to supply for the first time (?) a full explanation, accompanied by correct (?) drawings of that gun;* a matter of no little interest, it is assumed, at the present epoch."

The italics in this quotation are Dr. Scoffern's, and give the key-note of the book. It must have been rather mortifying to the author to find himself anticipated by the editor of what he calls a "technical illustrated journal." In a foot-note he acknowledges this fact, but with the qualifying reservation, that the editor in question had stated that he could not vouch for the perfect accuracy of the drawings he gave; "and, indeed," continues Dr. Scoffern, "they will be found to differ from my drawings of the gun (obtained from a reliable source, and which I can depend upon) in some important particulars. To cite an example:—The breech-screw of the Armstrong gun is perforated, as described at page 37, whereas the journal referred to depicted it solid. Other particulars of discrepancy will be discovered by reference."

We have at the present writing both drawings before us; but, after a most careful scrutiny and comparison, we have failed to detect any other discrepancy than the one alluded to. This is rather provoking, after the italicised statement in our first extract:—"*I am able to supply, for the first time, a full explanation, accompanied by* CORRECT DRAWINGS, *of that gun.*" On again referring to Dr. Scoffern's drawing, we find in a foot-note that it is no drawing at all! "*This diagram*" he tells us, "is to be regarded in a *functional sense*, not as a copy to a scale!" So we must take the promise of "correct drawings" in a *functional sense*.

THE NEW PATENT LAW FOR INDIA.

(Concluded from p. 288.)

XXIV. It shall be lawful for any person to apply by motion to any of Her Majesty's Courts of Judicature for a rule to show cause why the Court should not declare that an exclusive privilege in respect of an invention has not been acquired under the provisions of this Act by reason of all or any of the objections following (to be specified in the rule); that is to say:—

That the said invention is of no utility; or

That the said invention was not, at the time of presenting the petition for leave to file the specification, a new invention within the meaning of this Act; or

That the petitioner was not the inventor thereof; or

That the specification filed, or the amended specification (if any) does not particularly describe

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and ascertain the nature of the invention, or in what manner the same is to be performed, or

That the petitioner has knowingly or fraudulently included in the petition or specification, or amended specification, as part of his invention, something which was not new or whereof he was not the inventor, or

That the original or any subsequent petition relating to the invention, or the original or any amended specification, contains a wilful or fraudulent mis-statement, or

That some part of the invention, or the manner in which that part is to be performed, as described in the specification filed, or the amended specification, is not thereby sufficiently described and ascertained, and that such defect or insufficiency was fraudulent and is injurious to the public.

XXV. Any person may, in like manner, apply to any of Her Majesty's Courts of Judicature for a rule to show cause why the Court should not declare that an exclusive privilege has not been acquired under the invention to be specified in the rule by reason of all or any of the objections following (to be specified in the rule) that is to say:—

That such part of the invention is wholly distinct from the other part thereof, and is of no utility, or

That such part of the invention was not, at the date of the petition for leave to file the specification, a new invention within the meaning of this Act, or

That the petitioner was not the inventor of that part of the invention, or

That that part of the invention, and the manner in which it is to be performed, is not sufficiently described and ascertained in the specification filed or the amended specification, and that such defect or insufficiency is injurious to the public.

XXVI. It shall be lawful for the Advocate General at any of the Presidencies of Fort William in Bengal, Fort St. George, and Bombay, or any other person, by order of the Governor General in Council, to apply to any of the said Courts of Judicature for a rule calling upon the petitioner, his executors, administrators, or assigns, to show cause why the question of the breach of any special condition upon which the leave to file a specification has been granted, or any other question of fact on which the revocation of the exclusive privilege by the Governor General in Council under the power herein-before reserved may, in the judgment of the said Governor General in Council depend, should not be tried in the form of an issue directed by the said Court; and if the rule be made absolute, the Court, unless the breach or other matter of fact be admitted, may thereupon direct such issue to be tried, and certify the result of such trial to the Governor General in Council; the costs of such trial, and also the costs of any proceedings in any of the said Courts of Judicature under the provisions of this Act, shall be in the discretion of the Court.

XXVII. Notice of any rule obtained or proceeding taken under either of the last three preceding Sections shall be served on all persons appearing to be proprietors or to have shares or interests in the exclusive privilege under the provisions of Section XXXV. of this Act, and it shall not be necessary to serve such notice on any other persons.

XXVIII. Any of the said Courts of Judicature, if it think fit, may direct an issue for the trial, before the same Court or any other Courts of Judicature, or any principal Court of original jurisdiction in Civil cases of any question of fact arising upon an application under Sections XXIV., XXV., or XXVI. of this Act, and such issue shall be tried accordingly in a summary manner, and if the issue be directed to another Court, the finding shall be certified by the Court before which the same was tried, to the Court directing the issue. If the issue be directed to any Courts of Judicature, the Court by which the issue is tried may, before the finding is certified, direct a new trial of such issue according to the usual course and practice of such Court. If the issue be directed to any Court other than a Court of Judicature, the finding shall not be subject to appeal, but the evidence taken upon the trial shall be recorded, and a copy thereof, certified by the Judge, shall be transmitted together with any remarks he may think fit to make thereon, to the Court by which the issue was directed; and such Court may either act upon the decision of the Court which tried the issue, or direct a new trial if it should appear necessary.

XXIX. If it shall appear to any of the said Courts of Judicature at the hearing of any application under the provisions of Sections XXIV. or XXV. of this Act that, by reason of any of the objections therein mentioned, the said exclusive privilege in the invention or in any part thereof has not been acquired, the Court shall give judgment accordingly, and shall make such order as to the costs of and consequent upon the application as it may think just: and thereupon the petitioner, his executors, administrators, and assigns shall, so long as the judgment continues in force, cease to be entitled to such exclusive privilege.

XXX. If the Court, at the hearing of any such application as last aforesaid, shall think that the petitioner has, in the description of his invention in the petition or specification, or amended specification (if any) included something which at the date of the petition was not new or whereof he was not the inventor, or that the specification is in any particular defective or insufficient, but that the error, defect, or insufficiency was not frandulently intended, the Court may adjudge the said exclusive privilege to have been acquired and to be valid, save as to part thereof affected by such error, defect, or insufficiency, or if the Court shall think that the error, defect, or insufficiency can be amended without injury to the public, they may adjudge the exclusive privilege in the whole of the invention to be valid, and may upon such terms as shall appear reasonable, order the specification to be amended in any of the said particulars; and thereupon the petitioner, his executors, administrators, or assigns shall, within the time limited by the said Court for the purpose, file a specification amended according to such order. Provided that no such amended specification shall have the effect of extending or enlarging the exclusive privilege before acquired.

XXXI. An exclusive privilege shall not be defeated upon the ground that the petition contains a mis-statement, unless such mis-statement was wilful or fraudulent.

XXXII. Whenever it shall be adjudged by any of the said Courts of Judicature that an exclusive privilege as to the whole or any part of an invention has not been acquired, the said Secretary to the Government of India shall, upon the production of the judgment of order, cause an entry thereof to be made in the said book hereinbefore directed to be kept, and shall cause a reference to such entry to be made in the margin of the entry of the specification contained in such book.

XXXIII. If, upon proceedings instituted within two years from the date of a petition to file a specification, the actual inventor shall prove to the satisfaction of the principal Court having jurisdiction in Civil cases, within the local limits of whose jurisdiction the defendant shall reside as a fixed inhabitant, that the petitioner was not the actual inventor, and that at the time of the petition he knew or had good reason to believe that the knowledge of the invention was obtained by himself, or by some other person, surreptitiously or in fraud of the actual inventor, or by means of communication made in confidence by the actual inventor to him, or to any person through whom he derived such knowledge, the Court may compel the petitioner to assign to the actual inventor any exclusive privilege obtained under this Act, and to account for and pay over the profits thereof.

XXXIV. In any action for the infringement of such exclusive privilege the plaintiff shall deliver with his plaint particulars of the breaches complained of in the said action; and the defendant shall deliver a written statement of the particulars of the grounds (if any) upon which he means to contend that the plaintiff is not entitled to an exclusive privilege in the invention. In like manner, upon any application to any of the said Courts of Judicature under Sections XXIV., XXV., or XXVI. of this Act, the applicant shall deliver particulars of the objections on which he means to rely. At the trial of any such action or issue, no evidence shall be allowed to be given in support of any alleged infringement, or of any objection impeaching the validity of such exclusive privilege which shall not be contained in the particulars delivered as aforesaid. If it be alleged that the invention was publicly known or used prior to the date of the petition for leave to file such specification, the places where, and the manner in which the invention was so publicly known or used shall be stated in such particulars. Provided always, that it shall be lawful for any Court in which the action or proceeding is pending, or in which the issue is tried to allow the plaintiff or defendant respectively to amend the particulars delivered as aforesaid upon such terms as shall seem fit.

XXXV. A book shall be kept in the office of the Secretary to the Government of India in the Home Department (such book to be open to inspection without fee) wherein every person filing a specification under this Act, or any person to whom the exclusive privilege may be assigned, shall cause to be stated some place in India where service of any rule or proceedings for the purpose of cancelling or revoking his exclusive privilege may be made, and shall cause a reference to such entry to be made in the margin of the entry of the specification; and may from time to time cause any other place in India to be substituted by similar entry and reference. All such rules and proceedings as aforesaid shall be deemed sufficiently served if a copy thereof be left at the place entered in such book or (if any other place be substituted for the same by entry in the said book) at the place last substituted, by delivering the same to any person resident at, or in charge of, such place; or if there be no person resident at, or in charge of, such place; or if such place be not within the local limits of the jurisdiction of the Court, by causing such rule or proceeding to be sent by post, by a registered letter, directed to such person, at such place; and if any such person shall neglect to make or cause to be made such entry, then service of such rule or proceeding may be effected by affixing a copy thereof to some conspicuous part of the Court House, or in such other manner as the Court may direct.

XXXVI. Act VI. of 1856 shall be of the same force and effect in respect to every petition and specification filed under the provisions thereof before the Act was repealed, and in regard to all proceedings consequent thereon or in relation thereto, and for the purpose of everything done under that Act while it continued in force, as if previously to the passing of the said Act the sanction of Her Majesty to the passing thereof had been obtained and signified in pursuance of the Statute passed in the seventeenth year of the reign of Her Majesty, entitled, "An Act to provide for the Government of India," and as if the said Act had not been repealed, and the term of every exclusive privilege obtained under the said Act is hereby extended, and shall continue until the expiration of fourteen years from the time of the passing of this Act. No exclusive privilege obtained under the said Act by an importer, not being the actual inventor, shall cease to have effect by virtue of the provisions of Section XVI. of the said Act, if the invention be put in practice in India within the period of two years from the time of the passing of this Act.

XXXVII. Every petition for leave to file a specification under the provisions of this Act, or for the extension of the term of an exclusive privilege, shall be written or printed on stamped paper of the value of one hundred rupees.

XXXVIII. In the construction of this Act, the following words and expressions shall have the meanings hereby assigned to them, unless there be something in the subject or context repugnant to such construction.

Words importing the singular number shall include the plural number, and words importing the plural number shall include the singular number.

Words importing the masculine gender shall include females.

The word "invention" shall include an improvement.

The word "manufacture" shall be deemed to include any art, process, or manner of producing, preparing, or making an article, and also any article prepared or produced by manufacture.

The word "printed" shall include "lithographed."

The words "inventor" and "actual inventor" shall include the executors, administrators, or assigns of an inventor or actual inventor, as the case may be.

The word "assigns" shall include grantees of the sole use or benefit in India of an invention, or of the sole use of an exclusive privilege for a limited time.

The word "India" shall mean the territories which are or may become vested in Her Majesty by the statute 21 and 22 Vict. c. 106, entitled "An Act for the better Government of India."

The words "Governor-General in Council" shall include the "President in Council."

The words "Secretary to the Government of India" shall include any Under-Secretary to the said Government.

The expressions "Her Majesty's Courts of Judicature" and "Courts of Judicature" shall mean the courts established by Royal Charter.

Captain Connolly, R.N. (Captain Matthew Connolly, not "W. Connolly," as was printed in our last number), politely directs our attention to a misprint which, we regret to see, occurred in our article upon the rifle rest:—"You have made," he says, "one great misprint, viz., you say, 'for a *sportsman* firing from the kneeling position,' &c., whereas in my manuscript I wrote 'for a *short man*,' &c.; which you will at once see makes a great difference. For an average-size man, the ramrod used as a rest is exactly the proper height in the kneeling position, but for a short man it is rather too high; but in sloping it forward, and resting its head against the upper band, it can be raised or lowered at pleasure." We believe we are not mistaken in believing that Captain Connolly was last week appointed to the command of the Hannibal. We are pleased to see so fine a ship in the hands of so gallant and skilful an officer.

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NOTICES.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

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Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

THE demand for Mr. E. J. REED'S paper—

ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY, IN RESPECT OF DIMENSIONS, FORM, MEANS OF PROPULSION, AND POWER OF ATTACK AND DEFENCE,"

has been so great that the Journal of the Society of Arts, the MECHANICS' MAGAZINE, and all other Scientific Journals in which it appeared in December last, are now out of print. The demand still continuing, it has been deemed desirable to reprint it in a separate form. An 8vo. edition of it, in large type, and on fine paper, has, therefore, been prepared, and may now be had at the Office of this Magazine, price 1s.

Our Weekly Gossip.

IN a leading article, the *Morning Post* of Wednesday last makes the very gratifying announcement that the Woolwich Select Committee, the times of whose ignorance the authorities have so long winked at, has been commanded to resign its functions. Our aristocratical contemporary says:—"British inventors may now solace themselves by the reflection that the Select Committee at Woolwich has ceased to exist. It has perished by its own hands. Internal dissensions have been the cause: thus affording not a little countenance to the accusations so frequently brought against it." We further learn from the same source that in place of the Woolwich Select Committee, a "Coast Defence Committee" is to be organised in connection with a school of artillery at Shoeburyness, to the scrutiny of which all projects suggested for the use of the public service will be submitted. We understand that in the constitution of this body the fundamental rule will be recognised that no head of department in Woolwich, or any other arsenal, is to be eligible. Members of the Coast Defence Committee will be public servants, not public masters, as individuals composing the Woolwich Committee were heretofore; and care will be taken that inventions submitted in confidence shall not be appropriated without consent and acknowledgement. "A very expressive peculiarity of the new organisation has now to be announced. Artillery officers, heads of manufacturing departments, are to be called upon to elect either to be civilians or military men; they are either to retire on half-pay, or else to give up their positions. Inventors will have reason to be thankful for this change of organisation."

Admiral Bowles, C.B., the Commander-in-Chief at Portsmouth, has just most judiciously ordered that all steam-ships making trial of speed in Stokes' Bay shall carry a white and blue swallow-tail flag, to indicate the purpose on which they are employed, and to warn all ships to keep clear of their line of course, so that a recurrence of such accidents as occurred at the last trial of the Doris may be prevented. If the general adoption of an efficient means of lowering the boats is still to be delayed throughout the Navy, there is no reason why such should not be made imperative on board vessels during such trials, equally with the flag in question. There are other emergencies besides collisions when it might be wanted, and in the last trial of the ship mentioned its absence was painfully evident.

A correspondent, "Nauticus," sends us the following, which speaks for itself, and for which we thank him: "In an article in the 'Weekly Gossip' of your last number, you have drawn public attention to the late unfortunate collision of H.M.S. Doris, specially ascribing the melancholy loss of life which ensued to the fact of that ship not having been supplied with Clifford's boat-lowering apparatus. Now, however incontrovertible be this inference, permit me to observe that it admits of a wider field of extension, as I am desirous of showing. Some of your readers may call to mind that when this identical frigate made her first trial trip in the Channel some three months ago, during a fresh breeze and heavy swell, a boat temporarily fitted with Captain Kynaston's 'disengaging hooks,' containing a gallant admiral, a post captain, and a crew of 13 men, was successfully detached from the ship while steaming at the rate of nearly 12 knots per hour. Subsequently, when the Doris was commissioned by her present commander, the latter made special application for his quarter-boats to be fitted after the same plan, which was refused on the score that the ship being under sailing orders, there could be no time for completing the necessary arrangements. This was an error, inasmuch as these 'disengaging hooks,' may be fitted to any boat in half-an-hour; be this as it may, the Captain of the Doris, since the melancholy accident alluded to, has never ceased to deplore that his boats had not been fitted on Captain Kynaston's method. The evidence taken before the coroner at Portsmouth records the same feelings of regret, very fairly naming Mr. Clifford's invention in conjunction with the Captain's. With reference to another part of the article originally quoted, I would add that *two minutes* is ample time to allow for a vessel, which has any pretensions to a man-of-war, to detach her quarter-boats fitted with the ordinary tackles, after once her way is stopped, as was the case in the Perseverance's violent collision, but not in the comparatively gentle shock which the Doris sustained in brushing away the sloop's mast with her 'whisker.' Considering the present disabled condition of Captain Kynaston renders him dependent on the good offices of his friends, and the courtesy of the Press (and to none is he more indebted than to yourselves) to bring his invention fairly before the public, I shall be glad if you can devote a small space to the substance of this letter as an act of justice to that officer, which does not tend in any shape to qualify Mr. Clifford's claims on public consideration, and which cannot be said in any way to violate the well-known impartiality of your columns."

We have had a great deal of discussion lately respecting the invention of liquid-fire shells. Captain Norton's name has been very prominently connected with the subject, but we have the gallant officer's authority to state that he lays no claim whatever to the use of any specific chemical substance for the purpose, his improvements being confined to the appliances by means of which such substances may, in his belief, be safely and effectually used. Dr. Scoffern makes an ambiguous claim in respect to the use of such substances, but his language on the point is very indefinite, both as to the material and as to time. A letter from Mr. Macintosh, whose patent for such shells has been too much lost sight of, puts the matter in its proper light in so far as shells charged with bisulphuret of carbon and phosphorus is concerned. He says:—"Permit me to state that 'a shell filled with coal-tar naptha mixed with phosphorus and bisulphuret of carbon, having a bursting charge sufficient to open the shells, which, when exploded, scatters its contents in all directions—the shower of inflammable material falling among cavalry and troops ignites spontaneously, causing their immediate disorganisation and destruction. Fired into shipping, these shells, bursting on deck or below, cause the same results; fired into harbours, dockyards, or towns, the result is alike destructive and decisive.' The above is extracted from my patent—No. 1774. In 1853 I offered my invention to the Government, but Lord Panmure, when Minister of War, interdicted the sealing of my patent, on the grounds of its efficacy and great value, which interdict has since been removed by his lordship. The patent has been sealed and consequently made public."

A long and valuable letter on rifles, by Major W. F. Nuthall, of the Bengal Army, appeared in the *Morning Post* of Tuesday, April 26. We have not space to reproduce this letter, but we refer to it for the information of those of our readers who are especially interested in the rifle question. The following description of the Emperor's new cannon appeared in the French journals:—They are internally grooved, as in the rifles or carbines "*de précision*." The calibres are reduced to two dimensions only—12-pounders for siege guns, and 4-pounders for field batteries. For the navy the calibres remain unaltered. The solid ball is done away with, the projectile being one which strikes like a full shot and then bursts like a shell, thus having a double effect. It is fitted with waddings of lead, which enter into the grooves of the gun, and give the requisite precision to the aim. This new piece is equivalent to one of 24 of the old system, which is the size ordinarily used for opening a breach. Against a massive butt of masonry a battery of ancient 24-pounders was pointed, some weeks ago, at a distance of 35 metres, viz., that at which fire is generally opened against a rampart. A second mass of masonry, similar to the first, was breached by a battery of 12-pounder new guns, but at a distance of 70 metres. The experiments proved that fewer rounds from the rifled gun were required to open the breach than from the old 24, and at double the distance. The 4-pounder field piece is so small that it may be well termed the artillery rifle, weighing less than 300 kilogrammes. Six gunners can carry it on their shoulders without difficulty. The charge of powder is only 500 grammes, and sends the ball four kilometres.

The conversion of blotting-paper, or waterleaf, into a substance very nearly resembling parchment, is one of the scientific marvels of the day, and it promises to become, also, a very useful art. Vegetable parchment, as the new material is called, is simply unsized paper dipped into diluted sulphuric acid, and then carefully dried. The proper strength for the solution constitutes the only question in the process. Messrs. De La Rue are the patentees, and we have before us specimens of the material. It has an opaque and horny appearance, and is very strong. The paper of which bank notes is made are tested by having weights suspended to it, but blotting-paper parchment sustains a much greater strain than bank-note paper. For very many purposes it will undoubtedly supersede sheepskins.

The Royal Albert Bridge, across the Tamar, was opened by the Prince Consort in person, on Monday last. It consists of 19 spans or arches. Seventeen of these spans are wider than the widest arches of Westminster-bridge, while two, resting on a single cast-iron pier of four columns, cross the whole stream of the Tamar at one gigantic leap of upwards of 900 feet, or a greater distance than the breadth of the Thames at Westminster. The total length of the structure from end to end is 2,240 feet, very nearly half-a-mile, and 300 feet longer than the entire stretch of the Britannia-bridge. Its greatest width, as formed only for a single pair of rails, is 30 feet at basement, but its height from foundation to summit is no less than 260 feet, or more than 50 feet higher than the monument.

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated April 7, 1859.

865. D. Moseley, of Ardwick, Manchester, Manufacturer. Improvements in the manufacture of cards for carding cotton and other fibrous materials.

867. R. Postlethwaite, of Liverpool, Saddler. An improvement in harness pads for horses.

869. G. Champney, of Halsham, York, Farmer. Improvements in reaping machines.

871. J. Garrett, of Arundel-place, Haymarket, Tinman. Improvements in the construction of goblets, jugs, and other like articles.

Dated April 8, 1859.

873. J. T. Pitman, of Gracechurch-st. Improvement in the construction and use of fire-works for signals. A communication from M. J. Coston.

875. J. Bindley, of Birmingham, Engineer, and J. L. Hinks, of Birmingham, Manufacturer. Improvements in rotatory steam-engines and pumps, a portion of which improvements may also be applied to the bearings of shafts or axles, and other rotating bodies.

877. M. Wheeldon, of Burslem, Glass Cutter. An improvement in looking-glasses and mirrors.

879. M. A. F. Mennons, of Paris. Improvements in the treatment of mineral phosphates of lime. A communication from B de Siebenthal.

881. W. Hooper, of Mitcham, India Rubber Manufacturer. Improvements in insulating and protecting telegraphic conductors.

883. W. Henderson, of Alderley Edge, Chester, Chemist. Improvements in treating certain ores and in obtaining products therefrom.

885. E. R. Handcock, of Norfolk-st., Strand, Esq. Improvements in steam and other motive power engines.

Dated April 9, 1859.

887. E. J. Hughes, of Manchester. Improvements in the manufacture of woven fabrics. A communication from E. Davies.

889 J. H. Young, of Great College-st., Camden Town. Improvements in setting-up (composing) and distributing types.

891. J. H. Johnson, of Lincoln's-inn-fields. Improvements in the manufacture or production of the ferrocyanide and cyanide of potassium. A communication from J. V. Lucas.

893. J. Martin, of Islington, Manufacturer. Improvements in the materials used in the manufacture of bonnet fronts and ruches.

895. W. E. Newton, of Chancery-lane. Improvements in steam engines and boilers. A communication from E. G. Boileau.

897. R. Brown, of St. Paul's Churchyard. Improvements in stoves and apparatus for warming and ventilating apartments and buildings.

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Dated April 11, 1859.

899. R. Wappenstein, of Manchester, Medallion Engraver. Improvements in cop tubes, and in machinery or apparatus for placing the same on the spindles used for spinning and doubling fibrous materials.

901. J. Anderson, of Liverpool. Improvements in the construction of the furnaces of bakers' ovens for the purpose of consuming smoke, which improvements are also applicable to the consumption of smoke in other furnaces.

903. L. Wimmer, of Vienna, Baker. An improved preparation for killing beetles.

905. W. Rowan, of Belfast, Engineer. Improvements in spinning flax, hemp, and other fibrous materials.

907. W. S. Clark, of Aberdare, Glamorgan, Mining Engineer. Improved means of loading ships or vessels with coal, and of separating or removing small coal therefrom.

909. J. Marland, of Southport, Lancaster. An improvement in the manufacture of cop tubes.

Dated April 12, 1859.

913. G. J. Johnston, of Ashley, Cambridge, Machinist. Improvements in drills, for drilling of corn, seeds, and manure.

915. W. E. Newton, of Chancery-lane. Improvements in the manufacture of iron. A communication from W. Kelly.

917. C. Burrell, of Thetford, Engineer. Improvements in apparatus for screening corn and seeds.

919. J. Crossdale, of Islington, Boot Maker. Certain improvements in boots and shoes.

921. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in the preparation of red dyes. A communication from Messrs. Renard Frères.

Dated April 13, 1859.

923. R. Emery, of King-st., St. James's-sq., Gentleman. Certain improvements in carriages for common roads.

925. H. Eckhorn, of Cranbourne-st., Leicester-sq., Manufacturer. Improving and regulating the production of light in lamps, to which he gives the name of "Universal lamp regulator."

927. J. Apperly, Cloth Manufacturer, and W. Clissold, Engineer, of Dudbridge. An improved construction of fulling machine.

929. A. R. Johnson, of St. John's Wood, Gentleman. An instrument for damping, severing, and affixing postage and other like stamps.

931. W. A. Gilbee, of South-st., Finsbury. Improvements in the construction of the axles of railway and other carriages. A communication from M. Tenting aîné.

933. J. Hughes, W. Williams, and G. Leyshon, of Brierley-hill, Stafford. Improvements in the manufacture of tin and terne plates.

Dated April 14, 1859.

937. H. C. Coulthard, Engineer, and J. Jordan, Pattern Maker, of Blackburn. Certain improvements in steam engines.

939. E. Partridge, of Stourbridge, Engineer and Iron Founder. An improvement in the manufacture of 'pipe' boxes for cart and waggon axles.

941. E. Dowling, of Little Queen-st., Holborn, Scale Maker. Improvements in parts of scales or weighing machines, and in balance weights used for those articles, which are also applicable for other purposes.

943. A. McDougall, of Manchester, Chemist. Improvements in coating metallic surfaces.

945. S. Barnwell, of Coventry, Manufacturer, and A. Rollason, of Birmingham, Chemist. Improvements in the manufacture of umbrellas, parasols, hats or hat covers, caps, capes, coats, mantles, dresses, gloves, and other similar articles.

Dated April 15, 1859.

947. W. A. Gilbee, of South-st., Finsbury. Improvements in the construction of buffers for railway and other carriages, also applicable to other purposes where springs are employed. A communication from M. Tenting aîné.

949. G. Ashcroft, of Cardiff, Engineer. Improvements in working presses and other hydraulic machines.

951. H. A. Silver, of Cornhill, India Rubber Manufacturer. Improvements in insulating wire for electric telegraphs.

Dated April 16, 1859.

953. T. White, of Edgbaston, near Birmingham, Managing Clerk. An improvement or improvements in frames or stands for holding liquor bottles, pickle jars, cruets and castors, and for holding bottles and vessels generally.

955. L. Collier, of Rochdale, Machine Maker. An improved feeding apparatus, applicable to grain, loaf sugar, drugs, or other similar materials.

957. W. E. Newton, of Chancery-lane. Improvements in the manufacture of alumina. A communication from Mr. Le Chatelier, of Paris.

959. A. Courage, of Bagillt, Flint Smelter. An improved method of obtaining the metallic particles contained in fumes or vapours from lead and other smelting works.

961. J. Sidebottom, of Broadbottom, near Mottram, Cotton Spinner. Improvements in the construction of tubes and partial tubes, and in machinery or apparatus for placing them on the spindles of machines used in spinning, doubling, winding, and warping, also improvements in machinery for making such tubes and partial tubes.

963. N. Kenward, of Sutton. Improvements in machinery for obtaining motive power by fluids.

965. W. Walker, of Liverpool. Improvements in rocket guns. A communication from T. W. Roys.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

997. L. P. Porter, of New York. Improvements in knitting machinery. A communication from J. R. and E. Kilbourn. Dated April 20, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, May* 3, 1859.)

2910. J. Ronald. Spinning.

2917. W. S. Yates. Dragging bristles, &c.

2926. E. T. Dunn. Covering of floors, &c.

2933. J. Ronald. Ropes and cordage.

2945. D. Edleston. Textile fabrics.

2946. J. Railton. Looms.

2956. J. Smethurst. Metallic pistons.

2960. J. Davies. Lamp. A communication.

2965. B. Browne. Boots and shoes. A communication.

2971. J. H. Johnson. Boots and shoes. A communication.

2994. W. Burgess. Converting reciprocating into rotary motion. A communication.

2999. J. H. Johnson. Boots and shoes. A communication.

3003. J. Lees and W. Heap. Punching holes.

3006. L. A. Normandy, jun. Shaft tugs. A communication.

14. M. Wigzell. Nail.

37. F. Clark. Knobs and handles.

73. L. A. Normandy, jun. Resinous substances. A communication.

133. W. Betts. Capsules.

154. G. and J. Collier. Washing and drying.

202. B. Templar. Umbrellas and parasols.

238. D. Graham. Driving centrifugal machines. A communication.

242. J. Kerr. Fire-arms.

560. H. Brown. Fabrics.

641. R. A. Brooman. Threads. A communication.

651. G. B. Galloway. Fuel; steam engines.

680. A. Mein. Glass bottles.

740. B. Browne. Switches and signals. A communication.

745. P. P. Boll and H. Reger. Furnaces. A communication.

792. J. W. Hadwen. Threads.

858. F. M. Crichton. Time keepers.

866. A. Chaplin. Steam boilers.

867. R. Postlethwaite. Harness pads.

903. L. Wimmer. Killing beetles.

916. P. Hill and J. Moore. Pile fabrics.

919. J. Crossdale. Boots and shoes.

922. S. Tatton. Treating silk.

951. H. A. Silver. Insulating wire.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed April 29, 1859.

2418. J. Wright.
2419. G. Zanni.
2420. R. W. Chandler and T. Oliver.
2422. L. J. Lewis.
2423. J. Morris.
2428. F. Wrigley.
2431. H. H. and W. F. Henson.
2432. J. Dobson and D. Pearce.
2433. J. Cariss.
2491. J. Richmond, J. Quick, jun., and A. Fraser.
2679. C. Parker.
2711. W. E Newton.
2751. L. Bissell.
2871. A. V. Newton.
235. W. R. Alexander.
237. O. Hussey.
383. J. Evans.
581. J. Fraser.

Sealed May 3, 1859.

2453. V. Blumberg.
2458. J. Fowler, jun., R. Burton, and D. Greig.
2467. R. A. Brooman.
2471. T. Till.
2472. T. B. Smith.
2477. L. Schwartzkorf and F. C. Philippson.
2485. J. Cliff.
2489. J. Jackson, A. Fisher, and J. J. Harney.
2495. J. Wardill.
2510. W. Clark.
2544. J. Benyon and J. W. B. Bowden.
2570. J. H. Johnson.
2595. W. Clark.
2626. J. H. Johnson.
2738. E. Jones.
522. W. Burgess.
530. J. H. Johnson.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

928. U. Scott.
1009. T. Restell.
1020. J. H. Johnson.
1027. W. E. Newton.
1028. N. Defries and G. H. Bachhoffner.
1029. H. Mapple.
1033. R. A. Brooman.
1042. W. Naylor.
1059. A. Chadburn.
1087. A. C. L. Devaux.
1091. L. L. Jardin and J. Blamond.
1211. C. De Jongh.

LIST OF SPECIFICATIONS, &c.

Published during the week ending April 29, 1859.

No.	Pr. s	d	No.	Pr. s	d	No.	Pr. s	d	No.	Pr. s	d	No.	Pr. s	d	No.	Pr. s	d
2123	0	6	2134	0	7	2143	0	3	2152	0	6	2161	0	7	2170	0	3
2124	1	11	2135	0	10	2144	0	7	2153	1	9	2162	0	3	2173	0	6
2125	0	3	2136	0	5	2145	0	6	2154	0	3	2163	0	3	2175	0	7
2126	0	3	2137	0	7	2146	0	3	2155	0	3	2164	0	3	2176	0	3
2128	0	7	2138	0	3	2147	0	9	2156	0	9	2165	0	3	2179	0	3
2129	0	6	2139	0	3	2148	0	3	2157	0	4	2166	0	3	2182	0	7
2130	0	10	2140	0	9	2149	1	3	2158	0	6	2167	0	3	2184	0	3
2131	0	3	2141	1	4	2150	0	10	2159	0	3	2168	0	3	2186	0	10
2132	0	3	2142	0	5	2151	0	5	2160	0	3	2169	0	7	2667	0	3
2133	0	3															

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINES, &c., 2142, 2150, 2152, 2153.
BOILERS AND THEIR FURNACES, 2138, 2144, 2147, 2174.
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c. *None.*
SHIPS AND BOATS, including their fittings, 2131, 2173, 2181.
CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 2135, 2136, 2156 2165.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals. *None.*
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 2127, 2128, 2130, 2133, 2145, 2146, 2148, 2175, 2178, 2179.
BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c. *None.*
LIGHTING, HEATING, AND VENTILATING. *None.*
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 2129, 2158, 2159, 2160, 2164, 2171, 2177.
METALS, including apparatus for their manufacture, 2134, 2139, 2162, 2174.
CHEMISTRY AND PHOTOGRAPHY, 2157.
ELECTRICAL APPARATUS, 2168, 2180.
WARFARE, 2149, 2155.
LETTER PRESS PRINTING &c., 2140.
MISCELLANEOUS, 2124, 2125, 2129, 2132, 2137, 2141, 2143, 2151, 2161, 2163, 2166, 2167, 2169, 2170, 2172, 2176, 2182,

2124. A. M. PERKINS. *Improvements in surface condensers.* Dated Sept. 21, 1858.

The patentee employs upright pipes of wrought or cast iron, pairs of which are connected together by horizontal wrought iron tubes, the ends of which are screwed and tinned or soldered, and are screwed into tapped holes on the sides of the two upright pipes, which holes are also tinned or soldered. He then applies a trough for conducting water over these tubes in small streams, so that the evaporation of the water may keep the pipes sufficiently cool to condense the steam inside. In applying the condenser to a steam engine, one of the upright pipes is connected to the eduction pipe of the engine, while the other upright pipe is connected to the air-pump. *Patent completed.*

2125. J. JOHNSON. *Improvements in machinery or apparatus for washing, churning, colour-mixing, or similar purposes.* Dated Sept. 22, 1858.

The inventor places the peggy in the ordinary tub, and gives to it a to and fro curvilinear motion by placing its rod or shaft in the boss of a bevel wheel geared into another bevel wheel, which has an alternate curvilinear motion imparted to it by fixing on its shaft a lever, having a stud placed in a slot of one of the arms of a double lever working on a fixed stud, the other arm being connected by a rod to a crank pin or a toothed or other wheel, having motion given to it by gearing pulleys or other suitable pulleys. The shaft of the peggy moves to and fro, and also up and down, as required, by means of a key and slot in the bevel wheel placed upon it. *Patent abandoned.*

2126. T. B. HUBBELL. *An improvement in hooped petticoats.* (A communication.) Dated September 22, 1858.

Here eyelet-holes are formed above and below one, two, three, or more of the upper hoops in the horizontal tapes or webs, whereby the hoops are held together, and it will be found convenient to form these eyelet-holes in, say, the third tapes from the front. A lace is passed through and through these eyelets from one side web to the other, and when the petticoat is on the wearer the lace is passed behind and the ends brought round in front; by tightening the lace to the extent required the desired fulness will be obtained behind, and the petticoat will sit neatly and flatly over the stomach. *Patent abandoned.*

2127. J. HOPE. *An improved calico printing roller.* Dated Sept. 22, 1858.

This invention is not described apart from the drawings. *Patent completed.*

2128. F. F. EMERY. *An improved sewing machine.* (A communication.) Dated Sept. 22, 1858.

This consists in a mode of operating the hook about the bobbin, viz., with a compound motion produced by a crank and an arm, or by two cranks, whereby the point of the hook is made to travel either in an elliptical or a circular path, without being reversed or made to point upward and downward during its rotation. Also, in an arrangement of a back supporter and loop cast off separate from the hook, so as to operate with the said hook and the front supporter or nipper of the bobbin in a manner not only to support the bobbin, but to aid in discharging a loop from the hook. Also, in an arrangement of a guide lip to the back supporter. Also, in an arrangement of an auxiliary presser or spring with respect to the bobbin and its holder. Also, in a mode of constructing the hook. The invention is not described in detail apart from the drawings. *Patent completed.*

2129. T. HOWE. *Improvements in smiths' forges.* Dated Sept. 22, 1858.

This relates to portable and stationary forges, and consists in constructing cylindrical or other forms of metal vessels, sliding or moving one within the other, and fitted with valves for the admission of air at the atmospheric pressure, and for its escape at the degree of pressure which

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may be required. These are substituted for the ordinary leather bellows. *Patent completed.*

2130. R. A. BROOMAN. *Improvements in apparatus for printing shawls and other articles.* (A communication.) Dated September 22, 1858.

Here impression tables and colouring tables are employed, one or more tables being fixed, and one or more moveable. The moveable tables are each supported upon a horizontal frame or platform which rests upon rollers carried at the extremities of levers. These levers are mounted eccentrically upon centres, and have their opposite extremities connected by links to other levers, which are again connected by levers to the end or ends of a beam or beams. When this beam or these beams is or are caused to rock by a hand lever or otherwise, the several links and levers impart an upward or downward motion to the platform or frame, and through it to the table, the motion being rendered smooth and easy by the rollers on which the platform immediately rests. The printing blocks are supported upon wheels which run on rails, and are successively passed over the colouring tables and the impression tables, which are successively forced up to them by the parts before described. Provision is made for fixing the printing surfaces before the shawl, &c., extended upon the impression table is brought up against it, and also for adjusting the shawl, and bringing the desired portions of it successively beneath the same printing surface. When the colouring table is fixed a colour roller is connected to it, and arranged so that it will turn when the printing surface moves over it in one direction, and remain at rest when that surface moves over it in the opposite direction. *Patent completed.*

2131. J. TYSSEN. *An improved apparatus for indicating the speed of ships and other vessels.* Dated Sept. 22, 1858.

This consists of an apparatus to be fitted to a ship to show inboard the speed at which the ship is passing through the water. The inventor fits on the axis of a three-bladed screw, which is placed outside the vessel, a wheel inboard, which wheel gears into one or more wheels, and causes the last in a train to make, say, one revolution when the vessel is progressing at a certain rate, say ten knots an hour, which revolution is shown upon an indicating dial.—*Patent abandoned.*

2132. C. W. HARRISON. *Improvements in filters for purifying air and liquids.* Dated September 22, 1858.

This consists in arrangements for purifying air and liquids by the agency of carbon. *Patent abandoned.*

2133. L. CASTELAIN. *Converting all vegetable fibre by aid of chemicals into form to resemble horsehair.* Dated September 22, 1858.

The chemicals used for the above purpose are liquid chlorid, chlorid of gaz, chlorid of lime, soda, and sulphate of iron. *Patent abandoned.*

2134. J. SPENCE. *Improvements in the manufacture of steel, and in the furnaces employed in such manufacture.* Dated September 22, 1858.

This consists, 1, in producing steel from pig-iron or other cast iron in a puddling furnace, by regulating the quality or chemical condition of the air passed into the furnace. 2, in an improvement in the puddling furnace, whereby each regulation is effected. We have given a detailed description of this invention on page 302. *Patent completed.*

2135. A. B. CHILDS. *Improvements in winnowing machinery.* Dated September 22, 1858.

Here the foul corn or grain is placed in a hopper, which has a long narrow opening at the bottom, so as to divide the corn or grain into a thin stream, which in descending meets with streams of air from a fan, by which much of the chaff, &c., is blown forward through a spout, and then the corn or grain falls on to a riddle or screen of sheet metal, the holes in which are of a size large enough to let the sound grains of wheat or grain pass through, but prevent the chaff and substances which are lighter, and also those which are larger, passing through, and such substances move on and are passed off at the front end of the machine, which is facilitated by a stream of air coming from the same fan as that from which the upper blast is derived, passing under and rising up through the holes in the riddle. The holes in the riddle are punched so as to produce a raised margin to each hole on the upper surface of the riddle. From the riddle the grain and seeds which have passed through receive a second winnowing, and descend on to an inclined screen, the holes of which are of such size as not to permit the sound grains of corn or grain to pass through, but allow seeds and the matters or substances less than the sound grain to pass through, and these matters fall on to and descend down an incline below the screen into a receiver at the bottom. *Patent completed.*

2136. EARL OF DUNDONALD. *An improved machine or apparatus for tilling and preparing land for cultivation.* Dated September 23, 1858.

Here a series of spades, prongs, cutters, &c., are caused to revolve on an axis driven by wheels and pinions or endless bands, from the supporting or carrying wheels of the machine or their axis, the contact of the periphery of the wheels with the ground producing the movement of the cutter frame. The mechanical movement which actuates the cutter frame is so proportioned as to give a relatively increased velocity to the spades or tilling instruments. By these means the tilling instruments are made to move the ground at a greater velocity than that at which the machine advances and at a favourable angle for penetrating the soil. *Patent abandoned.*

2137. A. F. JALOUREAU. *Improvements in the manufacture of pipes.* Dated Sept. 23, 1858.

This consists in making water or gas pipes, or pipes for enclosing electric telegraph wires, by rolling up in a cylindrical form thin sheets of paper, cloth, wire-gauze, metal, &c., which are cemented or soldered together by a waterproof cement or material. *Patent completed.*

2138. H. MCGRADY. *Improvements in the construction of flues, boiler and other furnaces, and in certain appliances thereto.* Dated September 23, 1858.

Here the inventor forms a bridge at the extreme end of the furnace, which may be called the flame-bridge; nearer the furnace mouth is another bridge perforated with a number of ports or passages through which the flame rushes; a third bridge stands a little way from the last-mentioned one, nearer to the furnace mouth, which may be called the fire-bridge, over which the flame plays in passing through the port-bridge. Passing across the front of the furnace mouth, under the plate, is a tube or pipe fixed transversely to the direction of the furnace, and having a number of small apertures which are opened and closed by a shutter. This tube, bending in a direction perpendicularly to its length, opens into and is connected at each end with two other tubes which pass alongside the furnace, and terminate each in a chamber beyond the flame-bridge, so that when the apertures of the front tube are open, the air rushing in will pass along the last-mentioned two tubes, and discharge itself into the flame at the flame-bridge. *Patent abandoned.*

2139. T. C. HINDE. *An improvement or improvements in the manufacture of iron and steel.* Dated September 23, 1858.

This consists in the use of hydro-chloric or muriatic acid or sulphuric acid, or nitric acid, applied in admixture with common salt or other analogous compound, the said mixture of acid and salt being mixed with the fused cast iron. *Patent completed.*

2140. D. GRANT. *Improvements in colour-printing presses.* Dated September 23, 1858.

This consists in making use of a circular bed upon which the blocks from which the printing is to be taken are placed, and for as many blocks as there are upon the bed the patentee arranges round the press inking-apparatuses, one for each block; each inking-apparatus is intended to supply ink of a different colour. Motion is communicated to each inking-apparatus to cause that part which supplies the colour to the block to travel over the block and back by a cam or eccentric worked by a pinion set in motion by a toothed-wheel or rack extending round the press. The tympan is circular with flaps in two compartments, and upon rotary motion being communicated thereto, it carries the paper successively over each block; the platten descends once for every successive onward motion of the tympan. The invention is not fully described apart from the drawings. *Patent completed.*

2141. J. WILSON. *Improvements in floating docks.* Dated September 23, 1858.

Here a floating vessel is constructed with parallel upright sides, the ends being at right angles to the sides, or otherwise, there being a grate or grates at one of the ends. The sides are each made hollow, with upright partitions, to separate the space between the two walls of each of the sides into several compartments. Provision is made for communications or water-ways being opened from one compartment to another. The upper compartments on each side are divided by one or more horizontal partitition, the upper horizontal partition on each side forming the floor for an engine-room and workshops. A steam-engine, or engines and boilers, with suitable pumps, are to be erected in each of the sides of the dock, with apparatus for steaming timber, the engines also working the sawing and other machinery in the workshops and dock when not used for the purposes of the dock. One end of the dock is also constructed hollow and divided into compartments, with water-passages and valves, so as thereby to be enabled to adjust the level of the bottom, notwithstanding an excess of weight being at any time at one end of the dock. There are other modifications. *Patent completed.*

2142. P. PICKERING. *An atmospheric engine.* Dated September 24, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

2143. R. and W. FORD. *Smoke consuming by means of a reciprocating or reversing fire.* Dated Sept. 24, 1858.

Here the furnace is divided into two compartments by a partition. This partition is placed on the level with the grate or bars of the furnace, reaching up to and touching the bottom surface of the boiler. In this partition a passage is left to allow the smoke to pass from one compartment to the other. The passage is close to the front of the furnace at the back of the furnace door, and the lower surface thereof is on a level with the bars. Each compartment has a separate furnace and damper at the back end of the grates. At the opening left in the partition, provision is made for the admission of atmospheric air from below, by small bars or a perforated plate. The supply of air is regulated by a shutter underneath. The furnaces are charged alternately, and the damper in connection with the chamber into which the fresh coal is introduced is shut down, thereby preventing the escape of smoke to the chimney. The smoke or gases emitted or generated from the fresh or green coal are retarded on the way into the other fireplace by the size of the opening in the division wall, and from confinement to an extent in the furnace attain the necessary temperature, which compels the gases to unite, and gradually lessens the bulk of the smoke, which, as it now moves through the opening in the partition, is mixed with a quantity of atmospheric air, when it ignites and passes over the other fire, burning with great rapidity, and yields a large extent of heating power. The consuming of the smoke is thereby completely obtained. *Patent abandoned.*

2144. E. T. WRIGHT. *A new or improved method of, and apparatus for, preventing the explosion of, or injury to steam boilers through deficiency of water.* Dated Sept. 24, 1858.

This consists in connecting a water buoy or float in the steam boiler with the furnace door, or with a door opening into the furnace, so that when the water in the boiler falls below a given level, the said door is opened. By the opening of the said door cold air is admitted into the furnace, whereby the boiler is cooled, and the draught through the fire to a great extent suspended. This invention is not completely described apart from the drawings. *Patent completed.*

2145. R. A. BROOMAN. *Improvements in the manufacture of pile and cut pile fabrics, and in machinery employed therein.* (A communication.) Dated September 24, 1858.

This consists in the manufacture of a new kind of pile fabrics, particularly carpets, whereby designs in all colours may be produced with great sharpness and distinctness whatever the length of pile. The machinery consists of a very simple loom. The most important feature in the manufacture is the arranging of the warp. The invention is not described apart from the drawings. *Patent completed.*

2146. H. H. and W. F. HENSON. *Improvements in water-proofing leather, woven fabrics, and other materials, and also for rendering them fire-proof, or partially fire-proof.* Dated September 24, 1858.

Here the materials are passed through a solution of chloride of zinc, and then through a mixture of solutions of hydrated protoxide of lead and sulphate or acetate of alumina, or both. The patentees also use a mixture of solutions of nitrate of lead, acetate of lead, and sulphate of alumina. *Patent completed.*

2147. R. BODMER. *An improved apparatus for preventing explosion in steam boilers.* (A communication.) Dated September 24, 1858.

This consists in the adaptation of a tube made of copper and of sufficient length to give the requisite amount of expansion necessary to actuate a depressing lever when the escape valve requires to be opened. *Patent completed.*

2148. C. F. VASSEROT. *Improvements in the construction of spinning cards.* (A communication.) Dated Sept. 24, 1858.

This relates to the manufacture of cards, the teeth of which are kept by their basis, and strengthened at the back by cloth or leather. The card has its fixed basis stuffed with fleece wool. The part adjoining the fixed part is formed of a piece of felt, coated before the teeth are put in with gutta percha. This felt must be sufficiently soft to allow the teeth to spring; joined to this latter, so as to make one body, is a box coated with gutta-percha, and in the front of this is a piece of cloth of the usual form. *Patent abandoned.*

2149. W. RICHARDS. *Improvements in fire-arms and cartridges.* Dated Sept. 24, 1858.

Here, in making breech-loading fire-arms wherein plugs or moveable pieces are used to close the breech ends, the patentee applies to such plugs or moving pieces hooks or instruments which enter into and hold wads or parts at the back ends of the cartridges, so that when the plugs or moveable pieces are moved back to admit of fresh charges being introduced at the breech-ends of the fire-arms, the hooks or instruments may withdraw the wads or exploded cartridges. The arrangement of plugs or sliding-pieces for the closing of the breech-ends of fire-arms which he prefers when using this part of his invention, is that described in the specification of his former patent dated the 25th of March, 1858. *Patent completed.*

2150. G. L. FULLER. *Improvements in steam-engines.* Dated Sept. 24, 1858.

This consists in such a combination of steam-chests or passages and steam valves as to enable two or more cylinders, working at different angles to one another, to be worked as may be required, either jointly at their full powers or on the continuous expansion system, wherein the steam admitted to the first of the series afterwards forms the supply to the others, thus giving to two or more cylinders, so arranged, as extensive a power (or nearly so) of expansion as could be attained in a single cylinder with a stroke equal in length to the sum of the strokes of such cylinder, and at the same time leaving their joint actual power intact. And the invention consists mainly in forming separate, or dividing the steam passages or chests for the valve openings to the tops and bottoms of such cylinders individually, but common as regards the tops and bottoms of the series respectively, and then arranging an expansion valve or valves common to the whole to govern the whole supply. It also consists in working the above expansion valve or valves, so as to render the same applicable to the purpose required, by enabling the cutting off of the steam from the different ends of the cylinders to be independent, and thus to permit of the rate of expansion being extensively varied while the engine is at work. *Patent completed.*

2151. G. L. TURNEY. *An improved mode of packing pins for sale.* Dated Sept. 24, 1858.

The patentee forms a kind of book consisting of a cover containing leaves of paper for receiving each a row of pins, and into these leaves he inserts the pins in the usual way of sticking pins into paper. *Patent completed.*

2152. A. F. DELACROIX. *Improvements in locomotive engines.* Dated Sept. 25, 1858.

These consist, 1, of a new system of transmitting the movement of the steam cylinder piston to the driving-wheels; 2, a particular system of brakes permitting the stopping of a train of carriages without shock at the third or fourth turn of the wheel. These features are not described in detail apart from the drawings. *Patent abandoned.*

2153. R. ROMAINE. *Improvements in the construction of steam cultivators, and in the means for operating such and other locomotive steam engines.* Dated Sept. 25, 1858.

This relates, 1, to various improvements in the details of construction of the cultivators for which the patentee has obtained letters patent; and, 2, to means of facilitating the working of such machines, and the turning of traction engines generally. The invention is not described apart from the drawings. *Patent completed.*

2154. M. A. F. MENNONS. *The separation of iron and steel from their combination with certain foreign bodies.* Dated Sept. 25, 1858.

This consists in economising the waste matters known as "grindstone sands." The oxides and earthy parts of this waste material being separated, the residue, which is composed of finely-divided iron or steel, is submitted to pressure for the double purpose of expelling the moisture and giving a certain amount of cohesion to the mass. The metal is then passed to the furnace and is either forged

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directly or reduced to castings in the ordinary way. *Patent completed.*

2155. E. FARNCOMB. *Improvements in Lilliputian fire-arms.* Dated Sept. 25, 1858.

This applies to Lilliputian or toy fire-arms, and consists of various arrangements of detail to be used with very small percussion caps, and very small charges of gunpowder. *Patent abandoned.*

2156. C. HALL. *Improvements in apparatus for applying power to the cultivation of the soil.* Dated Sept. 25, 1858.

This invention was described and illustrated at page 218, No. 14, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

2157. W. CLARK. *Improvements in purifying natural phosphates of lime.* (A communication.) Dated Sept. 25, 1858.

This consists, 1, in the purification of phosphates of lime for rendering them easier of transportation and assortment, by treating them with an acid, such as hydro-chloric acid, for eliminating the carbonates combined therewith; 2, in the purification of phosphates charged with silica or silicates, by agitating them in water, for precipitating the silica, and then decanting the muddy liquid which contains the phosphate of lime in a pure state, as described; 3, drying phosphates of lime purified in a stove, or in drying turbines or machines. *Patent completed.*

2158. J. C. DIEULAFAIT. *A kind of garment which may receive different forms according to the will of the wearer.* Dated Sept. 25, 1858.

This consists in making garments so that their shape may be changed or modified at will. *Patent abandoned.*

2159. S. H. GREAVES. *Improvements in the mode of manufacturing the blades of table and other knives.* Dated Sept. 27, 1858.

This consists in cutting the bar steel into short lengths, and before reducing it to shape, welding it to the iron which forms the bolster. The blade and tang are then drawn out, and the knife finished in the usual way. *Patent abandoned.*

2160. X. BOUTTEVILLE. *An improved neckcloth or tie, means of connecting ties to collars and bands, and an improved collar.* (A communication). Dated Sept. 27, 1858.

This consists of a band or collar, the ends of which are brought round to the front of the neck, and terminate in two loops, by preference of metal, which loops are attached to the band or collar. The tie or band which is used to form the bow consists of a strip of silk, &c., sufficiently long to form the bow or knot; it is passed through the two loops, and the ends brought back to tie the bow or knot. *Patent abandoned.*

2161. W. LANDER. *Improvements in engraving and printing for the purpose of ornamenting china and earthenware.* Dated Sept. 27, 1858.

This invention was described and illustrated at page 231, No. 15, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

2162. E. L. BENZON. *Improvements in the manufacture of steel.* (A communication.) Dated Sept. 27, 1858.

The patentee introduces into a reverbatory furnace crude pig iron, or refined metal, and in the first stage of the puddling process adopts the usual mode of operation, to bring the mass to a perfect state of boiling. He then makes up a good fire, and works with an open damper, to accumulate sufficient heat for subsequent operations. During the boiling and raising of the mass, globular grains begin to appear on the surface of the melted cinder, and these will increase gradually in number as the process continues. The elimination of the mechanically-combined carbon goes on very rapidly. As the decarbonisation continues, the grains will become pointed, and even elongated, and on touching each other, will now adhere, and, on uniting, will sink through the cylinder. This will indicate the presence of that percentage of carbon which constitutes the hardest weldable steel. This stage of the process having been attained, will form a starting point for the workman, and will enable him to produce steel of the different degrees of temper and hardness required for various applications and purposes. As soon as the proper amount of decarbonisation has been effected, and the further progress thereof stopped, the metal is to be formed into balls, care being taken always to keep the metal as much as possible immersed in or covered by the cinder, and when the balls are made, they must be removed from the furnace, and forged into blooms at the welding heat of steel. *Patent completed.*

2163. W. E. NEWTON. *Improvements in cigar holders, or mouth pieces for cigars, and in pipes for smoking tobacco.* (A communication.) Dated Sept. 27, 1858.

This consists in placing a chamber or bulb in the cigar-holder, between the cigar end of the cigar-holder, or the bowl of the pipe and the mouth-piece, and fitting into the bulb or chamber a piece of sponge, &c., to absorb and hold water, so that the sponge, &c., will pretty accurately fit the chamber or bulb, allowing the smoke to pass through the sponge, &c., and arresting and absorbing the empyreumatic oil arising from the burning tobacco, and at the same time cooling the smoke as it passes through; and in addition in placing a diaphragm filter across the bulb. *Patent abandoned.*

2164. E. LEWTHWAITE, and G. AMBLER. *Improvements in clocks, watches, chronometers, and other time-pieces.* Dated September 28, 1858.

This relates, 1, to the escapement, and consists in dispensing with the "pallet-wheel," and substituting in lieu thereof a "propeller" made of metal, stone, &c., with one or more very short arms, pins, or radii, which act upon the pallet as a "dead-beat," or otherwise. By this the inventor avoids the variations in time caused by the changes of temperature expanding and contracting the pallet-wheel. It relates, 2, to the fusee, and consists in having the driver, or first motion-wheel, formed with inverted cogs, in addition to the cogs now thereon, such wheel to be loose upon the axis, or spindle of the fusee, and gearing with a small pinion working in a stud attached to the fusee, which gears with a pinion affixed on the axis or spindle. By this means power or continuous action is maintained whilst winding-up. *Patent abandoned.*

2165. B. JONES. *Improvements in press wheel rollers, or clod crushers, which improvements are also applicable to rollers for crushing, bruising, and pulverising roots, and other substances.* Dated September 28, 1858.

Here two or more external rollers working in the same plane are fitted with internal rollers to correspond, the external rollers being formed with blades of hammered iron. When the rollers are set in motion, the internal rollers fit into the interstices between the blades, and are carried round in a direction contrary to that of the external rollers. The earth is thus prevented from adhering to the blades of the roller. *Patent completed.*

2166. J. H. LINSEY. *Certain improvements in binding or covering books.* Dated September 28, 1858.

This invention was described and illustrated at page 240, No. 15, of the MECHANICS' MAGAZINE (New Series). *Patent abandoned.*

2167. G. MEAD. *Improvements in the construction of tobacco pipes.* Dated September 28, 1858.

Here the bowl of the pipe has an internal reservoir for the reception of tobacco, communicating by a suitable aperture at the lower part thereof with a chamber at the bottom of the bowl, the chamber extending also between the internal surface of the bowl and the exterior of the reservoir, which latter is united to the bowl at the upper part thereof. The pipe or tube is so placed as to open into the upper part of the chamber between the bowl and the internal reservoir, the effect being that the oil descends through the aperture in the reservoir containing it into the lower part of the chamber, when the oil will be absorbed by the bowl, colouring the latter, and rendering the smoke cool and agreeable. *Patent abandoned.*

2168. J. L. CLARK. *Improvements in coiling and securing telegraph cables preparatory to laying them from ships or vessels.* Dated September 28, 1858.

In coiling an electric telegraph cable into the hold of a ship, strong cords or bands are used at intervals around the coils. The one end of each cord or band is to be made fast, and a loop is to be made therein, and such loop is to embrace a coil of the cable; then another loop is to be drawn through the previous one, and such loop is to embrace the next coil of the cable; then another loop is to be drawn through the previous one, which is to embrace the next coil of the cable, and in this manner each coil is to be embraced by a loop formed in each of the cords or bands, and so long as the last end of each cord or band is retained the loops will hold the coils securely together; but as the ends of the cords or bands are pulled, the succeeding loops formed in the length of the cord or band will be released, and the coils will be successively unlashed one from another. *Patent abandoned.*

2169. J. MANNING and T. PAUL. *An improved stone staff to be used in dressing millstones.* Dated Sept. 29, 1858.

This stone staff is more particularly adapted to "staffing" mill-stones. The staff is supported upon two metal discs, which rest one upon the other, the surfaces in contact with the discs being perfectly true. The upper disc carries the staff itself, with which it is made to revolve, so as to pass over the whole surface of the mill-stone in a true plane. It is, therefore, impossible that the face of the staff can touch, and consequently it cannot mark any other than the highest places on the millstone. These places, when indicated by the staff, are afterwards removed with the "stone-bill" in the ordinary way, and the process of marking and removing the projecting places is repeated until the whole surface is made perfectly true. *Patent completed.*

2170. J. LUIS. *A new method of fixing pastel pictures.* (A communication.) Dated September 29, 1858.

Here the pastel picture is executed in the ordinary manner, care being taken not to use unpasted paper, the thick printing paper for copper plates being best. On a smooth marble or wood slab a layer of almost liquid silicate of potash, or natron, about one-fifth of an inch in thickness, is spread. The back of the pastel picture is then placed upon the silicate surface, so that the liquid may be absorbed through the back of the paper. When the picture is well saturated, it is held so that the superfluous liquid may run off; after that the picture must be placed upon a paper to dry. This operation is repeated, and the picture is completely fixed. *Patent abandoned.*

2171. G. OLD and T. PENDLETON. *Improvements in dress fastenings, and in attaching dress-fastenings to articles of dress.* Dated September 29, 1858.

This consists of two pieces of sheet metal, each having a form resembling an anchor. The arms of one part of the fastening are bent a little upwards, and the arms of the other part are bent a little downwards out of the plane of the sheet metal of which they are made. When the parts are attached to the parts of dress, &c., to be fastened, the arms of one part may be engaged with, or hooked to the arms of the other part, and the two portions of the dress be held thereby together. There are modifications included. *Patent abandoned.*

2172. G. T. BOUSFIELD. *Improvements in apparatus for, and in the manufacture of paper bags, and other similar articles.* (A communication.) Dated September 29, 1858.

This consists in drawing a continuous sheet of paper (from a roll) around a rigid bar or former, pasting one edge of the paper, and pressing the other edge upon the pasted edge, so as to form a partially flattened tube. *Patent completed.*

2173. T. BRITT. *An improvement in the propelling of steam-boats.* Dated September 30, 1858.

This consists in the construction of a folding four-blade propeller, and the shafting for the same. This propeller is formed by four blades coupled together by a joint in the boss of the propeller. The two principal blades have the bearings. The centre part of the boss is taken out half-way along the boss, sufficient metal in the thick part of the blades to answer for the centre of the boss being taken out of the other two blades. The boss is taken out half-way along; it goes in the boss of the two principal blades, and the after-bearing is bolted on the two principal blades. In the two principal blades the fore-part of the boss is hollow. The shaft goes through that part to work the two centre blades; thus the joint is formed in the boss of the propeller. The object of this joint in the boss of the propeller is that it allows the propeller to close together, or open-out at right angles, as may be required, for the convenience of lowering the propeller down in its place, or hoisting it upon deck. When the propeller is down in its place, there are apparatus to open them out at right angles, and the shaft is made to couple them in that position, and work them in that position. *Patent completed.*

2174. J. WRIGHT. *Certain improvements in the mode of arranging and moving fire-bars for locomotive, puddling, and other furnaces.* Dated Sept. 30, 1858.

This consists, 1, in the mode of arranging fire-bars of furnaces in such a way that by acting on the alternate ends of a set or series of such bars they shall be raised or lowered in contrary directions. 2. In having the top edges of the bars of any regular or irregular form, and so arranging them that they shall possess a horizontal reciprocating motion, that is to say, that while one portion are receding from the mouth of the furnace the other portion advance towards the mouth, and at the same time the latter are coming forward they may be also elevated. *Patent completed.*

2175. J. MORRISON. *An improvement in or addition to sewing machines.* Dated Sept. 30, 1858.

This consists of an instrument to be attached to sewing machines for folding the edges of the fabric to be sewn, consisting essentially of two plates or strips of sheet metal, or one plate folded, the said plates or strips being situated parallel to one another, twisted into a screw-like form, and either grooved or plain on their inner or opposed surfaces. *Patent completed.*

2176. S. TAYLOR. *Certain improvements in apparatus to be used as a fire-escape, which improvements are also applicable to other similar purposes.* Dated September 30, 1858.

This consists in the use of a well-known arrangement or system of levers, which when suitably hinged and jointed are commonly called "lazy tongs." *Patent abandoned.*

2177. L. CECCONI. *Improvements in the construction of cornets, trumpets, horns, and other wind instruments of a like nature.* Dated September 30, 1858.

This invention was described at page 240, No. 15, of the MECHANICS' MAGAZINE. (New Series.) *Patent completed.*

2178. H. KINSEY, W. H. MORRISON, and S. SMITHARD. *Improvements in means or apparatus for the purpose of folding lace or other fabric, and also for cutting the same into lengths adapted to be used in the manufacture of bonnet and cap fronts, and for other purposes of millinery.* Dated September 30, 1858.

Here one end of the fabric to be folded is passed in between the parts of a plate or trough, the sides or opposite edges of which gradually incline towards or over one another, with a tendency to cause the edges of the fabric passed therethrough to fold in the direction desired. And one end of the fabric having been passed into such first folding means it is thence taken hold of by rollers in pairs, which act not only to draw the fabric through such first folding means, but also to flatten or fully crease the folded parts. In connection with rollers other rubbing surfaces may also be employed, as may also steam or other heat to such rollers or rubbing surfaces. The fabric thus folded with its two edges towards or over the centre thereof is then passed between other guides, having a tendency to cause it to fold again in the middle, and through this second folding means the fabric is drawn by other rollers to flatten it, and through other flattening means if desired to produce a perfect creasing to the fold obtained. The inventors also apply in connection with such folding means cutting apparatus governed to act at intervals desired, so as to cut the fabric into requisite lengths. *Patent abandoned.*

2179. R. LEVY. *Improvements in the manufacture of coats, ladies' riding habits, and other similar garments.* Dated September 30, 1858.

The inventor places under the arm pits or other parts a number of eyelet holes or ventilators to remove the excess of heat, and prevent excessive perspiration. *Patent abandoned.*

2180. C. W. SIEMENS. *Improvements in electric telegraphs.* (Party a communication.) Dated Sept. 30, 1858.

The specification of this invention contains a great amount of detail, and is too voluminous to admit of an intelligible abstract in our pages. *Patent abandoned.*

2181. A. NORMAND. *Improvements in constructing ships and vessels propelled by screw or such like propellers.* Dated Sept. 30, 1858.

Here the patentee gives to the part of the stern comprised between the two stern posts on each side of the central plan of the vessel, and on a proper extent, a segmental form, either convex or concave in cross section, or a plane surface. He closes the bottom opening of the well-hole by sliding lateral doors or shutters taking the form of the outside of the vessel and moveable either from within or from the deck of the vessel, so as to recede or approach each other. He also proposes to alter the usual shape of the opening of the well-hole, making it follow the profile figure of the screw when viewed from the stern, the screw being turned to bring the central part of its blades into a vertical line, which is the position it will be required to take when it is raised or lowered.—*Patent completed.*

2182. G. UHLHORN. *Improvements in applying motive power to give motion to machinery.* Dated Sept. 30, 1858.

This is applicable where two or more prime movers are employed to give motion to the same shaft, and the invention consists in so connecting together the shaft from the two or more prime movers that the shaft from the prime mover of the greatest power will not in rotating cause the shaft from the prime mover of lesser power to rotate, but the shafts from the prime mover of lesser power will, in rotating, cause the shaft from the prime mover of greater power to rotate. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, MAY 13, 1859.

THE WAR RESOURCES OF ENGLAND.

"There is a sound of thunder afar,
Storm in the South that darkens the day,
Storm of battle and thunder of war,
Well, if it do not roll our way."
"T." in the *Times*.

THERE is no beauty in war that we should desire it; and, happily for us, we have lived to see England stand firm in a peaceful neutrality while continental emperors take each other by the beard. It will indeed be well if the storm "do not roll our way." It may, however; and lest it should we must prepare to sustain it. This is the feeling of the nation, and this is the meaning of that summons of the Poet Laureate's (if we mistake not)—

"Form! form! riflemen form!
Ready, be ready to meet the storm!
Riflemen, riflemen, riflemen form!"

The poet is justly impetuous, and his energy is not altogether misdirected in calling upon small-arms'-men to "look to their butts and take good aims." But his cry, and a thousand other cries of like nature, just now raise again the question, How far the existing appliances of warfare ought to be relied upon by England in this day?

War is unquestionably a barbarous pursuit. It is, we doubt not, destined to ultimate, although remote extinction. We believe that—as Mr. Buckle states in his magnificent "History of Civilisation"—every great increase in the activity of the human intellect has been a heavy blow to the warlike spirit; and that—as Sir Benjamin Brodie lately remarked at the Royal Society—there are very few of the discoveries which have been made in the physical sciences which have not, sooner or later, had the effect of promoting the well-being of mankind, in this respect. We may therefore reasonably anticipate a period in the history of human civilisation when men shall really beat their swords and spears into ploughshares and pruning-hooks—when future Mechis and Fowlers shall buy up the stocks of the Lancasters and Wilkinsons.

But meanwhile we *may*, as we have said, have to fight; and it is very important that we should know how to do that in the most effectual manner. Up to the present moment we are relying solely upon instruments and munitions of warfare which, so far as their leading qualities are concerned, have become old and universal. We thrust at the enemy with bayonets; we slash at him with swords; we let off pyrotechnic tubes at him; we blow little balls of lead and large balls of iron at him; and we sometimes make the balls of iron hollow, and put a combustible substance inside them. This is the sum of our warlike operations. We are improving the details of the various instruments used for these purposes it is true; but that is all. Sir William Armstrong's gun is, at the very best, only a means of throwing bolts and balls with greater accuracy, and to greater distances, than heretofore. No one can pretend that it is more. And yet that gun—which others already possess as well as ourselves—is the only improved weapon of offence that we are arming ourselves with for coming eventualities. And in respect of our defence, the expedient of covering the sides of ships with shell-proof iron—an expedient which the Admiralty have only *talked about* as yet, and which, however necessary, is after all a clumsy kind of business—is the only novelty we contemplate.

Now, this is not, in our judgment, as it ought to be. Science can befriend us in other and better ways than these; and we have no right to turn from her advances. She can enable us to broaden, and deepen, and heighten, and quicken our powers of hostility. There is—to go no further for an example—the Macintosh system, which cabinet ministers have inquired into, and witnessed, and trembled at, and tried to suppress, but which they have neither the courage to sanction nor the sagacity to adopt. Its efficacy is not, we believe, doubted; at any rate it has been tested officially more than once but never reported against, and if past experiments are deemed insufficient, the inventor is ready to repeat his proceedings at any place, on any scale, and in the presence of any appointed functionaries, at his own cost. And assuming (as we have therefore the right to assume) its efficacy, its power would make us most terrible. Masters of the seas as we are, there is not a sea fortress on the continent which it would not put safely, cheaply, and bloodlessly into our hands, should the need for taking it arise. There is no harbour that could hold an enemy secure from us. At the same time the system of warfare under notice is not necessarily destructive; it may be used simply to render innoxious—to *disarm*, as it were—the enemy if desired. "It is surely time," as we said on a former occasion, "for the country to inquire how it is that such an invention is not favoured by the guardians of the State. There is nothing secret, nothing illegitimate, nothing suspicious about it; the inventor has published his plans, courted investigation, and even invested much money in furtherance of his invention; there can be nothing absurd or preposterous in his proposals, for Lord Panmure took pains to keep them secret during the war, and thus pronounced even more strongly in their favour than if he had consented to adopt them. We have never yet known a word to proceed from any other official person against them; there is considerable anxiety in the nation respecting our defences; and Members of Parliament are threatening to tax us even yet more heavily in order to increase them. There can, therefore, be no good, no plausible reason, even for delay, and indecision, and circumlocution in the matter. The public should see that the invention is no longer neglected. They should also see that a better spirit is introduced into our War Department. It will not do for us to plod heedlessly on in this art of war, which we are so well able to improve."

As a matter of economy, this subject should be looked into, and studied, and pronounced upon by the nation. It cannot be denied that the existing systems of warfare are extravagantly costly. Let us take an illustration of this. In the naval attack upon Sebastopol, on the 17th of October, 1854, the Agamemnon and Sans-pareil were stationed at 800 yards from Fort Constantine. These two ships could bring about eighty-seven guns to bear upon the works, and the firing from them lasted four hours; yet the strength of the masonry of the fortress was not at all impaired! It has been estimated that some 7,700 shot and shell were fired; and since the effects produced were comparatively slight, most of this number must have been uselessly expended. Again, when the large Russian steamship Vladimir was fired upon by expert gunners, in the most deliberate manner, at a distance of twenty-five cables' length only, she was struck by only 10 shots out of 500! These facts indicate, however faintly, somewhat of the extravagant expenditure of means and money which is contingent upon the present modes of warfare.

It is high time, therefore, that we supplemented our present practice by something cheaper, more simple, and more effective. It is folly to shut our eyes and ears either to the defects of our present means, or to the practicability of improving and adding to them. And this, if ever, is the time to give the subject our attention. Our aim is to remain neutral and inoffensive, but our desire is to be strong as well as pacific; and while we contemplate nothing but self-defence, we are bound to perfect that defence by the readiest and best means at our command. It remains, therefore, for the nation to say whether, in the event of another war, we shall content ourselves with repeating the ineffective display made during the last war in the Russian waters, or whether we shall invest our fleets with such a power as that which the Macintosh system is admitted to possess.

EXPLOSION AT GUNPOWDER WORKS.

WE have to thank "Polvora" for the very temperate letter which appeared in our last number—temperate because "Polvora" evidently holds in his hands the artificial thunder which has sent so many of the innocent and guilty to perdition, and which he, as the champion of the gunpowder manufacturers, knows so well how to wield. The letter is, moreover, of value, as emanating from "the largest manufactory in England (perhaps in the world)."

Having, then, caught a gunpowder manufacturer, and one who "has not had *a fatal* (the italics are our own) accident for twenty years," we can do no other in courtesy than request him to accept our congratulations at so desirable a state of things in the district of his factory. In doing this, he must pardon us if we place him before his brethren as an example both to admire and to imitate. For has he not introduced and improved the machinery of the "mixing-houses," the "incorporating-mills," the "press-house," the "caming-house," the "drying-house," and the "dusting-house?" And "these," he *naively* adds, with a well-deserved "blow" at his brother manufacturers, "have not been *blazed* abroad to the world"—and, as a *non sequitur*—"there have been no fatal accidents." Are we, then—as he does not hint at what these improvements are—to conclude that secresy is a prevention, and that publicity is the cause of accidents? and are we likewise to conclude that it is only at ——— that these improvements in the machinery, and the consequent reduction of the number of hands, are to be found? If so, we at once enlist "Polvora" upon our side, and confidently appeal to our readers that so far from our strictures being "rather severe," they have not been strict enough. For where judicious thought and judgment have been exercised there, "no fatal accidents have occurred for twenty years." Then, say we to those who have turned their picturesque mills and grounds into slaughter-houses, "Go unto your neighbour, and profit by his council. Be thou no longer insensible to improvements, but learn wisdom and mercy in ———!" We may add, that we have heard the highest encomium passed upon the firm from which "Polvora" writes for their unselfish devotion to the welfare of their workpeople, and we can readily believe that the well-earned and merited payment he mentions is cheerfully accorded to men "amongst whom a case of drunkenness is never known;" and we are equally assured, from the most reliable source, that when the same firm thought they saw in the introduction of gun-cotton a less dangerous compound than gunpowder, they readily embarked a large fortune in it, and as conscientiously abandoned it with a heavy loss upon the discovery of their error in judgment.

But these are exceptional cases, and do not shake one jot the premises upon which we have taken our stand as a rule. We know full well that

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the matter of wages is an irritating one, and as it may—indeed does—form a large element in the consideration of *safety*, we are not a little proud to add from so high an authority as "Polvora" —"Give men good wages, and you may generally get good men." Upon this point—the lowness of wages—"Polvora" "would fain hope there is some misinformation." *There is none.* Two and twopence a-day—and two and twopence only a-day—do the "black-men" get who are exposed in the mills to the first and worst consequences of an explosion. True, this amount before coroners' juries is made to assume a higher and less illiberal rate, by stating that "the 'black-men' can earn twenty-four or thirty shillings per week." But this is only done by over-work —by the sacrifice of two or more nights of rest —and by a consequent self-consignment to so many hours more of peril and risk.

It will thus be seen that "we do not grudge the manufacturers their due meed of praise" where praise is really due, and it would give us immeasurable satisfaction, even at this late hour to be shown that we were incorrect in our statements, and consequently to blame for our strictures. Nor do we "censure the manufacturers because they cannot cope with the elements;" but we certainly think that when the brewer, the home-made wine manufacturer, the vinegar maker, and the gin distiller, &c., have their practical and analytical chemist at their elbow, so treacherous a compound as gunpowder, (now —*only now*—discovered to be "not so simple in its elements as was formerly supposed, but can boast for its properties, besides the usual products of carbonic acid, carbonic oxide, nitrogen, and sulphide of potassium, the presence of hydrogen, oxides of nitrogen, cyanide of potassium, sulpho-cyanide of potassium, sulphate and carbonate of potash, and various other salts," the several quantities of which have been determined by Bunsen), ought not to be left without scientific espionage to watch its vagaries, and keep its dangerous idiosyncracies in check. Upon whom does the disgrace fall, if the men who accumulate large fortunes in its production, and ought to be the natural guardians of their assistants, are to be held immaculate and free from stricture?

THE ENGINES OF HER MAJESTY'S SHIPS OF WAR.

In returning to the Report on the Marine Engines of the Navy, to which we drew attention in our last number, we have to observe that the committee next directed their attention to the means that have been taken to preserve the engines and boilers of the vessels laid up in ordinary. On this subject, as on all others, the committee write with a solemn guardedness of language, which would have been very effective indeed if it had been associated with any researches or conclusions of importance, but which, as it is, looks very ridiculous, and only fails to be amusing because it is puerile. They think, for example, that steam-vessels of the first class —which are supposed to be ready for sea at twelve hours' notice—should not be taken on occasional trial trips, unless there be other than engineering reasons for the practice. And so with regard to the employment of the spare time of the steam-ship staff in ordinary, upon which they "twaddle"—(we dislike that word, but it expresses what we mean)—justifying their remarks by the sapient announcement that "nothing is trivial which conduces towards improving the system of public service." They conclude this part of their Report by making several recommendations, bearing mainly upon subjects discussed in our former article. Of these recommendations we shall here notice the first three only. They are elegantly expressed as follows:—"1. That the plan should be generally adopted for all gun-boats of taking away the mastic from under the boilers, and placing them upon iron crutches. 2. That in all new steam men-of-war, and in those whose boilers may require renewing, where there is sufficient space, mastic should not be used at all, but the boilers placed either upon iron crutches, sleepers, or the bearings should be rested upon putty, so that the bottoms of the boilers shall be completely accessible. 3. In cases where, from the build of the vessel, it is impossible to dispense with mastic, and where the boilers have to be placed by contractors, care should be taken that a well-qualified Government officer attends to see the work properly done."

In reply to these the Surveyor says, the evidence of the persons whose opinions were asked on this subject is by no means unanimous. To carry out the proposed arrangement the boilers must be placed higher in the ship, and it is with difficulty, even by reducing the steam space below what is desirable, and otherwise contracting their dimensions, that boilers can be kept sufficiently below the surface of the water to be reasonably protected from destruction by shot. Every effort has been made to keep them as low as possible, and except in special cases, the evils arising from raising them would most certainly outweigh the contemplated advantage; indeed, in a vast number of cases, the plan is altogether inapplicable. It is strange that any committee whatever could have forgotten this. The committee next consider that several changes might be advantageously adopted in the manner of proceeding with a steam-vessel arriving at a home port with defects, both as regards treatment before repairs are commenced, and also in the manner in which they are carried out. After proper surveys and reports upon the defective engines have been made by the authorities, it should be determined, they say, whether they are to be repaired by the steam-reserve or by the factory; if by the steam-reserve, the captain and inspector of machinery in that department will have to take the requisite measures, and on them should rest the whole responsibility. If heavy castings are required, application must be made to the chief engineer of the dockyard, who will have to give the necessary directions. The committee are of opinion that by following out this plan the dockyards will be relieved from a considerable amount of labour, which can be beneficially applied in a different direction, and the expenditure in making repairs will be reduced. "As the repairs will be effected by those artificers who have been to sea and witnessed the working of steam-engines under various circumstances, it therefore may be expected that the work will be better done by them than by workmen who are not conversant with engines at sea." To meet the necessities of the additional work thus entrusted to the artificers of the ship and the steam-reserve, a floating workshop (like those at Sheerness and Devonport) ought to be provided at Portsmouth; the one at Devonport ought to be enlarged and improved; "and all these floating factories, if at all deficient in their internal arrangements, ought to be at once furnished, and properly fitted up with simple but useful tools." (Let the reader conceive of an Admiralty report with such wise observations as this last abounding in it!) When extensive repairs are being carried out the chief engineer of the ship should be in constant communication with the chief engineer of the factory, to point out those defects of the engines that are most prominent, and most necessary to be remedied. "The committee consider the above a matter of importance, and are convinced that if carried out in a proper spirit much good will result from this intercourse." Another "matter of importance" is that "the engineer who conducts the construction and repairs of marine engines in a factory should have had experience of the working of engines at sea." To this the Surveyor replies that at present out of the chief engineers of the dockyards and their principal assistants, amounting altogether to eight, there are no less than four who have been naval engineers. "It is apprehended," by him, that "the Board would never think of laying down any fixed rule, such as that suggested by the committee, which would limit them in their selection of individuals to fill these important posts."

The purchase and cost of steam-machinery is the next topic touched by the committee. In compliance with the directions given to the committee by the Admiralty, they "have given special attention to the manner in which purchases should be entered into, and also into the cost, marking at the same time where there has been in these transactions any want of economy that ought in future to be avoided." As a preliminary remark, the committee observe that the improvements lately made in steam-engines and boilers have a tendency to increase their cost. The tubular boiler with brass tubes costs more than the flue boiler, and the direct-action engines for propelling the screw are not only more expensive to purchase than those used for the paddle-wheel, but require a greater expenditure of tallow and oil for facilitating the motion; it would be easy to state many more changes connected with the structure of engines which have at all events required, for the present, extra expense. It appears to the committee that this circumstance, by causing larger sums to be expended necessarily under special heads, may have a tendency, if not strictly guarded against, to check that proper economy which is so necessary, and so difficult to retain in all large concerns. "Impressed with this idea, the committee submit to their lordships' consideration a few cases of large sums spent without adequate results upon steam machinery, which they hope may act as beacons to guide future expenditure." We shall not follow the committee into the details of their charges under this head. They are neither very numerous nor very strong; and they are all sufficiently replied to by the Surveyor, who concludes his observations on this head in the following sentences, which we quote in justice to the Department:—

When a great and beneficial change has been effected, such as the change from the paddle to the screw, whereby steam has been rendered applicable to ships of war of all classes, it is generally easy to look back at the several efforts that were made to accomplish the object, and to point at some of them as having contributed to the result less than others. No doubt, with our present knowledge and experience, and as it were seeing at a glance the whole course pursued, and its successful termination, this may be done without much risk of error. But it should not be forgotten, as it sometimes is in this particular case, that many competent judges thought the screw system of propulsion could never be successfully carried out, and that the invention had to struggle against adverse opinion, and no small opposition; such opponents, however, would now probably admit that the comparative failures in effecting this great change were fewer than they themselves expected, and fewer than have generally attended the introduction of equally important changes from one mechanical system to another.

The committee next direct attention to the method adopted by the Admiralty when making their contracts for the purchase of engines and boilers. Years ago, when engines were wanted for the navy, it was the practice to apply to almost all the known respectable firms, giving very often a preference to those makers who could place the greatest amount of power in the smallest space. No doubt that was apparently the most economical manner of pro-

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ceeding, but it introduced many bad engines into the service. At the commencement of the Russian war the Government saw that it was necessary for the rapid supply of machinery to confide their orders to a few first-rate makers, amongst whom Penn and Son and Maudslay and Field were amongst the principal, and they did the country ample justice, considering how little time was afforded to complete the orders entrusted to them. These eminent firms were forced, however, the committee allege, during that press of orders so unexpectedly coming upon them, to apply to other engineers for some of the items in their contracts. Thus several makers who had formerly supplied the Government with engines gradually were thrown out of the list, and at present the contracts are almost limited to Penn, Maudslay and Field, and Miller and Ravenhill. A good deal of trouble is thus saved, and the committee say they have reason to believe that the best steam-machinery that this country can produce has been lately received. Further, from every inquiry that the committee have made, after visiting most of the principal manufactories of steam-engines, as well as receiving important information from most of the great steam-companies, they have no reason to believe that the Government have generally paid a higher price for their engines and boilers than private individuals have done. These statements are succeeded by the following curious remarks :—

The committee are of opinion, that although this plan of purchasing engines has been adopted by several large steam companies, still they think that the Government could advantageously throw their contracts more open. A special advantage of this mode of conducting the contracts has offered itself to the committee. The Government would certainly gain a better and more extended knowledge of the real state of the engine market. It even appears doubtful to the committee whether the steam authorities at the Admiralty have been made aware that the factories for constructing marine engines at Glasgow, and its immediate vicinity, are of such a complete and extensive a nature, that from them, perhaps, could be furnished marine engines for the whole of Europe. The greater number of these Glasgow engineers have never had an opportunity afforded them of constructing steam machinery for our men-of-war, and of course may not be so well acquainted with all the requisites and limits that are necessary for that species of engine. In this case, therefore, and indeed in most cases, the steam department of the Admiralty ought to furnish their own plan of engine; but, at the same time, in order that they may be kept cognizant of all improvements, the parties tendering should be requested to send in plans and tenders for such engines as may appear to them superior. In time of war, and when sudden pressure of demand came upon the Government for work upon which they could depend, they would then have acquired such knowledge as would enable them to apply at once to new resources, by which the country could be kept supplied in almost the shortest possible time with engines for every variety of vessel.

The committee next refer to an extract from a letter from Sir Baldwin Walker, Surveyor of the Navy, on which they make a few very hostile remarks :—

That letter states, they say, that the difference between the steam machinery required for men-of-war and that which is suitable for mercantile steam-vessels is so great, that for large steam-engines entire trust ought to be given only to those makers who have been in the habit of supplying engines to the navy. Certainly this remark implies an argument, whether intended or not, for employing more engineering firms than is done at present. In that letter it also stated, "if the Admiralty did not employ, to a considerable extent, the very best makers in this country, foreign countries, and particularly those which may at a future time be our most powerful enemies, would be more benefited by the purchase of English engines than they have been within this last few years." Now, whilst the committee fully and entirely concur in the opinion that only the best makers for large engines ought to be employed by the Admiralty, they must protest against the reason assigned for that measure as wholly fallacious. It is in vain to expect, in these days of free and open commercial relations, that any purchase of steam-engines by the Admiralty from a few eminent firms will for any length of time prevent foreign countries from supplying themselves with the best steam machinery that this country can produce. Even if any such effect were the result to a partial degree, the only consequence would be to force foreign countries to manufacture their own engines. In the course of their inquiries, the committee have been led to the opinion that some improvements might be made in the mode of taking the contracts for providing steam-engines for the navy. The specifications do not appear to be sufficiently comprehensive; one deficiency has been referred to by Mr. Murray, chief engineer of Portsmouth Dockyard, who stated as follows:—"I have always been of opinion that the indicated horse power up to which the engines are to work, with a given supply of coal of average quality, should be inserted in the contracts."

The committee entirely agree in this opinion, and see no reason why a specific clause should not be inserted, embracing that point in all future contracts for steam-engines. They also agree with Mr. Murray that it would be highly advantageous, whenever the authorities have approved generally of the drawings, and accepted the tender sent in for any pair of engines, that a power should be reserved of arranging with the contractor for any minor improvements that might be considered advantageous after the general approval has been given. It appears that hitherto two reasons have prevented the steam professional advisers of the Admiralty from interfering with the contractors. The first is a fear of laying themselves open to a charge of favouritism, by preferring some particular party. The second reason is, that in the event of the engines failing, it has been considered advisable that the whole of the responsibility should be thrown upon the contractors. The committee cannot see any force in either of these reasons; and, indeed, they consider the second one to be entirely fallacious. They concur in the opinion given by Mr. Murray, that the responsibility of the contractors practically ceases as soon as the most important parts of the engine are passed, and the greater proportion of the instalments made. The professional advisers of the Admiralty are, practically speaking, the parties upon whom the responsibility rests. It is necessary that they should be well acquainted with every new improvement that has been found applicable to the marine steam-engine. And, further, they should not only take care that these improvements are adopted in all new machinery, but by careful supervision, as far as supervision can avail, should prevent either bad workmanship, the use of hot-blast iron, or any other inferior material.

To all this the Surveyor makes a very full reply, which deserves careful attention, but which can scarcely be considered sufficient. At first sight, he says, any extra condition in a contract seems calculated to secure a better bargain for the buyer; but whether it actually does so, depends mainly upon the feelings, interests, and character of the person undertaking it. Experience shows that it is not easy to ensure the faithful fulfilment of the simplest contract when a contractor is unprincipled and endeavours to evade the conditions, or barely to fulfil them to their strict letter instead of their spirit. With such a man it is presumed the Government would not desire to have any dealings at all. But men of the opposite character not unfrequently undertake to do more than can be performed; as, for instance, to build a ship with a given draught of water to realise a certain speed under certain conditions, or to make her engines work up to a certain amount of power with a given expenditure of fuel. Such failures generally end in a sort of compromise. Now, under ordinary circumstances, this does not seem to be the most suitable kind of contract for the Government to make, and accordingly it is very seldom had recourse to. The general system adopted by the Admiralty for obtaining engines, is to specify beforehand the minimum area of fire-grate, and of absorbing surface of the boiler, on which the power mainly depends, and to approve of the size of cylinder, length of stroke, and other particulars of the engines before the tender is accepted. That eminent marine engineers would do their very utmost, regardless of cost, to realise the best results which can be obtained is notorious; but it is not so generally known that even some time after an engine has been set to work, if they discover an improvement which can be introduced, or an indication that any part has not worked or may not continue to work in a perfectly satisfactory manner, they earnestly solicit, as a favour, permission to alter or renew them at their own cost; and with one or two solitary and not recent exceptions, they have never hesitated to remedy at their own cost every defect, apparent or real, which has been pointed out to them. No doubt, their own interest would alone prompt them to do all this, but it is right the fact should be known.

Such being the case, it may be asked (says the Surveyor) is it probable that if the proposed condition were inserted in future contracts, that with a certain quantity of coal of "average" quality—a vague definition—a certain amount of power must be realised, it would have the effect of eliciting greater skill or judgment on the part of the manufacturers? But further, if this amount of power were fixed at a point difficult to attain—and without so fixing it the condition would be simply useless—might it not be an inducement to them, rather than risk a failure, to endeavour to effect the object without due regard to permanent excellence, or the satisfactory working of engines and boilers under the ordinary requirements of the service? If, however, this condition is intended by the committee to be a part of their proposed system of having engines made on a Government plan, and of designing and manufacturing the boilers in a Government establishment, thus reducing the manufacturers to mere operatives acting under the directions and supervision of Government officers, it is evident the committee cannot have considered the subject with any degree of attention. The two recommendations are obviously incompatible. It may perhaps be unnecessary to add, that no condition which is not clear and specific ought to be inserted in a contract, unless indeed some paramount object is to be gained. In the present instance, however, such does not appear to be the case, for the committee do not even state the object which they have in view, and it may well be doubted whether an important one could be found. Now, as was before observed, coal of "average" quality is a vague definition, but this is not all. It is well known that the actual power developed by an engine, which is seldom two days alike, depends upon many circumstances other than its own merits and those of the coal and boiler; such as the draught of water of the ship, state of the weather, direction of wind as affecting the ventilation of the stoke-hole and the draught of the boiler, skill and energy of stokers, duration of trial, quantity of water blown out of the boilers to prevent incrustation, degree of expansion used, &c.; and when it is borne in mind that with a boiler of given size and construction, every experienced person can predicate within very narrow limits what power it will realise if the steam be made proper use of. The difference between the power specified in the contract and that realised would never be very great; hence the aggregate influence of the circumstances before referred to would become the chief point in dispute, and it is more than probable differences of opinion on this and on the mode of conducting the trials would lead to a want of harmony and co-operation between contractors and Government officers, than which nothing more detrimental to those public interests with which they are connected could possibly happen; while on the other hand no benefit whatever could possibly be gained.

The committee recommend, further, that in all future specifications for new engines a clause be inserted, excluding entirely the use of hot-blast iron. From various inquiries which have been made, the committee are convinced that even the engineers of our Government factories are not sufficiently impressed with the vast difference which exists between the strength of hot and cold-blast iron. When at Sheerness the committee witnessed the following trials, to

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test the difference of strength between a pig of iron made by hot blast, and a similar one made by the cold blast. The difference was at once apparent: they found that a single blow with a small sledge hammer broke the pig of iron made by the hot blast, and that repeated blows very soon broke it up into fragments. The pig of iron made by the cold blast, on the other hand, resisted entirely the stroke of the same hammer by which the other had been broken so easily, and further, that it stood un injured even repeated blows with a very large sledge hammer before it broke. The difference was apparent also in this, when the hot-blast iron was thrown upon the ground it broke immediately from the effects of the fall, whereas the cold-blast iron bore a similar treatment without the slightest injury. The committee having witnessed these trials, having inquired carefully into the subject, and having ascertained that, on an average, if sixty represents the cost of hot-blast iron, 120 represents the cost of cold-blast iron, which also may be taken as their relative mechanical value, strongly urge upon their lordships the necessity (seeing the temptation is so great) of taking the most stringent steps to prevent the introduction of any portion of hot-blast iron into the castings required for the Government engines. They further add, that they believe a large proportion of the breakdowns that take place on board steam-vessels proceed from the use of this very inferior metal. By way of rejoinder to this, the Surveyor says it is but just to those manufacturers who have been employed by the Admiralty to say that there is no reason whatever to suppose, nor indeed is such an imputation made against them, that they have used it injudiciously. "The principle of prohibiting the use of a material which, when used with judgment, is unquestionably productive of benefit, because it is cheap, and may be improperly used by unscrupulous persons, cannot be defended. The adoption of such a principle would be calculated to discourage improvements and check advancement in the manufacturing and mechanical arts; indeed, in the present day it would be as anomalous as it certainly would be contrary to sound policy."

The committee next recommend that engines alone should be purchased, and that boilers, screw-propellers, and it may be presumed everything connected with them, should be manufactured in the dockyards; this would amount to nearly one-half of that which is now supplied under contract. If this recommendation were ordered to be carried out, no doubt many of the difficulties and objections which at once present themselves, and which appear of a serious character, would not be found insuperable; but, as the Surveyor says, a proposition to increase to such an extent the system of costly manufactures in the dockyards could not be decided in the affirmative without grave consideration, and a more close investigation and a fuller inquiry than it appears to have undergone by the committee. He further says, the general question of manufacturing in public establishments what can always be obtained by contract is not new; it has been frequently discussed, but without gaining many supporters. A strong feeling seemed to prevail in the minds of the Select Committee of Navy and Army Estimates in 1848, that even at that time the system required rather to be checked than extended, and whether right or wrong, persons in high position and of great judgment are now found, occasionally, to express in Parliament and elsewhere the same opinion. The committee's suggestion to have in progress of manufacture at each of the factories an engine, with the special or principal object of absorbing labour when not required for repairs, is one which, if adopted, would, in the opinion of the Surveyor, have the good effect of sometimes obviating the necessity of discharging men. But their further suggestion, that the boilers and screws for all new engines should be made in Government factories, and, in addition, that a large number of engines should also be made in these establishments, does not meet with his approbation. They also suggest that the remaining engines should not be obtained as heretofore from the eminent engineers whose plans they have decided to be the best and the most suitable for ships of war, but that two or more of these plans should be selected, or others invented by Government officers, and that complete working drawings and specifications should then be prepared and placed in the hands of such manufacturers as may be willing to undertake work under these conditions. Engines may, it is assumed, be thus obtained at a reduced price, and of the same or superior excellence. "Now, the only inquiry the committee seem to have made as to the expediency, or even practicability of adopting such a system, was," says the Surveyor, "by asking certain manufacturers if they would be willing to construct engines on a Government plan, not whether they would construct them on the plan of another manufacturer, and reduce themselves to mere operatives, having only to conform to detailed drawings, and to submit implicitly to the directions of Government officers: but it is worthy of remark that the two most eminent firms in this or any other country, Messrs. Maudslay and Messrs. Penn, were not asked even that question; their reply, if they had been, may be readily conjectured. Mr. Humphreys, whose engines, at least for small power, the committee consider the best adapted for the Royal Navy, was asked, and he said he would not. If therefore this engine is to be procured for the future, it must either be made by him as heretofore, or we must make drawings of it, and endeavour to induce manufacturers to adopt a course which it is hoped few people could reconcile to their views of right and wrong, unless they considered the moral responsibility rested with the Government. The patent right for Mr. Penn's engine it is understood will shortly expire, as in the case of Messrs. Humphreys, there would be no legal impediment to supplying manufacturers with drawings of Mr. Penn's engine, to enable them to make engines on his plan also. To expect, however, to obtain in this manner engines of the same excellence as those manufactured by the inventors themselves, at all events for some time to come, is altogether unreasonable. For every kind of engine there are particular adjustments and allowances required, and for certain parts a suitable selection and treatment of materials, a knowledge of which can be acquired only by long practice, and cannot be communicated by any drawings or instructions. It relates more especially to those practical details learned by experience in constructing a succession of engines on the same plan. Moreover, it would be difficult, if not impossible, to ensure the same excellence of workmanship in ordinary engineering establishments."

ALEXANDER VON HUMBOLDT.

THE great Humboldt is no more. Full of years and honour, he died in his native city of Berlin on Friday last. We should deem it a delight to write a worthy notice of one so illustrious, had we the leisure, and the faculty, and the culture essential to the task. But we have neither: it were mere charlatanry to pretend to it. Happily his fame needs no aid of ours. His memory is graven on the world for ever. The following few facts concerning him, from another source, may be repeated here. Alexander von Humboldt was born at Berlin on the 14th of September, 1769. He was an undergraduate at Göttingen, which university he left for Frankfort-on-the-Oder. Geography and geology where is chief studies. His intelligence and zeal were not overlooked by the Government. In 1795 he was sent by the Prussian Government to study the nature of the volcanic eruptions of Vesuvius. Humboldt's mind took a wider range. He aspired to investigate regions unknown. Africa was his object. He went to Marseilles and joined Bonpland, who was on the point of starting on a similar mission, with the intention of accompanying him. This plan failed, but through the interest of Baron Forell, the Saxon Ambassador, Humboldt obtained permission and authority to make a scientific tour of Spanish America. During 18 months Humboldt examined geologically and geographically every part of Venezuela, the Orinoco, and the Rio Negro. He afterwards visited Bogota, the Cordilleras, and Quito. At this latter place Humboldt, at great personal risk, investigated the volcanic mountains. He spent some time at Lima. In August, 1804, Humboldt landed at Havre, rich in experience, and with an invaluable collection of specimens of geological and botanical interest. Humboldt fixed his residence at Paris, taking an occasional trip to London; but Prussia could not spare so valuable a man, and the King requested Humboldt to return. The King made him a Privy Councillor, and offered him various diplomatic missions. But mountains, not men, were Humboldt's object. He wished to explore the Andes and the Himalayas, to make a comparison of their respective dimensions. This plan failed. He, however, succeeded in another. He started for Siberia, and then visited the chief cities of Russia. There is not one branch of science to which Humboldt has not contributed something—nay, much. The powers of his mind seemed to increase as they produced. The friend of Kings, he was a Liberal. He took a large view of the world in a political sense while investigating with the utmost minuteness the conformation of some unknown substance. Doubtless we shall shortly receive from some German pen a worthier notice of one of Germany's greatest celebrities.

The following telegram from Berlin on Tuesday last tells enough of what remains:—"The solemn funeral procession of Alexander von Humboldt is now on its way to the Cathedral. All that represents science, art, and intelligence in Berlin joins in the procession. Three Chamberlains in gold costume, bearing the orders of the illustrious deceased, precede the funeral car, which is drawn by six horses from the Royal stables. Upon the car is a simple uncovered coffin of oak adorned with flowers and laurel. On either side of the car are students, bearing green palm branches. A line of carriages of immense length closes the procession. The Prince Regent and all the Princes and Princesses are assembled in the Cathedral, awaiting the arrival of the great philosopher's mortal remains. A mournful aspect overspreads the whole town."

DR. LARDNER.

ON the 4th inst. at Naples (not Paris, as has been said), died Dr. Dionysius Lardner, the best popular scientific writer in the English language. His labours were as useful to the nation as they were honourable to himself. He was born at Dublin in 1793, and after some time spent in the office of his father, who was a solicitor, he was entered at Trinity College, Cambridge, and devoted himself to scientific studies. He soon showed that he had now chosen the right path in life, and rapidly gained an extraordinary number of prizes in pure mathematics, as well as in natural philosophy, astronomy, and other branches of study. In 1817 he obtained a B.A. degree, and for ten years remained at the University, publishing at first various treatises on mathematics, including the differential and integral calculus, and subsequently on the steam-engine. For this he obtained a gold medal from the Royal Dublin Society; and his reputation being now in a great measure esta-

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blished, he began to contribute to the *Edinburgh Encyclopædia* and the *Encyclopædia Metropolitana*, writing elaborate articles on pure mathematics, as well as on the applied sciences. In 1827, on the establishment of the London University, Dr. Lardner accepted the chair of Natural Philosophy and Astronomy, and removing to London, he set on foot a scheme for a *Cabinet Encyclopædia*, which he gradually perfected, obtaining the co-operation of many eminent men. Sir John Herschell wrote a paper for this book which attained considerable celebrity, "The Preliminary Discourse upon Natural Philosophy," but most of the scientific articles are due to Dr. Lardner himself. In 1840 Dr. Lardner went to the United States, and delivered with much success a series of lectures, which have since been published. After devoting much time to "Railway Economy," and writing a good deal on this and other subjects, Dr. Lardner started his last important work, the *Museum of Science and Art*, which contains many of the best popular treatises on science which have ever been written. He was for manyyears a contributor, to a greater or less extent, to the MECHANICS' MAGAZINE. His last communication was upon the vexed question of the moons' rotation, and appeared a year or two since. Dr. Lardner has left one son, a commissary-general of the British army, and two daughters, the issue of two marriages.

Proceedings of Societies.

INSTITUTION OF CIVIL ENGINEERS.

April 19.—Joseph Locke, Esq., M.P., President, in the chair. The Paper read was "Description of the Entrance, Entrance Lock, and Jetty Walls, with the Wrough-iron Gates and Caisson, &c., of the Victoria (London) Docks," by Mr. W. J. Kingsbury, Assoc. Inst. C.E. This Paper had chiefly for its object, to bring forward an account of some special works, which from their magnitude and peculiarity presented novelty and interest; it was, therefore, rather a contribution to the history of the Victoria Docks, than an attempt to convey a complete idea of that undertaking. The Victoria (London) Docks were briefly described as being situnted in that part of the Plaistow Marshes, Essex, which, projecting forward towards the south-east was bounded on three sides by the River Thames, which there formed a loop, or bend, extending from Bugsby's Reach, just below Blackwall, to Galleon's Reech, below Woolwich. The entire area comprised within the dock was shown to be about 200 acres, of which one-half, or 100 acres, was water space. This consisted of the entrance, with its lock, the tidal chamber of 18 acres, and the main dock of 74 acres. In general terms, the basin and dock together were 4,050 feet in length, and 1,050 feet in width at the level of high-water mark. In addition to the quay room afforded by the sides of the basin and dock, four jetties, each 581 feet long, and 140 feet wide, were projected from the north side into the dock; these jetties, with the sides of the dock and of the basin, provided a length of three miles of quay space. The descriptive portion of the paper was too technical to be usefully described without engravings.

May 3.—P. Bidder, Esq., Vice-President, in the chair. The paper read was "On the Tyne Docks at South Shields, and on the Mode adopted for shipping Coals," by Mr. T. E. Harrison, M. Inst. C.E. These docks had been constructed on the banks of the River Tyne, at the upper end of South Shields, on a large area called Jarrow Slake, which was covered with water at spring tides, to a depth of from 5 feet to 8 feet. The area so covered amounted to about 350 acres, and of this quantity 179 acres were now inclosed. The area of water in the dock, as executed, was 50 acres, the depth of water being 24 feet 6 inches at an average spring tide. The entrance basin was 9½ acres in extent, with a depth of water of 25 feet, for a width of 200 feet in the centre of the channel, gradually shoaling to the sides. One entrance had a width of 80 feet, and there was a lock of 300 feet in length and 100 feet in width, with gates 60 feet in width; the cills in each case were laid 24 feet 6 inches below high water of average spring tides—such spring tides having a lift of 14 feet 6 inches. The total quantity of excavation in the docks was 1,783,452 cubic yards, and in forming the standage ground 281,305 cubic yards. The total quantity of masonry of all descriptions was 2,000,000 cubic feet. The cost, up to the date of the opening for public traffic, was £140,476. This sum included all the standage and railway approaches, the shipping jetties, the purchase of land, and all the dockworks, but it excluded Parliamentary and other charges, not engineering. The works were under the immediate superintendence of Mr. Robert Hodgson, as Resident Engineer; and the contract for their execution was let to Mr. James Gow. A brief account was then given of the different methods of shipping coals, used at the Northern coal ports, during the last forty-seven years. The system of "keels" was first described; and it was stated that it still existed, to a limited extent, both on the River Wear and on the River Tyne, in the case of those collieries not having direct railway communication to a place of shipment. Where the vessels could reach the shipping places, as at the Wall's End Colliery, the mode of shipment was by spouts, in general principle the same as those adopted at the Tyne Docks; but without, for a long time, any arrangement for allowing for the difference in the level of the tide and in the size of the vessel. The first innovation on the "spout" system took place in 1812, when a coal-drop was erected at Pelaw Main Spout, on the River Tyne, by Mr. B. Thompson, further improved by him in 1813, and since generally followed, with various modifications. The principle of all these drops was, that the loaded waggon, in its descent, raised a counterbalance weight; and when the coals were let out of the waggon, the counterbalance weight brought the waggon back to its previous position. The system of tubs, fitted into "keels," in order to avoid the breakage of the coal, was then alluded to, and the machinery by which they were transferred to the vessel was briefly described. It was stated, that after mature deliberation, and careful examination of all the different plans, it was decided to adopt, in the Tyne Docks, the system of shipping by spouts. The angle of inclination of the spouts was 50°, that having been found by experiment to be the angle at which coals would slide on smooth iron plates, without rolling. In order to allow for the varying level of the ship's deck, which it was shown might amount, under certain circumstances, to 20 feet, arrangements were made to deliver the coals at four different levels. The coals were directed into any one of four divisions, by the opening or shutting of trap-doors, turning on hinges, and well balanced, so as to be easily moved. The spout was also raised, or lowered, in guides, and was operated by winches, the men standing on the level at which they worked when shipping coals. Traps were also provided for regulating the descent of the coals into the ship. In some cases, the spouts were made to slide in a frame turning on a pivot, the object being to give a greater range into the ship's hold, particularly with screw colliers, and thus avoid the necessity of moving the ship. In practice, the plan was to keep the spout nearly full, merely letting the coals slide sufficiently down to allow of the next waggon being teamed; so that, although in the first filling of the spout, or on altering the level of the spout, the coal had a few feet to fall, yet this only applied to a small quantity of coal. Afterwards the whole mass slowly descended, and no further breakage took place. Two jetties, on which there were twenty shipping places, were already at work. The shipping places were 100 feet apart from centre to centre, and were so arranged, that the vessels overlapped each other. Arrangements were made, so that the number of shipping places could be increased to fifty, as the trade required. In laying out the ground, the saving of manual labour had been a primary consideration, and gravity had been called into operation to the utmost possible extent. In order to ship the quantity of coals now transferred to, and being shipped in the Tyne Docks, there were employed last year at South Shields thirty-four horses and four pilot engines, and the work was carried on throughout the whole twenty-four hours. Under the present arrangement not a single horse was employed, and only two pilot engines, and the work was done generally in fifteen hours. At present there was rather a deficiency of standage for light waggons, but this was in course of remedy, and when completed no pilot engine would be necessary. The cost of labour for carrying the coal along the jetty, a distance of 1,050 yards, for the shipment, and for returning the empty waggons to the point where the engine took them up, was about seven-sixteenths of a penny per ton.

INSTITUTION OF MECHANICAL ENGINEERS.

May 4.—Henry Maudslay, Esq., Vice-President, in the chair. The Secretary (Mr. W. P. Marshall) read the minutes of the previous meeting, and a large number of new members were elected.

The first paper read was a "Description of the Pumping Engine at the Newcastle Water Works," by Mr. Robert Morrison, of Newcastle-upon-Tyne. This is a horizontal high-pressure expansive and non-condensing engine, working direct a double-acting pump placed opposite the steam cylinder, and controlled by a crank and fly-wheel. The water is drawn from a pure water basin, supplied by a filter bed, and is forced by the pump into a high reservoir for supplying the town by gravitation. The pump valves are rectangular flap valves of india-rubber, the delivery valves being placed immediately over the suction valves at each end of the pump; and a small air vessel is fixed over each of the delivery valves for the purpose of slightly easing their action, in addition to the large air vessel upon the main. The steam cylinder has an expansion slide, working on the back of the ordinary slide valve.

The next paper was "On the construction of Hot Blast Ovens for Iron Furnaces," by Mr. Henry Marten, of Wolverhampton; commencing with the origination and early development of the idea of hot blast by Mr. Neilson, of Glasgow, thirty years ago, and giving a description of the principal modifications and improvements that have been successively effected in the construction of hot-blast ovens. To remedy the defects still experienced, after many modifications, from expansion of the pipes the round form of oven was then contrived, having the fire-grate in the centre and surrounded by a circular main pipe, divided by a diaphragm all round into an outer and inner portion, on the top of which were placed a number of upright heating pipes, each consisting of two pipes cast in one piece, and communicating with each other at the top, one leg of the pipe opening into the outer division of the main, and the other into the inner; the two sockets of each pipe being close together and cast all in one piece were thus freed from the injurious effects of expansion experienced in the previous arched pipes. The blast passed up one half and down the other half of each pipe; and the top of the oven was built in a dome shape, so as to reverberate the heat from the fire upon the pipes. These round ovens have since been elongated into an oval form, to contain a greater number of heating pipes; and a central core of fire-brick has been added, filling up the vacant space in the centre of the oven, bringing the heat into closer contact with the pipes arranged round the sides of the oven, and acting also as a regulator of the temperature of the blast, by absorbing any excess of heat from irregularity of firing, and giving it out again an any diminution of temperature. Hot-blast ovens on this construction, with some further improvements in the arrangements for cleaning out without stopping, have now been in constant work for some time at the writer's works, and have proved thoroughly satisfactory, being quite free from any trouble, either from expansion or burning of the pipes, or from leakage at the joints; the blast is maintained uniformly at a temperature of about 800° Fahrenheit, producing an important increase in the yield of the iron furnace.

The last paper was "On Jenson's Marine Engine Governor," by Mr. Henry Maudslay, of London; the object of which is to prevent the engine from running off at an excessive speed, when the resistance of the water to the screw propeller or paddle wheel is suddenly removed by the pitching or rolling motion of the vessel in stormy weather. The governor consists of a piston working in a cylinder, the bottom of which communicates with an opening through the side of the vessel, as near as possible to the propeller or paddle wheel; the pressure of water in the bottom of the cylinder thus corresponds exactly with the depth of immersion of the propeller, and tends to raise the piston, which is loaded on the top by an adjustable spring, and connected by bell-crank levers and links with a throttle valve in the steam pipe of the engine. When the motion of the vessel causes the propeller to be less deeply immersed, the pressure of water in the cylinder is diminished, and the piston is forced down by the spring above, closing the throttle valve to the required extent, and preventing the speed of the engine from increasing; and, on the other hand, when the propeller is more deeply immersed, the pressure in the cylinder is increased, and raises the piston, opening the throttle valve and admitting more steam to the engine, so as to maintain the required speed; the object being to control the speed of the engine before it has time to change sensibly, instead of waiting for a change of speed in the engine to bring the governor into action, as in the case of the ordinary engine governor.

ASSOCIATION OF FOREMEN ENGINEERS.

May 7.—At the monthly meeting of the Association of Foremen Engineers, held at the Bay Tree Assembly Rooms, City, on the 7th inst., a paper was read by Mr. John Briggs on the "Concussion of Water." Mr. Joseph Newton presided on the occa-

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sion, and a full attendence of members encouraged the reader in his task. The difficulties which beset the path of the hydrostatic engineer, were in the first instance referred to, and the more particularly, as regarded the working of forcing and lifting pumps. The methods of overcoming those difficulties, by attaching to the suction and delivery pipes air vessels, and attending to the proportionate sizes of the pipes themselves, as compared with those of the working barrels, were next described; Mr. Briggs' own practical experience in such matters making his explanations the more clear and valuable. It is not improbable that at a further period, and when our columns are less crowded than at present, we may give more extendedly the substance of this important contribution to the transactions of the Society. The discussion which followed the reading of the paper, and in which Messrs. Keyte, Stabler, M. Jones, Ferguson and the Chairman took part, was protracted till nearly 11 o'clock, when its adjournment till the meeting on the first Saturday was put and carried. The meeting soon afterwards came to an end.

ROYAL AGRICULTURAL OF ENGLAND.

May 4.—Monthly Council. The Duke of Marlborough, President, in the chair. Mr. R. Barker, chairman of Finance Committee, presented the report, by which it appeared that the current cash balance in hand was £1,583 1s. 8d. The report of the Inspection Committee having been read and deputations received from Canterbury, Croydon, Guildford, and Reigate, the Council decided that the Country Meeting in 1860 should be held at Canterbury, on condition that the Mayor of that city entered into the usual agreement with the Secretary of the Society by the next Monthly Council on the 1st of June. Mr. Wren Hoskyns, chairman of Chemical Committee, presented the report recommending that the wording of the rule regulating the members' privilege of analysis be altered so as to meet the intention of the Council, viz., so as to exclude all but analyses "required for the *bonâ fide* personal use of farmers." The following subjects of investigation by the Society's Consulting Chemist were recommended:—1. The changes that take place in liquid manure in passing through different soils. 2. Experiments on top-dressings for Wheat and Barley. 3. The continuation of his experiments on the nature and physiology of cultivated turnips. 4. The different modes of applying manure in autumn and in spring. Mr. E. Pope was elected one of the Stewards of Implements, in the place of Lieut.-Colonel Towneley. Mr. Fisher Hobbs was elected Steward of Live Stock. On the motion of Mr. Brandreth Gibbs, a communication from the Secretary of the Crystal Palace, inquiring relative to the Society's proposed Metropolitan Meeting in the year 1861, was referred to the "Metropolitan Sites Committee."

MEETINGS FOR THE ENSUING WEEK.

MON.—*Royal Geographical Soc.*, Anniversary Meeting, at 1 p.m.

TUES.—*Royal Inst.*, "General facts and leading principles of Geological Science," by John Morris, F.G.S., at 3 p.m.

Statistical Society—1. Mr. Welton—"On the Occupations of the People of England and Wales." Part II. 2. Mr. Acton—"On Illegitimate Births in Marylebone, St. Pancras, and St. George's, Southwark," at 8 p.m.

Inst. Civil Engineers, "Short account of the Wrought-iron Girder Bridge over the Spey, on the Aberdeen and Inverness Railway," by Mr. W. Fairbairn, M. Inst., C.E. "Description of the Government Water Works, Trafalgar Square," by Mr. C. E. Amos, M. Inst., C.E., at 8 p.m.

WED.—*Society of Arts*, "On the relative values of Coal and Coke in Locomotive Engines," by Mr. Benjamin Fothergill, at 8 p.m.

Geological Society—I. "On the Nomenclature of the old Red Fishes," by Sir P. Egerton, M.P., F.G.S. II. "On the Yellow Sandstone of Dura Den, and some of the old Red Fishes," by the Rev. J. Anderson, F.G.S., at 8 p.m.

Royal Agric. Society, Weekly Council, at 12 a.m.

THUR.—*Society of Antiquaries*, at 8 p.m.

Royal Society, at 8 p.m.

Chemical, at 8 p.m.

Royal Inst., "On the seven periods of Art," by A. H. Layard, Esq., at 3 p.m.

Linnæan, at 8 p.m.

FRID.—*Royal Inst.*, "On the colours of shooting Stars and Meteors," by John Hall Gladstone, Esq., F.R.S., at 8 p.m.

Royal Geographical Society, Audit of Accounts, at 11 a.m.

SAT.—*Royal Inst.*, "On Modern Italian Literature," by J. P. Lacaita, Esq., at 3 p.m.

Literature.

The Life of James Watt, with Selections from his Correspondence. By JAMES PATRICK MUIRHEAD, M.A., &c., with Portraits and Woodcuts. Second Edition. London: John Murray, Albemarle-street. 1859.

(SECOND NOTICE.)

LITTLE Scotland has played a grand part in world-history. Her earliest ages produced the finest types of physical courage and personal independence. Out of these, as out of a brawny frame, she developed, at last, intelligence and soul. She gave the world that sublimest of all spectacles, a whole nation raised to a glow and white heat of insight and pious fervour, when in every village and town her people signed their sacred covenant to defend the truth and one another. And she it was that last century gave to the world an instrument that, more than any other material thing, has metamorphosed the stage of human activities. In Great Britain alone, the steam-engine at this hour is achieving what would demand the manual labour of four hundred millions of men, or more than double the number of males supposed to inhabit the globe! Altogether, the history of the steam-engine is a romance, and makes us of these prosy years conscious that miracle and poetry are not dead.

To call James Watt the creator of the steam-engine seems only his fair portion of renown. Before he directed his mind to it, the sole use to which it was applied was to pump water from mines; but he, by his separate condenser, so transformed it that he made its uses universal.

Watt was another fine instance of the law that the hand cannot say to the brain, "I have no need of thee." The rude, hard, loud, practical, go-a-head world has to wait on and repair to the thinker as the well-head of all its life. Watt was a man of immensely preponderating brain. As a boy he had poor physical health; had little taste for most of boys' sports; but read books, especially of an imaginative cast, greedily, and was already of a meditative bent. And he grew up to be a sensitive, contemplative, imaginative person; shy and modest to an excess, and almost morbidly averse to practical life. "I find myself out of my sphere," he writes, "when I have anything to do with mankind; it is enough for an engineer to force nature, and to bear the vexation of her getting the better of him. I declare I had rather face a loaded cannon than settle an account or make a bargain."

The story of Watt's invention is the story of a pure birth of genius. And how alike is the working of genius, whatever its bent be, whether toward physical nature, or metaphysics and poetry; genius is so different from talent, reflection, and labour, though always allied and co-operating with these. How happy are our common names for her workings! The word "invention" means an accidental coming upon, alighting on a thing. "Discovery" means the lifting-up the lid that concealed one of nature's secrets. The blest Eureka comes by long waiting and looking. The search exacts great labour, and the discovery is the parent of yet more labour, but no labour ever procured the prize. How long James Watt brooded over his problem! "But I continued," he says, "to grope in the dark, misled by many an *ignis fatuus*. At length, as I was walking one Sunday afternoon, in the spring of 1765, the solution of the problem suddenly flashed upon my mind." Long years of labour and difficulty and sorrow it costs him to realise his idea; but necessity is laid upon him, and woe be to him if he obey not his vision. Once he writes:—"I have now brought the engine near a conclusion, yet I am not in idea nearer that rest I wish for than I was four years ago. However, I am resolved to do all I can to carry on this business; and, if it does not thrive with me, I will lay aside the burden I cannot carry. Of all things in life there is nothing more foolish than inventing." And long after, when somebody was expressing his admiration at his great achievements, he replied:—"The public only look at my success, and not on the intermediate failures and uncouth constructions which have served as steps to climb to the top of the ladder."

Take the following as a glimpse of his sly humour: he is describing, in a letter to a friend, the impression produced by one of his earliest engines, when he says—"The velocity, violence, magnitude, and horrible noise of the engine, gives unusual satisfaction to all beholders, believers or not. I have once or twice trimmed the engine to end its strokes gently and make less noise; but Mr. ——— cannot sleep unless it seems quite furious, so I have left it to the engineman. And, by-the-by, the noise seems to convey great ideas of its power to the ignorant, who seem to be no more taken with modest merit in an engine than in a man."

To those who only knew Watt as an *engineer*, how touching are these words of the *man!* Writing about his wife's death, he says—"I know that grief has its period; but I have much to suffer first." And again, writing on "the loss of friends," he says—"Like other evils, it must be endured with patience. The most powerful remedy is to apply to business, or amusements, which call the mind from its sorrows, and prevents it from preying on itself. In the fulness of our grief we are apt to think that allowing ourselves to pursue objects which may turn our minds from the object it is but too much occupied with, is like a kind of insult or want of affection for the deceased, but we do not then argue fairly: our duty to the departed has come to a period, but our duty to our living family, to ourselves, and to the world, still subsists; and the sooner we can bring ourselves to attend to it the more meritorious." And as strongly as he attached himself were others attached to him. Dr. Black (his old friend) sheds tears of delight over his success: "It's very foolish, but I can't help it when I hear of anything good to Jamie Watt." Watt lived to be nearly 83 years old, though of frail health from his childhood—another proof that the intellect is the life of the body, and not the consumer of it.

Directions for Laying Off Ships on the Mould-Loft Floor. With some Instructions for Drawing Ships in Perspective. By JOHN FINCHAM. *Third Edition.* London: Published by Whittaker and Co., Ave Maria Lane. 1859.

THIS work—which, in its former editions, is well known as the standard work on Laying Off throughout H.M.'s Dockyards—was first written for the use of the pupils of the late schools of Naval Architecture, and of shipwrights in the various mould-lofts. The applications made for copies after the second edition was out of print were so numerous as to induce the author to print a third. We are not quite sure, as we write, that this third edition has not been out some time; indeed, we have reason to believe that the new issue is, properly speaking, no more than a re-appearance of the third edition; but we cannot at the moment lay our hand upon our former copies, to see if it be so; and the matter is really of no importance. The author's age and health have unfortunately been such for some time as to preclude him from adding anything to the volume on its present appearance. But in its old form it will prove of the greatest value to young shipbuilders, at least until some more complete and comprehensive work, for which there is certainly room, makes its appearance. There must be many young men, we should think, to whom Mr. Fincham's book would be invaluable.

Beeton's Dictionary of Universal Information. By S. O. BEETON and JOHN SHEREER. Parts 1—6. London: S. O. Beeton, 18 Bouverie-street, E.C.

THIS is another of those marvels of cheap and excellent literature which we have lately had occasion to notice. We are told that this work, which is to be completed in 24 parts, at 3d. each, is to contain a complete gazeteer of geography—a perfect cyclopædia of history—a comprehensive compendium of biography—an interesting epitome of mythology—an inestimable treasury of Bible

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knowledge—a reliable chronological record—and the correct pronunciation of every proper name: and we really believe the promise will be very fairly fulfilled. In the six parts before us we have four very good maps, a plate of coins, a tabular calendar for 150 years, numerous good woodcuts, and 192 pages of well-written and well-printed matter. In order to test the value of the latter we have turned to several names not very well known until recently. The first we looked for was "Bangkok," the name of the capital of Siam, and under that name we found a very excellent summary of the characteristics of that little-known city. Other words were turned to with like result. It may also be mentioned that prizes, gold-watches, works of art, &c., are to be distributed among the subscribers to this work.

LIST OF NEW BOOKS.

Craig (W.) Influence of Electric Tension as the Cause of Epidemic, &c., Diseases, 10s.
Dickson's (J. R.) School Perspective, Illustrated, 5s.
Glenny's (G.) Manual of Practical Gardening, new ed., 5s.
James's Naval History of Great Britain, new edit., Vol. I., 5s.
Johnston's Map of the Seat of War in North Italy, 1s. 6d., sheet.
Jaeger's (B.) Life of North American Insects, with illustrations, crown 8vo, 8s. 6d., cloth.
Knight's (C.) English Cyclopædia: Arts and Sciences, Vol. I., 12s.
Lloyd's Map of the Seat of War, 2s., sheet.
Muirhead's (J. P.) Life of James Watt, 2nd edit., 16s.
Mitchell's (C. M.) Planetary and Stellar Worlds, new edit., 3s. 6d.
Monroe's (J.) Science and Art of Chess, 6s.
Nelson and Davies's New Atlas of the World, 12s.
Royal Blue-book, April, 1859, 5s.
Ruckard's (W.) Miner's Manual of Arithmetic and Surveying, &c., 10s. 6d.
Stanford's New Library Map of Europe, £3, in case.
Stanford's Map of Italy, 3s. 6d., sheet.
Stevens (R. W.) on the Stowage of Ships, and their Cargoes, Freights, &c., 2nd edit., 7s.
Webster's Royal Red-book, April, 1859, 12mo, 4s., cloth.
Wilson's (Rev. J. M.) Earth, Sea, and Sky, new edit., fcp. 8vo., 5s., cloth.

AN INVENTOR *v.* THE GOVERNMENT.

MR. GOSLING'S IMPROVEMENTS UPON THE ARMSTRONG GUN, &c.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—In the *Journal of the Society of Arts*, Jan. 30, 1857, will be found the following announcement:—

"PIER AND HYDRAULIC CRANES, &c.—Of the miscellaneous services carried out during the war, one of the most important was the erection of a pier at the wharf of the Royal Arsenal, extending out into deep water, by means of which four of the largest class of vessels can be alongside during all conditions of the tide; and in connection with this pier is the application of hydraulic power to work the cranes. Hitherto, ships had to lie off in the river, and to be loaded or unloaded by means of barges, which were floated alongside, and to or from the wharf. By the new arrangement, four ships can draw up to the pier at one time, and by means of the hydraulic cranes the work of a week is reduced to ten hours, the limit to speed being the time required to stow away, or sling the articles within the hold of the vessel. During the six months ending the 30th November, 113 transports, representing a tonnage of 67,975 tons, were unloaded, which is exclusive of the ships that brought home the Land Transport Corps, the troops, horses, and their equipments. The whole expense of this service, including the steam-engine and hydraulic accumulator apparatus, and the cranes, amounting to nearly £33,500, *was cleared off in the saving of time of vessels alone during the first six weeks that it was in operation*, an important consideration, although secondary to the far higher advantage which it affords the War Department in the rapidity with which it can embark war materials and stores."

Such, gentlemen, is the testimony of Mr. John Anderson, chief engineer of the Royal Arsenal, in a paper which he read before the above Society in January, 1857, as before stated. And before entering upon an account of my improvements upon the Armstrong gun, I ask that justice may be administered in this matter; for the credit of the undertaking above set forth is due to me. If the Government will afford me an opportunity of confronting the select committee who examined and reported upon my plans to Lord Panmure, I shall be able to prove to them that the important advantages above enumerated were brought about entirely by my exertions. In the early part of the late war with Russia, I observed vessels lying in the river waiting to receive their cargoes, and found on inquiry that some of them had been detained at least 30 days, at a cost of nearly £100 per diem, in consequence of the very unbusinesslike system they had in conveying stores to these vessels, which was accomplished by barges being rowed from the wharf, whilst horses were conveyed by boats, and this could only be accomplished when tide and weather would permit. Unknown to the authorities, I at once furnished myself with the necessary data, by personal examination, and prepared my plans for a pier, in order that troops, horses, and stores might be transmitted to the decks of vessels as fast as they could be stowed. I then wrote to the Board of Ordnance, asking to be allowed to lay my plans before them. The Board immediately requested me to forward them. They were then sent to the Royal Arsenal for inspection and report of the select committee. The committee were convened, the merits of my plan were fairly discussed, a sum of money was named as the probable cost of carrying them out, and the report forwarded to the War Department. Not hearing anything from the Board for three weeks, I wrote a letter to Lord Panmure, pointing out the advantages which would be derived, should my plans be adopted, in reply to which I had the honour of receiving a letter, in which his lordship was pleased to say that *he had found on inquiry that my plans would be very useful, and that they should have his lordship's further attention.* Soon after the receipt of this letter, I found that several contractors had been applied to for tenders, and also that one had been accepted, and had commenced the works, whilst I was not so much as allowed to furnish a tender, although the committee knew that I was in a position at that time so to do. I found also that my plans had been altered, without the slightest improvement, but, on the contrary, involving a larger outlay, and requiring more time in transmitting stores. For I find from the foregoing quotation, that no less a sum than £33,500 has been expended, whereas £10,000 only was named as the probable cost of a structure such as I had proposed, which would have been far superior in appearance, and much more becoming this important manufactory and depôt of our country. Having thus stated the facts of the case, all I ask is a fair and impartial investigation. "Truth fears nothing but concealment." If the House of Commons will allow a special committee to be convened, so that the whole of the correspondence and plans may be laid before them, I have no doubt as regards the issue.

I have also another cause for complaint. It is now nearly four years ago since I first saw the advantages of a similar contrivance to that which I proposed for the Arsenal, if adopted at Her Majesty's Victualling Yard, Deptford. I saw that a vast amount of money must be unnecessarily expended annually for want of a better method of transmitting stores. I also found that a pier would not affect the navigation of the river any more than the pier now in use at the Commercial Docks adjoining. I therefore wrote to the Lords of the Admiralty upon the subject, and, at their lordships' request, forwarded my plans. Subsequently I received a letter from Mr. Osborne, announcing that their lordships were "not prepared to adopt the ingenious pier proposed by [you] me." But why should it not be adopted? Is the country so overstocked with cash that she can afford to waste some thousands annually because the plan proposed did not emanate from one of their own engineers? But surely after such an announcement as that which was made by Mr. Anderson in reference to the advantages realised at the Arsenal pier, I may yet hope that the Government will for once deviate from their usual course of routine, and allow the humble inventor the happiness and advantage of carrying out his own designs, and thereby afford him an opportunity of showing the superiority of his plans to those which he must ever look upon as pirated.

In the month of May, 1858, having some business to transact at the Royal Military Academy, and whilst waiting for the arrival of the Governor, my attention was directed by an officer present to a small brass cannon which is used for the purpose of drilling the cadets. In the course of conversation I was informed by that gentleman that the elevation screw employed in the service was not to be depended upon in consequence of its liability to slip after the gun is set; and so great is the inconvenience arising from these defects, that the drill sergeant is obliged to request the gentleman stationed on the left of the breech to press down with his hand upon it, in order that he may take off the weight from the screw till he has ascertained whether the elevation was correctly taken. Such being the facts, I prepared a drawing, and employed an engineer to manufacture an improved screw, supplying it with an auxiliary nut, so that by simply pressing it upon nut No. 1, the screw becomes instantly secured, nor can it possibly escape until it is intentionally relieved. Having made this discovery, I wrote to Major General Peel, Secretary at War, describing the particulars of my invention, and also pointing out to him the advantages which would be derived by its adoption. On the receipt of my letter, the General wrote to the Ordnance Select Committee, requesting them to examine the model, and report thereon. After a lapse of six months, not having heard anything either from the War Department or the Committee, I wrote again to General Peel, when I was informed by that gentleman that a 24-pounder brass howitzer had been fitted with the screw, and had been sent to Shoeburyness, where it would undergo a fair trial; and although a few hours' severe test would be sufficient to prove its superiority over those now employed in the service, yet to this moment nothing has been reported regarding its results, whilst the gun before alluded to at the Military Academy, as well as many others, still remain in the same wretchedly defective state, and, to say the least of it, reflect the greatest discredit on those in authority, who have been provided with a remedy, but who are either too reckless or too obstinate to apply it.

I now come to the main subject of my letter—the Armstrong Gun. In the early part of March last, having heard of the arrival at the Royal Artillery barracks of the gun invented by Sir William Armstrong, I hastened to the shed in which it had been deposited for the purpose of examining it, not knowing at the time that any order had been issued to prohibit strangers from so doing. On my arrival I found a man engaged in cleaning the gun; I also found that the screw and portable breech pieces were withdrawn, so that I had an excellent opportunity of examining it in all its details. Having discovered several defects, which I have enumerated in my specification, I commenced a correspondence with Major-General Peel, which has issued in a series of letters on both sides, as well as leading me to submit models and drawings for inspection and report of the Ordnance Select Committee; the result of which is, General Peel has declined to entertain my application for the Government to manufacture a gun with my proposed improvements, assigning as a reason that he cannot put the country to the expense, although I have been the means of saving the country an incalculable amount of money through the introduction of the pier already alluded to. If General Peel was desirous of concealing the principles of the construction of Sir Wm. Armstrong's gun, he has had ample opportunity so to do during the last two months which my drawings have been before him; but, as he has thought proper to return them, accompanied with an insulting letter, in which he has uttered language which he knows is void of truth, namely —"that I do not understand the principles of the construction of Sir Wm. Armstrong's gun," I now and here beg to inform him and the world at large that I not only understand the principles of the construction of the gun in question, but that I am so fully acquainted with it in all its details that I can not only produce its counterpart but also a superior article, which will accomplish twice the amount of work in any given time with a less number of men than are now employed, and which will be less liable to accident to those who may be so engaged.

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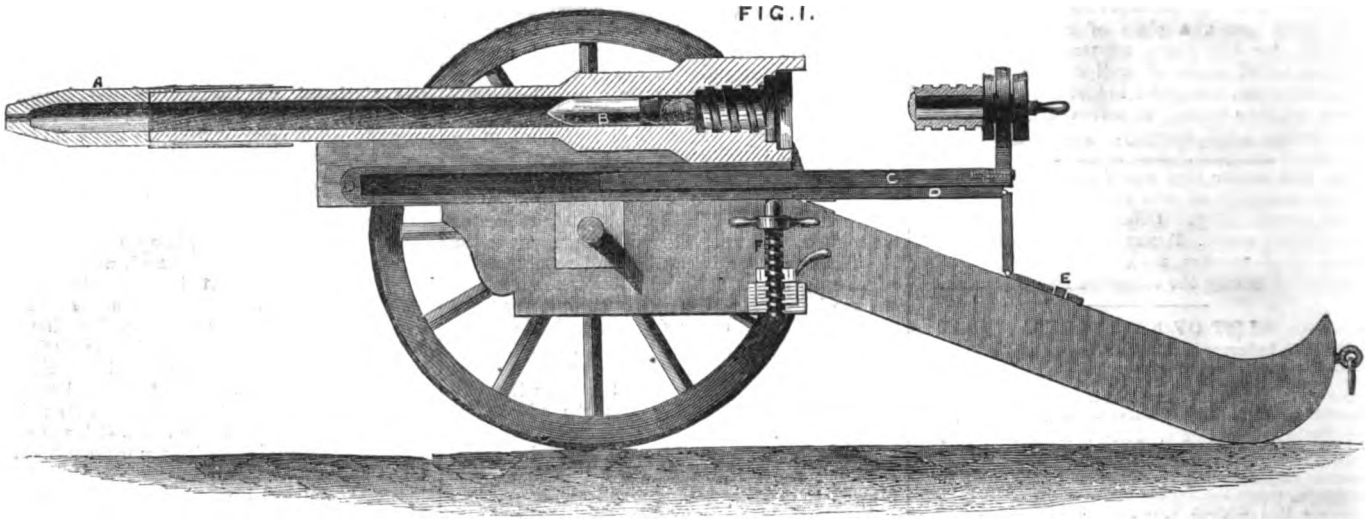
MR. GOSLING'S IMPROVEMENT UPON THE ARMSTRONG GUN, &c.

FIG. 1.



I append a copy of my specification and drawings, and beg that you will, if possible, publish both this letter and them in your Magazine.

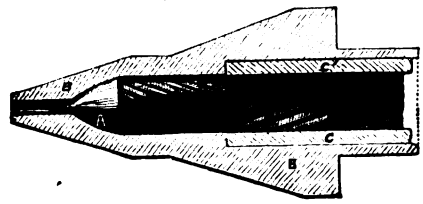
I remain, Gentlemen,
Your obliged and obedient servant,
WM. GOSLING.

82 Wellington-street, Woolwich, 11th May, 1859.

"GOSLING'S PROPOSED IMPROVEMENTS ON SIR WM. ARMSTRONG'S GUN.

"Specification of proposed improvements to be made to a rifle-cannon projectile, &c., &c., the invention of Sir Wm. Armstrong, whereby it may be made doubly efficient by delivering twice the number of shots, in any given time, than in its present state; dispensing with the sponge now used by causing each shot to cleanse the gun in its passage through the bore, and also throwing shots, varying from 32lbs to 200lbs, without increasing the size of the bore or charge of powder; by Mr. Wm. Gosling, Architect, Civil Engineer and Surveyor, 82 Wellington-street, Woolwich. In order to point out the advantages to be derived by the proposed invention it will be necessary to state that the inventor does not wish to alter the gun in question, either as regards its dimensions or calibre, but simply to correct its defects, with a view to render it a more efficient weapon for military and naval service. The defects discovered in the gun, and for which provision is hereby made, are as follows:—The portable breech-piece now employed, and which has to be removed for the purpose of charging the gun, is liable to be missing under peculiar circumstances, and, therefore, it is submitted that an improvement is of the utmost importance; hence, should the men at the gun, by accident, sudden surprise of the enemy, or any other casualty, lose the piece, of which there is considerable danger, the gun would be rendered useless; or, should the breech-screw not be sufficiently turned before the firing takes places, it would be shattered, or blown away, and could not be recovered again. Should a shot strike the handles which are used for the purpose of removing the breech-piece they would be instantly destroyed, so that the piece could not be used; or should a well-directed aim be taken by the enemy, so that the winch or lever which is employed for the purpose of working the breech-screw, the probability is, that it would be broken off, or the screw would become deranged so that it could not be worked. Another disadvantage in connection with the gun arises from the fact that the bore has to be sponged at every discharge, and after firing five times it has to be sponged *with water* in consequence of the shreds from the lead-coated shot clogging the grooves, for which purpose two water-tanks are provided and placed on either side of the gun. Now it may occur, that the army may be so circumstanced that water cannot be obtained, and, therefore, the efficiency of the gun, as now constituted, must inevitably fail; and, therefore, to send the gun into the battle-field in its present state would not only reflect the greatest discredit on the science of the British nation, but it would be a disgrace to the Government, whilst it would be attended with the most disastrous consequences to the men employed.

FIG. 2.



"Now in order to remedy the defects here enumerated, it is proposed, and also shown, in the accompanying drawings, *that everything connected with the gun shall be attached*, and therefore none of the casualties here enumerated can occur. 1st. It is proposed that the portable breech-piece shall be dispensed with, and the charge shall be entered from the end of the breech by withdrawing the screw. In order to effect this, the screw will be so constructed that by a quarter turn of the handles attached to the head of the screw and connected with the slide, it will instantly recede from the breech; by this means—namely, the screw being withdrawn at each discharge of the gun—*a current of air will pass through the bore, so that it will be kept constantly cool*. 2nd. That the sponge now in use, as well as the water-tanks, shall be superseded by the elongated shot being grooved at the end, and packed with tow, flannel, or other flexible substance, so that at each discharge of the gun, the bore will be made perfectly clean, thereby effecting a great saving of time; in fact, the gun can be fired as fast as it can be supplied with ammunition without an instant's delay, whilst a less number of men will be required to work the gun in consequence of the sponging being dispensed with, which takes the same amount of time as that employed in charging and firing the gun. 3rd. A moveable platform, constructed of oak, and strengthened with iron plates, will be hinged to the trail, so that when the gun is to be discharged by raising the platform, a traverse will be instantly formed for the slide and screw. 4th. The elevating screw by being furnished with an auxiliary nut, will be found of very great advantage, especially in night-firing; hence, when the gun is once elevated by a single turn of the nut, the screw will be instantly fixed, and the firing may be carried on during the night with the greatest precision. 5th. In order that the gun may be made available for the discharge of shots of different sizes, it is proposed that an elongated shell shall be prepared as follows:—A cylinder will be made the exact dimensions of the projectile; on this cylinder will be formed the intended shell by bending diagonally red hot bar iron 1½ by ½ over each joint of the several underlayers until it assumes the shape set forth in the drawings; the inside of the shell when cold will be coated with lead seven pounds to the square foot, so that when the lead-coated shot enters the shell, they will amalgamate, and constitute but one shot; thus, a gun of 3½ inches bore may be made available for the discharge of shots varying from 32 pounds to 200 pounds, thereby giving the gun an advantage over every other gun yet submitted, and when used in the naval service, instead of an incision being made in an enemy's vessel of 3½ in. in diameter, an aperture of 12 inches may be effected without increasing the size of the bore of the gun or charge of powder.

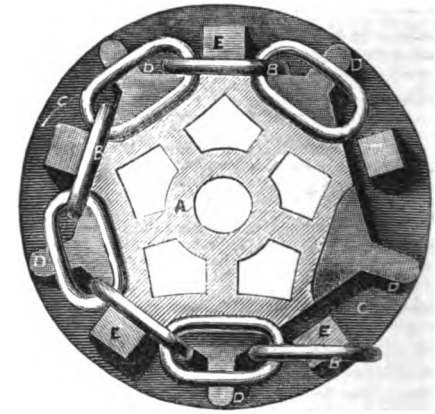
DESCRIPTION OF THE ENGRAVINGS.

FIG. 1.—*A section of shell for reception of shot to increase weight and destructiveness, also telescope slide attached; B improved sponge-tail shot; C slide and screw attached; D elevation of platform; E stop to support platform; F improved elevating screw, with its tightening nut.*

FIG. 2 *is a separate view of a portion of the muzzle C of the cannon with the ordinary shot A quitting it, and with it the large shot B for naval purposes.*

WARDILL'S IMPROVEMENTS IN CAPSTANS AND WINDLASSES.

MR. JONATHAN WARDILL, of Commercial-road-east, London, has patented an invention which consists in constructing purchases in such manner that a bite is afforded for both the horizontal and vertical links of the chain, or those links which alternately assume a vertical and horizontal position when being passed or wound over a windlass or drum. For this purpose he takes a central



piece or core, and forms round the periphery thereof, say, five concave spaces, intended to receive those links which, when the purchase itself is used vertically, pass in a vertical position. He bolts this central core between two flat-sided plates, provided on their inner faces each with as many radial chocks or blocks as there are concave spaces in the core. These radial blocks come opposite each other, and over, or in a line with, the centre of each concave space; then between the radial blocks are laid on each plate flat blocks, which form, with the radial blocks, hollow chambers, and when the chains are passing, receive those links which are presented horizontally. The radial blocks are curved or sloped off at bottom where they join the discs. In the case of open

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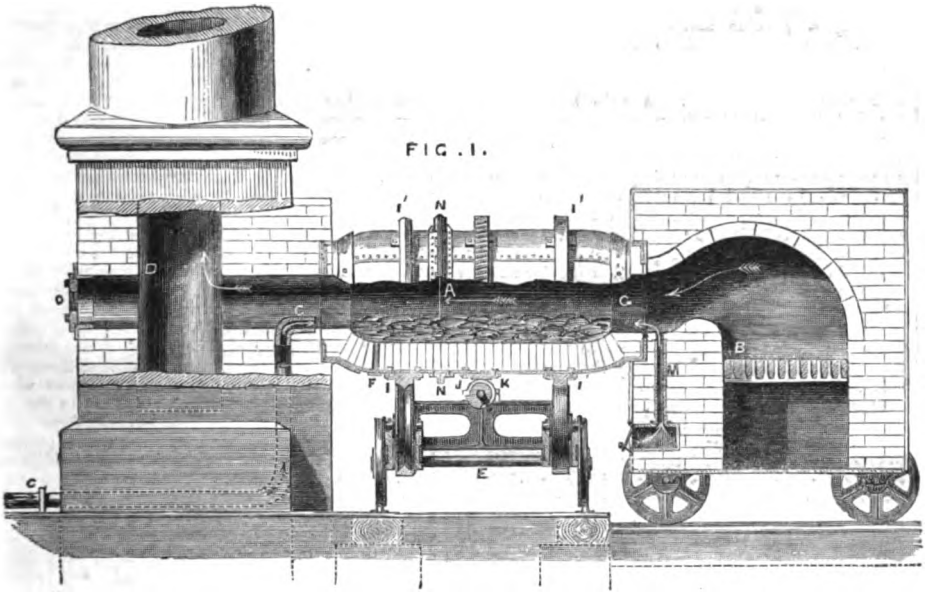
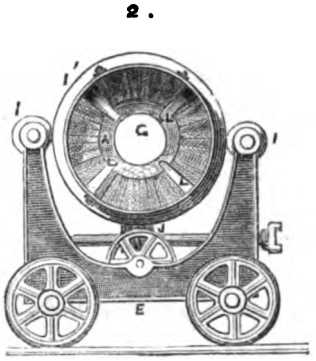
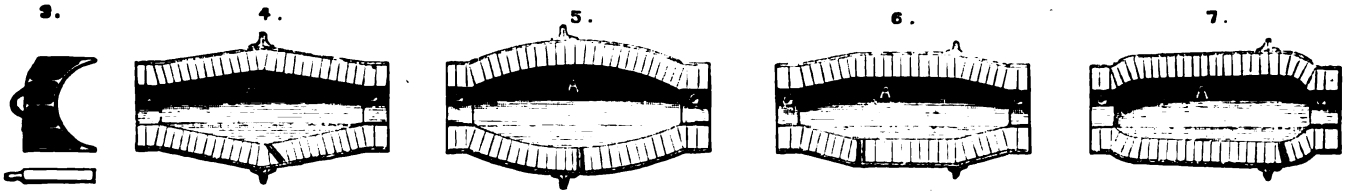
BESSEMER'S IMPROVED FURNACE FOR THE MANUFACTURE OF IRON AND STEEL.







link chains, an additional grip may be obtained by means of a tongue or projection carried up from that portion of the periphery of the core which divides or separates one concave space from another. The accompanying engraving is a section of a capstan thus formed. *A* is the centre piece or core; *B B* are the concave spaces formed round the periphery of the core; *C C* are flat-sided discs, having radial chocks or blocks *D D* formed on them; *E E* are flat blocks placed between the radial blocks. Although five concave spaces and blocks are shown, he does not limit himself to that number, as the same may be varied without departing from the essential features of the invention.

BESSEMER'S

IMPROVED FURNACES FOR THE MANUFACTURE OF IRON AND STEEL.

MR. ANTHONY BESSEMER, of Upper Holloway, has patented a set of improvements which are intended to cleanse the pig or crude iron from all its impurities, such as sulphur, phosphorus, silica, carbon, &c., and all other foreign matters, so as to produce steel and malleable iron. To effect this purpose he constructs a revolving reverberatory furnace or cylinder which is to contain the iron. This furnace or cylinder is composed of a cylindrical iron vessel made in two halves if requisite, and bolted together; both ends are to be contracted, so as to form a neck at each end, of about two-thirds or so of the diameter of the body part of the cylinder, and open at both ends. The whole interior is to be lined with segmental fire-bricks; one or more rows of bricks can be raised five or six inches higher than the rest to form a projection or projections to assist in dividing and changing the surface of the metal. The cylinder is mounted on a moveable frame capable of being moved backwards and forwards between that part of the furnace which contains the fire and the shaft or chimney. The cylindrical vessel is made to revolve the whole time the metal is under operation; the neck at each end may form the bearings. The cylinder which contains the metal, and the part of the furnace which contains the fire, form a complete revolving reverberatory furnace. The furnace part proper is of the usual reverberatory kind, and is likewise to be mounted on wheels capable of being drawn backwards and forwards. During the whole time the metal is under operation, the inventor blows atmospheric air or steam into the furnace, in such manner as to act upon the surface of the metal, so that the carbon, sulphur, phosphorous, &c., uniting with the oxygen of the air or steam may be carried off. The air or steam can be supplied by a fan or any other convenient means, and may be either hot or cold, and supplied at either end or at both ends of the revolving furnace. Although air and steam are mentioned on account of their economy, yet pure oxygen gas, or any fluid or solid matter containing oxygen gas, may be used in his process of converting crude iron into steel and malleable iron in his revolving furnace. In addition to these means of supplying the furnace with air, steam, &c., he places an air passage or pipe in the neck of the furnace proper, as near as possible to the neck of the revolving cylinder, which air passage or pipe can be made to open or shut as required Should it be requisite a rake or tool may be passed through the shaft into the revolving vessel to agitate or stir the melted metal, until the whole is converted into steel or malleable iron, as may be desired. In his revolving furnace, the usual fluxes, such as lime, silica, metallic manganese, oxide of manganese, salts, &c., may be used to advantage to assist in the separation of the various impurities which the crude iron contains.

In the annexed engravings, Fig. 1 is an elevation, partly in section, of the improved reverberatory furnace complete, and Fig. 2 is a transverse section through the cylinder. *A* is the cylinder; *B* is the furnace proper or fire-place; *C* is the pipe or tube through which the air, steam, or other like gas or vapour enters the cylinder; *D* is the shaft or chimney; *E* is the carriage on which the cylinder *A* is supported and rotates; *F* is a tap-hole, through which the metal may be drawn off from the cylinder *A*, but, if preferred, it may be drawn off through the neck *G*; *I I* are friction rollers, upon and between which the rings *I' I'* upon the exterior of the cylinder *A* run. *J* is a worm, which imparts rotary motion to the cylinder *A* through the wheel *K*, which is fixed around and upon the cylinder; *L L* (Fig. 2) are raised projections to assist in turning and stirring over the metal as the cylinder rotates; *M* is the air-passage near the neck of the furnace proper. The joint *N* shows how the two parts of the cylinder are united, when the cylinder is not formed in one. The cylinder *A* comes against the shaft or chimney on the side; *O* is a hole through which the interior of the furnace may be seen or the metal within it stirred by means of a rake or tool. Fig. 3 shows two views of a slide or plate, which fits half round the neck of the cylinder after it has been wheeled into place. Figs. 4, 5, 6, and 7 illustrate several modified forms which may be given, if desired, to the cylinder A. The operation is performed as follows:—Make the revolving cylinder moderately hot, then draw back the part that contains the fire to make room to put the crude iron through the neck into the body part of the revolving cylinder, then draw forward the fire furnace to its proper place, the fire then can be urged on as fast as possible. When the iron is red hot, or before, begin to blow into the revolving cylinder the air or steam through the pipe *C*, so as to distribute it over the surface of the fluid metal, which surface is always changing as the furnace revolves, the metal continually presenting a fresh surface for the oxygen to act upon during the whole time the metal is under operation. When the metal is in a fit state to pour, the fire furnace is to be drawn back, and the revolving cylinder is brought forward on its moveable carriage to where the moulds are placed. The metal is then to be drawn off through the tap-hole *F*, or through the neck *G*; to assist the pouring the cylinder is sometimes raised at one end. Where requisite, before pouring, the inventor places an air-tight cover on each end of the cylinder, connected by a pipe with an exhausted chamber, so as to draw off any gaseous matter that may have remained among the metal during the conversion.

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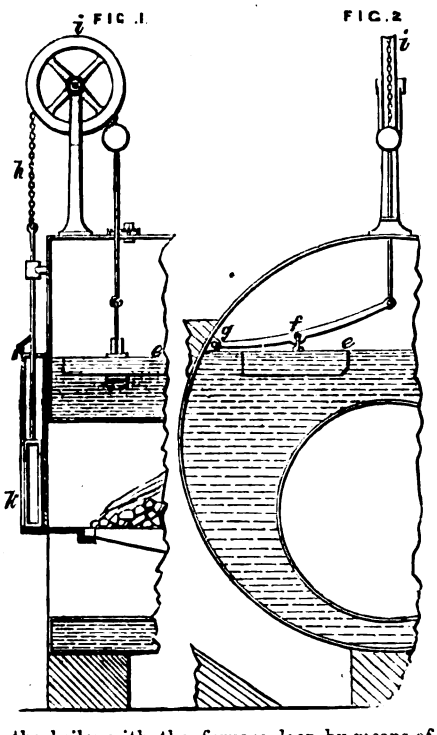
WRIGHT'S METHOD OF PREVENTING BOILER EXPLOSIONS.

MR. E. T. WRIGHT, Engineer, of Wolverhampton, has just patented the method of preventing boiler explosions by connecting a water buoy or float in the steam boiler with the furnace door, or with a door opening into the furnace, so that when the water in the boiler falls below a given level the door is opened, and cold air is admitted into the furnace, "whereby the boiler is cooled, and the draught through the fire to a great extent suspended; the overheating and consequent danger of explosion of the boiler is thereby prevented, and the attendant on proceeding to fire is warned of the state of the water in the boiler by the open door." The inventor sometimes connects the float

FIG. 1. FIG. 2.



in the boiler with the furnace-door by means of a chain and pulley, as illustrated in the engravings, Figs. 1 and 2; *e* is the float hung to the lever *f* in the boiler. The said lever *f* turns upon a fulcrum at *g*; a chain *h* passing over the pulley *i* connects the float *e* with the furnace-door *k*. By the descent of the float *e* the furnace-door *k* is raised. In boilers of the kind represented the distance between the water level and the furnace flue is sometimes insufficient to allow of the descent of the float through the requisite distance when the said float is immediately over the said flue. On this account the float is placed on one side as shown.

ON TIMBER FOR SHIP-BUILDING.

BY LEONARD WRAY.*

FROM time to time during my life I have had a great deal to do with a number of the principal timber woods of Europe, Asia, Africa, and America, which are known and classed by the timber-merchants and ship-builders of Europe; and I may moreover say, that I am very fairly acquainted with several timber woods which are almost wholly unknown in this country. With such a knowledge of these timbers, I have long been struck with the fact that, when used in the construction of ships, their accredited durability seems woefully at variance with that which we find possessed by the same descriptions of woods when they are used in various ways on shore. Timber which has the reputation of remaining perfectly sound for a hundred years and more in various structures, such as noblemen's mansions, churches, cathedrals, &c., when, for the purpose of ship-building, it is brought under the rigid classification of "*Lloyd's!*" is classed no higher, in any case, than thirteen years (in the first instance), even with all the well-defined advantages of copper fastening and other requirements indispensable in a firstclass ship! True, this term may be renewed for a further period of five years by effecting a genuine and complete "*restoration!*" but this is in general so troublesome and so expensive a course, that in nine cases out of ten the owner had better build an entirely new vessel than have recourse to it. A ship being once off the first letter at Lloyd's, very rapidly runs down the scale of her classification, unless kept up to a certain letter by constant surveys and expensive repairs; but through these I do not purpose following her. We have had instances, and those tolerably numerous, of ships, constructed of teak, mahogany, and even oak, lasting for a very long series of years, and being comparatively sound in their timbers when wrecked or broken up. On the other hand, cases are by no means rare of vessels, built even in the Government dock-yards, being—so to speak—unsound from the day they first entered the water. Indeed, we can recal instances, and might give the names of men-of-war which were said to be thoroughly rotton before they were ever launched. These speaking facts may well arrest our attention, and demand an earnest unprejudiced investigation.

No sane man will, for a moment, call in question the justice or wisdom of those rules established by Lloyd's for the building and classification of ships. But I nevertheless feel convinced that any useful and judicious experiments, tried by individuals, would always be fairly viewed and fairly encouraged by Lloyd's.

TIMBERS USED IN SHIP-BUILDING.

According to Lloyd's classification of timbers, we find that first-class comprises only the following:—The English and the African oak, the live oak of America, the mora and greenheart of Guiana, the teak and saul of India, and the iron-bark of Australia—being eight in all—of which number America supplies three; India two; and Europe, Africa, and Australia, only one each. These timbers are all close-grained and compact; hard, strong, heavy, and durable, being more or less naturally impregnated with certain oily, resinous, or astringent matters. The oaks (containing an acid and an astringent principle) are indubitably more liable to "rot" than the other named woods which abound in oily or resinous matter; hence we find ships built of the best English oak destroyed very speedily by "dry rot." I do not, however, say that even a wood so abounding in oil as the teak does not occasionally exhibit "decay;" on the contrary, experience has shown that this timber sometimes exhibits decay to an unexpected degree. On this point, however, I must beg of you to remark, that the varieties of teak are numerous, and that the character of the wood is very materially influenced by the peculiarities of climate, soil, and seasons in the locality from which it is obtained. Thus, we have the finest description of teak from Malabar; that from Travancore, from Ceylon, from Java, from the Malayan Peninsula, from the Burmese territories, and from the Tenassarim provinces. Of all these the Burmese and Tenassarim varieties are held to be the most inferior, simply because the great proportion of that shipped both at Rangoon and at Maulmain is timber grown on the rich, low, alluvial soils formed by the great rivers on whose waters they are eventually floated to market. In justice, however, to these ports of supply, I must state the fact that, both in Burmah and Tenassarim, the quality of teak, as a matter of course, varies according to the locality and soil on which it is grown. And we may therefore very fairly class the timber obtained from them as being good, better, and best. We find teak grown on high, dry, and open land, of a fine quality, being closer and more compact, and abounding in a mild, bland oil, which scarcely affects the iron bolts that may be driven into it. Whereas that grown in the dense forests of the wet, low-lying alluvials, is lighter, coarser grained, and contains an acrid oil, which not only affects iron very materially, but even, to a certain extent, poisons and inflames the hand which has been pierced by its splinters. We find also the weight and consequent specific gravity of teak varying in a most remarkable manner, viz., from a minimum of ·583 to a maximum of 1·056 (according to the experiments by Mr. Seppings;) although for all practical purposes we may take the range to be from ·600 to ·750. You are all, of course, aware that differences in situation and soil create corresponding differences in oak, in elm, and in all other English timber woods; but because teak happens to have its *habitat* in the "nethermost parts of the earth," this simple law of nature seems to be overlooked by all save by those few who have made these subjects their especial study. The greenheart, the mora, the saul, and the iron-bark, have likewise their differences, both of kind and locality, but they are by no means of so important a nature as to demand the same marked notice as I have taken in respect to the varieties of teak. These eight descriptions of timber hold, then, a very high and deserved character from Lloyd's classification, for with either of them may a first-class ship be built without the admixture of any other wood. But upwards of twenty other kinds of timber are permitted to be used in certain specified portions of a first-class ship; and some of these, at least, are no doubt working themselves up into a place amongst the highest-class woods. At first sight it may appear somewhat harsh, and even unreasonable, to place such a magnificent timber as the mahogany in the category of second-rate woods, the more so as we have had many well-authenticated instances of the extraordinary strength and durability of ships built almost entirely of mahogany; amongst which I may mention the oft-quoted case of the Spanish 80-gun ship named Gibraltar, captured by the English in 1757, and broken up at the age of 100 years, when all her timbers were found to be perfectly sound. But we must, in relation to these particular cases, bear in mind two circumstances which are in themselves all-important, viz., that in the first place, only the choicest and most superior description of mahogany was employed by the Spanish Government in the construction of the Gibraltar (which was built at the Havannah), and that no expense whatever was spared in the selection. Secondly, that such a selection of choice mahogany for the entire construction of a merchant ship at the present day would be far too expensive to suit even our princely ship-owners; whilst I need scarcely add that "swamp mahogany," or, indeed, any of inferior quality, would be highly unsafe, and, consequently, inadmissible for the "timbering" of a ship, however far it might be allowed for "inside" and "outside planking," &c. What the Crown of Spain so wisely did in days of yore has been, in my estimation, wisely imitated but a few years since by our own Government in the case of the Queen's beautiful steam-yacht the Victoria and Albert, which is, I believe, almost wholly constructed of choice mahogany, and may, with ordinary care, continue in existence long enough to carry in pleasure and safety her Majesty's great-great-grandchildren.

In ships of war, it is evidently extremely desirable to attain the highest possible range of durability; for in the peculiar circumstances of ships built for the Crown and of those built for the merchant service, there is this wide difference, that the former know not Lloyd's or its underwriters, whereas, the latter must "live, move, and have their being" according to Lloyd's, or that great body would certainly not know them or insure them. "Mahogany of hard texture" is, however, so far admitted in the construction of A 1 ships as to include beams and hooks, knees, rudder, and windlass, main pieces, outside planking to light mark, and the whole of the inside planking. As there is a pretty general misconception in respect to the specific gravity of this wood, I may observe that "superior northern Honduras is as heavy as Travancore teak, and even heavier than Malabar teak or English oak; the inferior qualities of mahogany alone being so very light and buoyant. I should be very pleased to see good mahogany enter more largely than it now does into the construction of ships; but I am persuaded that its more extended employment must be regulated with judgment and discrimination."

As may well be supposed, the cost of first-class woods is high, and the supply is not at all times equal to the demand. It is desirable, therefore, to know how the supply can be largely increased, and the cost considerably diminished. But previously to entering on that part of my subject, I must not omit to notice the silent but rapid revolution which is taking place in ship-building for the merchant service. This is not only in the increased and increasing proportion of iron used in the bracing, strengthening, and general framework of ships, but in the decided preference which even the most cautious men are gradually showing for ships built wholly of iron! Ships have been built comprising full fifty per cent. of iron, but such half-measures do not seem to satisfy the minds of men now. The great cause of "iron versus wood" is not, however, yet gained; the triumph may still be long in coming! The disastrous influence of iron upon the compasses—the treacherous character of iron plates and iron rivets—the pertinacious partiality of barnacles for iron bottoms—all these still exercise great influence upon many minds; but last, and above all, it is not the habit of our sturdy, sure-going countrymen to make any great change in a hurry. I do not hesitate to declare my own full belief that the compasses will traverse correctly—that both plates and rivets will prove steadfast, firm, and faithful, and even that the "barnacles" may be

* From the paper read at the Society of Arts on May 3rd.

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effectually kept off!—yet, I should not wish to see so great a change progress otherwise than calmly, carefully, and safely;—which it can only do under the guidance of further experience and the practical success of many years. As I have expressed my belief in the undeniable suitability of iron ships for mercantile pursuits, I must, at the same time, state my opinion against them, if applied to warlike purposes. Next to the entire non-existence of a navy, I can conceive nothing so perilous to the interest and safety of this country, as having our ships of war constructed of iron! Nor can I, at present, conceive how the inventive faculties of man—aided by all the science of the age—can afford any adequate safeguard against the disastrous liabilities of a thin iron structure, such as a ship exposed on the ocean to the terrible effects of a cannonade! It is quite probable, and indeed almost essential, that the partial use of iron in the construction of men-of-war should be very largely extended, as it would add considerably to their strength, lightness, and internal dimensions; but notwitstanding this increased and increasing employment of iron, I do not see any likelihood of the demand for ship-building timber abating for many years to come; on the contrary, I fancy that I can distinctly foresee a very enormous increase for the purposes of our navy alone; not merely for the contemplated addition and conversion of our war-ships, but for the continual building of new ones, to replace those which are now being converted into screw steamers. I hold it, as the inevitable result of such conversion, that dry-rot will make swift havoc amongst them, unless the only preventive measures possible have been timely effected; but as I shall have to refer to this important point again, we will now return to the more immediate matter from which I digressed.

Increased Supplies of Ship-Building Timber.

It is not sufficient that we discover forests of timber, even of the finest quality; for before they can be turned to profitable account, we require a pupulation to fell and trim the timber, a good shipping port, and the cheapest possible means of bringing the timber from its native forests down to the port of shipment. But we require even more than this, in the majority of cases, viz., a climate such as the European Superintendents can not only exist in, but be able to expose themselves in with some degree of impunity. As a summary, then, we may consider to be essential: 1. A tolerable climate; 2. abundance of good timber; 3. A sufficient amount of cheap labour; 4. Numerous intersecting creeks and rivers to float down the timbers; and lastly, a safe and eligible port for their shipment. It is quite in vain for visionaries or enthusiasts to call attention to vast forests of stately timber, existing in regions where these essentials are not co-existing; for every man who has had any experience in such matters knows full well the numerous difficulties that beset the labours of timber-cutting gangs. Leaving, then, all the beautiful and undoubtedly valuable woods which have their *habitat* in impracticable and impossible localities, I shall bring before you those that are easy of access, and that may be transported with facility to eligible seaports. Confining myself to those woods which are, or which may yet become first class on Lloyd's books, I will first present to your notice the extraordinary capabilities of Honduras.

Even before the time of the celebrated Dampier, the cutting of logwood and mahogany had become an important business in that colony. More than 180 years have since elapsed, and still it is almost wholly known to the world for its large exports of mahogany and logwood, and for these only! During this long series of years, Honduras has had its organised bands of wood-cutters, whose peculiar occupation has descended from father to son through so many generations, that it has become a part and parcel of their very natures. From childhood to the grave, the sole business of their lives is hunting for and cutting timber in the dry season; floating it down to Belize during the rains; and enlivening that seething town with their fantastic dances and drunken revels, until their money being exhausted, they once more are obliged to betake themselves to their occupation in the dense forest. Hard and laborious indeed is their life in the bush; the felling and squaring up of the vast logs of mahogany being really the lightest portion of their task; for they have to clear away the thick and thorny underwood, cut down and remove thousands of immense trees, in order to form roads, whereon their trucks can pass with their heavy loads to some creek or river. These main and bye-roads are often miles in length, all carefully graded and rendered complete by numerous temporary bridges strongly constructed. To make these roads and bridges, a party of 50 to 60 men are detached, whilst the remaining number are preparing the mahogany for trucking. Such gangs are usually provided with from 6 to 10 ponderous trucks, having 14 oxen to each truck; and as these work only at night, by torch-light, we can readily imagine how carefully the roads must be cleared of all obstacles. When the rains set in, and their logs are floating down towards the coast, these hardy fellows follow each batch in their little pitpans, and exercise all their amphibious dexterity in securing the safe and unimpeded passage of their property. Now, I have not given you this slight sketch for the purpose of mere amusement, but because I wish in the most emphatic manner to point out the important fact that, in this colony of Honduras, we have the largest and most practical body of tropical lumberers that exist on the face of the earth. That there is now exported from that colony about 25,000 tons of mahogany and about 6,000 tons of logwood per annum. That these woodsmen, in the pursuit of these two staple products, continually pass and repass vast quantities of fine and valuable timbers, in every way suitable for ship-building. The forests in which they live and work contain some of the finest quality timber in the world, and that in extraordinary profusion. I do not pretend to know many of these woods, but the following I am well acquainted with: the greenheart, the live oak (*Bignonia*), and other oaks; the mahoe, the bullet tree, the Neesberry bullet tree, the iron-wood, the locust (used for ships' planking and tree-nails), the dogwood, the red pine, the pitch pine (much superior to that of Carolina and the other Southern States of America), the cedar (*Cedrela odorata*), a light and durable wood, not liable to dry rot nor subject to the attack of insects. The trunk of this tree is 70 to 80 feet long, with a diameter of from 4 to 7 feet. I am sure I need not dwell upon the great value of these fine timber woods, but I must again observe that there are numerous others, perhaps equally valuable, which I cannot now enumerate. It is quite clear to my mind that the Honduras woodsmen could realise a very great deal more money, and with infinitely less labour, by preparing for market these timbers than they now do from their mahogany and logwood; but as the gangs are always hired under contract by some merchant or mercantile firm in Belize, it is evident that the initiative must be taken by those enterprising gentlemen. The safest course, perhaps, would be to commence the attempt by combining the two objects, for the same roads necessary for the trucking of mahogany would serve for the transport of the other timbers selected. There is a distinguished member of this society, Chief Justice Temple, still residing in Honduras, to whom we are all indebted for the indefatigable exertions he has made to attract attention to the capabilities and resources of this fine colony, and I am sure that his advice in relation to the course I have just suggested would be particularly valuable and instructive.

(*To be continued in our next.*)

THE ATLANTIC PAYING-OUT MACHINERY.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—I see in your impression of April 29, under the head of "Weekly Gossip," an abstract of a "report of a select committee of the American Institute of New York, appointed (*by whom?*) to examine the paying-out machinery on board of the U. S. frigate Niagara, and to furnish a report thereon concerning the design and construction thereof." We are pretty well accustomed in this country to pass over brother Jonathan's cormorant propensities without notice; but in this instance the *exparte* decision of this mock committee (who have certainly gone the entire ticket) upon work done in this country, is so glaring in its injustice to those who have borne the burden and heat of the day, that it would not be right to allow the statement which your columns have disseminated through the country to pass uncontradicted. The object of the meeting of the committee has manifestly been to show that Mr. W. E. Everett, of the U. S. navy, who had charge of the engines of the Niagara on her first trip, was the sole inventor and designer of the machinery used for paying-out the Atlantic cable in July and August, 1858. For my own part, I cannot accept this machine as altogether the best for the purpose (indeed, it is clear that it was too heavy for use in very rough weather, since men were employed on board the Agamemnon to keep the wheels moving during the rough weather which she encountered, when her stern dropped so much as to withdraw the strain from the cable), but some parts of it were new, and a great advance upon any machinery of the kind employed before. I believe the facts of the case are as follows:—The original machinery consisted of two machines, either of which could be used for paying-out or for hauling in; one of these had four sheaves, the other two. The "commission of engineers" (Mr. Everett being one of the commission) advised in September, 1857, that certain alterations should be made in the machinery, the bulk of which had been recommended to them by Mr. (now Sir Charles) Bright, the engineer, and one of the original projecters of the Atlantic line. One of their most important recommendations was the use of a form of brake invented by Mr. J. G. Appold, F.R.S., which has been employed for testing the engines of the Royal Agricultural Society for a long time, and which afforded a certain degree of compensation to any inequality of strain. If I am not mistaken, the first suggestion of this brake emanated from Mr. Appold himself, and was concurred in by the committee. The brake used by the Agricultural Society was set up by Mr. Amos at the Gutta Percha Company's works in the City-road, at the request of the Atlantic Company's engineer, and (after some experiments) was determined upon; at this time Mr. Everett was not even in England. No alteration whatever was made in the principle of the brakes finally used, and scarcely any in the details of construction; certainly none of the slightest importance. The machines with two over-hanging sheaves used in the former expedition were fitted with Mr. Appold's brakes at the works of Messrs. Easton and Amos. The chief parts of the machines were adopted without any change, but new sheaves were made with deeper grooves, in accordance with Sir Charles Bright's advice, and his recommendation as to guards to prevent the cable from escaping out of the grooves, scrapers to clean the grooves from the accumulation of tar and other details were carried into effect. As to the *new* parts of the machine—the dynamometer for indicating the strain, and the hand-wheel for removing all pressure immediately, if required—the former was patented by Sir Charles Bright in the previous year, and the latter was proposed by Mr. Amos, who took the greatest interest in the construction of the machinery from first to last, and the initiative in the practical design and carrying out of the wishes of Sir C. Bright, the engineer of the company, Messrs. Penn, Lloyd, and Field, who were good enough to lend their valuable aid to the company in the matter, and Mr. Everett, to whom was confided the experiments upon the materials and lubrication of the brakes recommended by the engineer of the company in September, 1857, and the supervision of the construction of the Niagara's machinery, Mr. Clifford being charged with the superintendence of that for the Agamemnon. Mr. Canning and Mr. Woodhouse, to whom was entrusted the important duty of coiling the cable on board the ships, were also consulted as to the machinery, and I shall be very much surprised if Mr. Everett ventures forth from the cover of this self-appointed committee to say that he designed any part of the machinery in question, or even suggested a single bolt or screw in it.

The fact is, that brother Jonathan has intended to be quite smart about the cable business; and no greater example can be found of English frankness and straightforwardness, as compared with American jealousy and unfairness, than the generous manner in which the engineer-in-chief of the Atlantic Company spoke of his American co-adjutors in his published report, as well as in his speech at the banquet given to him at Dublin, and the omission of all allusion to him in the celebration on the other side when all America went mad about the submersion of the cable in her eagerness to claim the entire thing as her own. I need not remind you of the smallness of the share which Americans really had in the undertaking. Three of the original promoters of the company, Sir Charles Bright, Mr. Brett, and Mr. Whitehouse were Englishmen, one only (Mr. Cyrus Field) being an American. More than three-fourths of the capital was found by British subscriptions; and out of the ships furnished by the two Governments to carry out the enterprise last year, the Agamemnon, the Valorous, the Gorgan, and the Porcupine, were provided by our Government, while the United States Government produced only the Niagara.

Under these circumstances it would be well for our Yankee friends to adopt a rule in the celebrated game of *poker*, to which they are so attached, viz., never to brag without holding a good hand.—I am, gentlemen, your obedient servant, T. B. M.

EXPLOSION OF GUNPOWDER WORKS.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—Your correspondent "Polvora" lacks logic. He starts with a curt dismissal of the chemical question; states that powder manufacturers are not insensible to improvements; begs, but only generally replies to, the question whether in certain departments of gunpowder works improvements have

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not been made; adds that in consequence of such improvements special works have had a complete immunity from accidents—that "hands" have been reduced as machinery has been employed; twits you with severity of remark, but concludes, forgetful of the antecedents of his letter, with the observation that as the lives of many depend upon this business, blessings will rest upon the discoverer of any means which will prevent the recurrence of accidents.

I can only say, gentlemen, that I, amongst others, thank you for the articles you have written upon this matter, and which, to show their importance, has been so extensively quoted and favourably commented upon by the *Times* and other journals, and trust that "War's Alarms" and a sudden *penchant* amongst the community for gunpowder will not induce you to drop a subject which has left a lasting impression upon thousands, as well as Yours obediently,

ONE WHO FELT THE "BLOW."

SUPERHEATED STEAM.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—Under the above head a very strong article appeared in the *Times* of the 23rd April last past, by which the public would be led to suppose that although other persons have attempted to work superheated steam that all had failed save Messrs. Penn and Son. We being patentees of a method for using superheated steam, which is now working both in the Royal Arsenal at Woolwich as well as in the Woolwich Waterman's Company's Boat Osprey, wrote to the editor of the *Times* as under, but our letter has not appeared in that paper. Knowing your impartiality, we venture to request that you will insert in your paper the following statement:—"Our principle of superheating steam, which is by arched pipes over the fire, has been used in the Royal Arsenal at Woolwich for some time, and we have a report of the saving of fuel to the amount of 30 per cent. It is also used in the Woolwich Waterman's boat "Osprey," running daily between Woolwich and London, and there has not only effected a saving of 33 per cent. in fuel, but shows a clear gain of 11 per cent. in revolutions, and that with less pressure on the boiler. We use our steam in the Osprey heated to 450 degrees, and we are satisfied from our experiments previously made that the most effective heat is from 400 to 450."

We are, Gentlemen, your obedient Servants,

PARSON & PILGRIM.

8 Adelphi Terrace, 4th May, 1859.

SHELLS FOR DEFENDING HILLY COUNTRIES.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

SIR,—When the British army under the Duke of Wellington occupied the Pyrenees, in the latter end of 1813, the different divisions were provided with large shells, of about the size of 32-pounders, for the purpose of allowing them to roll down the hills against an approaching enemy, their fuzes being first lighted. I practically demonstrated my improvement on this old plan, by hooking on my frictional ignitor to the fuze-hole of a wooden model of a 32-pounder, and then allowing the shell to roll down the glacis of the fort where Captain Lamprière, R.E., resides. This shell, on arriving at the end of the attached cord, fired the igniter by the check of its stoppage at the exact distance desired, being about 20 yards. This was done in presence of Captain Lamprière, R.E. Immediately after this Sergeant Sturrock, R.E., fired several of my gossamer blank cartridges from Mr. Leech's ingenious and very efficient breech-loading rifle carbine. About a year ago, I in due order submitted the above-named cartridges for the consideration of the Secretary of State for War, and the official answer I received was, that the cartridges would be tried when practicable. I have heard nothing of them since that distant day.

I am, Sir, your obedient servant,

Rosherville, April 27. JOHN NORTON.

The Society of Arts is beginning to move actively in the preliminary preparations for the "International Exhibition of 1861." They state their views thus:—"It is proposed that the works to be exhibited in 1861, shall be selected for their excellence; that they shall be arranged in classes, and not according to countries; that music and painting shall be included; and that foreigners shall be admitted to contribute on the same conditions as British exhibitors."

NOTICES.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of insertions less than 13; for 13 insertions, 4d. per line; and for 52 insertions, 3d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

With our Next Number will be Presented

A SPLENDID ENGRAVING OF

THE LIGHT-DRAUGHT STEAMERS FOR THE INDUS,

Built by J. SCOTT RUSSELL, ESQ., *for the Scinde Railway Company.*

This Engraving will comprise a side elevation, a longitudinal section, and a plan on a scale of $\frac{1}{4}$th of an inch to the foot.

NO EXTRA CHARGE.

Our Weekly Gossip.

On Tuesday evening Sir William Armstrong was entertained at a public dinner in the Assembly-rooms, Newcastle-upon-Tyne, in celebration of the honour of knighthood recently conferred upon him by her Majesty the Queen in recognition of his services in inventing the new rifled cannon. In reply to "The Health of Sir William Armstrong," proposed by Sir George Grey, Sir William rose, and after a few introductory remarks, said, that with respect to the gun of which so much had been said, it is absurd to suppose that its general character, which is already known to hundreds of persons, and which is already approximately—although only approximately—described in many publications, can be considered a secret. There is a great deal in detail which will be very difficult to make out, and which must be completely mastered before other nations can make the gun. It had been said two of his guns burst at Shoeburyness; but this, like many other assertions that have been made, is wholly, he said, without foundation. It has displayed extraordinary durability; and, in a long course of trial, none of them have exhibited the slightest indication of wear. Seventy pounders and hundred pounders are soon to be constructed upon the same principles. All the writers who have undertaken to give information upon this gun have spoken of a large screw working in the breech end of the gun, and pressing against a stopper for the purpose of closing the bore when the gun is loaded; "but they all ignore the fact," said Sir William, "of that screw being a hollow screw, or they have misunderstood the purpose of its being so. There can be no secret about a process which is now daily performed; the guns are both sponged and loaded through the hollow screw, and it is a great mistake to say that the charge or shot or sponge can be introduced by the narrow slot or opening which is spoken of as receiving the stopper. This stopper is a very small light piece, widely different to that represented in the fancy portraits which have appeared of this gun. It is chained to the gun to prevent the possibility of being lost by casualty. The carriages, which are arranged for guns intended for naval or garrison purposes, are adapted with a slide—a sloping slide, upon which the gun runs back on being fired, and then slips into its original position by gravity, thus obviating the necessity of employing a large number of men. The projectiles are in all cases made of cast iron, thinly coated with lead. The projectile for field purposes admits of being used indifferently either as solid shot or as shell, or common case or canister. It is composed of separate pieces, bound together so compactly that the shell has been fired through a solid mass of oak timber nine feet in thickness without sustaining a fracture. When used as a shell it divides into 49 separate regular pieces, and into about 100 indefinite and irregular pieces. It combines the principle of the shrapnel and percussion shell. . . . . It has been stated that the great defect of my shell was its small capacity for powder. If, instead of that, it had been stated that its great advantage was its large capacity, those persons who made the statement would have been nearer the truth. The shell of my thirty-two pounder admits twice the quantity that is contained in that of the ordinary gun, and there would be no difficulty in increasing the quantity. It has been urged that it would make so very small a hole in passing through the side of a ship. There may be some reason for that applied as a shot, but when applied as a shell it is the very thing I want. The shell is caused to explode in the act of passing through the timber, and the smaller the hole, the less will be the outlet for the explosion, and the greater the shattering effect. All the destructive effects will arise from the use of the shell."

We have received the following note from Mr. Scoffern, in which he politely compliments himself as "an author," and questions (by implication) our "authority":—"Dr. Scoffern presents his compliments to the Editor and incloses a note from Mr. Reed, which is self-explanatory. The justice of its publication in the MECHANICS' MAGAZINE will be obvious, and will spare the necessity of its publication elsewhere. The Editor will see the impossibility of plagiarism in this case, even assuming an author willing to rely on the authority of the MECHANICS' MAGAZINE. '199 Strand, May 5th, 1859. Dear Sir,—With respect to the priority of description of the Armstrong Gun, as between your book on New Resources of Warfare and the MECHANICS' MAGAZINE, I can testify that your delineation of Armstrong's Gun was drawn by me nearly a fortnight previous to its appearance in that journal. I am, very truly yours, J. C. REED. J. Scoffern, Esq., M.B.'"

Mr. Chas. Boner, dating "Ratisbon, Bavaria, April 30, 1859," writes as follows:—"In your journal, when speaking of Sir W. Armstrong's cannon, you observe, 'Nothing like the firing made with this gun at Shoeburyness has ever before been seen.' You will perhaps find it interesting to learn that this is not the first time an almost incredible range and *perfect* precision have been obtained with a weapon the charge of which was surprisingly small. In 1853 I was incessantly occupied with a plan for applying the rifling of small arms to cannon. After satisfactory experiments, I ordered a small cannon which was intended for trial in England. To lose no time, however, I went at once to London, taking with me pistols constructed on the same principle, and with which I had fired leaden as well as iron balls. The Select Committee at Woolwich, when they heard what the weapon was capable of performing, were incredulous; but on the 30th June, 1854, I fired at a target with a pistol, the barrel of which was 11 inches long, and the charge one drachm, at the iron target at 200, 300, and 400 yards, and should have continued at 500 yards, but Colonel Chalmers thought it better to leave off, as there were so many workmen about, and an accident, therefore, not improbable. The bullets struck the target almost immediately, and fell to the ground in the form of thin wafers, so battered were they by the force of the blow. Each shot fired at the several distances was marked down; and the different papers are still in my hands, signed by Col. Chalmers, and sealed with the official seal. With a carbine, loaded as easily as a musket, I am able to fire *with precision* at 800 yards. You may ask why were no further experiments made, or attention paid to the invention. This I am quite unable to tell you; and I only send you these facts, in the supposition that they may not be without interest for some of your readers. P.S.—You may perhaps care to know that with this method of rifling hardly any 'fouling' takes place; and that it makes little difference in the state of the barrel whether six, or eight, or sixty, or eighty rounds are fired."

Mr. Charles Maybury Archer writes:—"A constant and edified subscriber watching as I do weekly through the medium of your columns the progress of scientific project and achievement, permit me with your customary kindness to claim the paternity of one of my own offspring, even though it be by the unusual process of self-affiliation. One of your correspondents in last week's number, writing on the topic of telegraphs to China and Australia, subscribing himself 'Time is Money,' and dating from Vienna, March 31st, says:—'Before concluding, I beg to remark that the Atlantic Telegraph would now be in perfect working order if steps had been taken to obviate the total want of longitudinal expansion, or elasticity. This could easily be done by placing, at distances (which should be regulated by the length of the cable and geodetic formation of its resting-place), *conductive spring joints*, which would add a *little* to the bulk and first outlay, but would ensure the wanted elasticity and success of the enterprise.' This very proposal in minima particula, permit me to say I provisionally patented last year, and forwarded to the British Association Meeting at Leeds. It was shortly after reproduced by a gentleman at Manchester as his own, and it now comes from

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Vienna! Trusting that, on the principle of tribute to whom tribute, &c., and being perfectly prepared to protect the paternity of the idea, I believe you will favour me with these few words of passing comment."

The last number of the *Photographic News* directs attention to some of the uses of photography for practical purposes. Very recently there happened, says the editor, to be a "slip," as it is technically termed, of some land, in connection with some public works. Of course the parties who had engaged the services of the civil engineers and contractors blamed them for insufficient work. As the case was one of importance and involved several thousands of pounds damage, the proprietors at once sent for an able photographer, and he, under the direction of another civil engineer, who was called upon to give his advice in the emergency, took a series of views from all parts, and in a manner to satisfy the most particular jury that ever was assembled. It will at once be seen that this was a most important step, because the proprietors were enabled to proceed at once with remedying the misfortune. Had they not availed themselves of photography they must have left the embankment in a dangerous state, hourly becoming worse, in order that a "jury of inspection" might be called upon to view and arbitrate on the matter. Besides this, another and striking advantage accrued: good and correct photographs prevented the possibility of "hard swearing." Because we may rest assured that in giving evidence the witnesses for the plaintiffs would be inclined to exaggerate the damage, while, on the other hand, the witnesses for the defendants would naturally depreciate its importance; but photography happily comes in between the two, and sets both sides right by giving truthful and correct information. May we not hope that the day will soon arrive when photography, wherever it can be used, will be made available for the purpose of promoting justice and equity between man and man. While on this subject, we may allude to another and most important application of photography. We allude to a suggestion made at the annual meeting of the Association for the Prevention of Boilers Bursting. This association originated in Manchester some time ago, owing to the great number of lives that were annually lost by the bursting of boilers in large manufactories. The association appoints several agents to inspect boilers, and to report on imperfect ones, so that they may at once be remedied. There can be no doubt but that this association has already saved several hundreds of lives, and it is to be hoped that similar associations will be formed in all the large towns, so as to prevent the great annual sacrifice of life which takes place simply for want of proper care and attention. One of the members of the Association has suggested that in future, when any of these unfortunate accidents occur, there should be photographs taken of the boilers that have burst in order that a museum of such photographs might be formed, with reports showing the cause of bursting. This suggestion, we are happy to learn, has been adopted, and in future photographic copies of all these accidents will be taken, as guides and warnings to others to keep clear of what had produced the fatal result.

The same well-conducted journal also directs attention to the important subject of priority of invention, in the following manner:—"Our object is to draw the attention of our readers to the importance of making known to the world, as soon as possible, their discoveries or improvements. We are daily receiving letters from persons who, having seen in our columns a description of some apparatus or improvement which they have previously found out, claim for themselves the priority of publication. When we see our continental brethren so jealous of their fame as actually to take, in order to secure a trifling discovery, the earliest possible date, our correspondents should be similarly watchful over the fruits of their own brains, and remember that the best way to secure the credit of any discovery is to publish the account of it before any one else; not to wait till another has benefited the world by a full publication, and then to come forward stating that the same idea had previously existed in their own minds."

Inventors are still bent upon the artificial adornment of the fair sex. A Mr. Speight, of Clerkenwell, "artist in hair," has just completed a patent for an invention which relates to fictitious plaits and curls for head-dresses. These have been commonly composed of human hair, but the inventor employs dyed hemp, flax, aloe, plaintain or rhea fibre, or dyed China grass. The fibre or grass having been first dyed of the required colour is next combed or heckled, and thus receives a gloss. Then, to manufacture it into curls, the patentee employs a fixed holder or hollow support, into which he inserts a rod slotted at one extremity. On this rod he places a tube slotted at one end, and having a pin through it at the other. The pin, taking in the slot in the rod, keeps the tube steady. The fibres in a damp state are attached to the slots in the tube, and the tube being caused to turn, the threads assume a curled form, and are attached to the ends of the pin. The tube is then removed from the rod, and a heater inserted therein to fix the curl in the desired form. Grease or similar material is next applied to the curl, which is finally subjected to a proper drying process, and is then ready for the use of such ladies as Mrs. Dombey's mother.

From a tree which is found growing on the Malayan peninsula and on the islands of the Malayan and Eastern Archipelago, the natives obtain a juice which, according to their simple manner of naming things, is, in many localities, called "suso-poko," signifying in English "tree milk." "Suso-poko is a substance," says Mr. Leonard Wray, "in which the good qualities of both india-rubber and gutta percha are happily blended, and which will render it most important to the commerce and manufactures of Great Britain." In the preparation of this rude natural product for home use, Mr. Wray first frees it from all impurities, either of woody matter or otherwise, by certain simple and well-known methods; then it may be at once used for a variety of purposes. In other cases, he hardens and materially changes the character of this cleansed product by means of chloride of sulphur. In order to dissolve it, and render it fit for manufacturing purposes, he treats it with naptha, bisulphuret of carbon, oil of sassafras, and other suitable solvents, and also with heat. Having prepared it, he applies it as a substitute for gutta percha, caoutchouc, and other similar substances; and, in some cases, mixes it with one or more of those substances.

Mr. John Fowler has just added to his many steam-ploughing inventions another which consists in so arranging the ropes by which the implement is hauled to and fro over the land, that every time the implement arrives at the headland it may be turned round either entirely or partially by the action of the traction rope. If it be desired to turn the implement entirely in this manner, the end of the traction rope is attached near one of the hinder corners of the implement, and is led round the back of the implement, and along one of its sides to a clutch in front, by which it is held while the implement is doing its work. When it is desired to turn at the end of the traverse, the traction rope is released from the clutch, and then, in unwinding itself from the implement, turns it half round so as to reverse its position ready for the next traverse over the land; at the same time it winds the return rope partially round the implement, and when this is made fast in the clutch it is ready to become the traction rope again.

A correspondent astutely signing himself "Toredo Navalis," writes:—"As you are about to notice Mr. Wray's paper on timber for ship-building in your next number, I beg to bring under your immediate notice my plan submitted to the Minister of Marine, at Paris, and to our Admiralty. The wood is introduced into a close vessel which is exhausted of air; any oil in which any *bitter* powder, cedar chips, or oil of creosote is infused, is then admitted, and forced in by the pump till the pressure is from 140 to 160 pounds to the square inch. Finally, the wood is coated to the depth of a fifth or sixth of an inch with the following composition, which no degree of heat or cold will ever affect:—Boil in a large iron pot any quantity of tar, and mix with it *charcoal* very finely powdered, stirring them all the time till the whole is reduced to a state of mortar; spread the whole on the wood with a *wooden* trowel."

Mr. J. W. Duffey, of Clerkenwell, writes us as follows:—"Believing you like to be informed of anything new, I beg leave to call your attention to the following, viz.: Uncovered wire for every variety of Electro-Magnectic apparatus, on the principle that two currents travelling in the same direction parellel with each other, will not interfere one with the other, or pass off in a lateral direction. Although this is opposed to the present theory, I can positively assert and prove it to be a fact. The description of a small induction coil I am manufacturing will give the best idea of its practicability and advantage. The core consists of a bundle of 16 iron wire, 2½ inches long, ⅜ diameter; primary wire, 2 yards of 16 copper wire covered. I use covered wire in this case because uncovered wire, while making the core strongly magnetic, induces a very feeble current in the small wire. (You will understand by this it does not interfere with the use of uncovered wire for the relay-magnet for telegraphing.) The small wire consists of two separate coils, 50 yards each; of 32 uncovered iron wire, six layers in each coil. Between each layer is interposed a layer of paper. Break-piece and connections same as those ordinarily in use. With the coils in connection so as to form a single coil of 100 yards, using a pint Smee's battery, gives a powerful shock."

We read in the *Greenock Advertiser*:—"A new feature has arisen in aquatics in this locality from the construction this season of a number of wooden screw steamers of small tonnage. Messrs. Cameron, boat-builders, East Blackhall-street, have recently launched two handsome little vessels of this description, about thirty feet in length, and belonging to Messrs. J. and W. Young, of Glasgow. Their engines, of 1½ h.p. nominal, are high pressure, and made of brass, and the screws are placed beneath the keel instead of at the stern post. It is expected that by this mode these tiny steamers will skim along at a rate of nine knots an hour. Messrs. Cameron have on the stocks another screw of thirty-eight feet in length, and remarkably fine model, for a gentleman in town. She will be fitted with a condensing engine of 4 h.p., and it is anticipated that she will steam very fast. Mr. Macdonald, boat-builder, Virginia-street, has nearly completed a fine clipper cutter yacht, of about fourteen tons, for the Earl of Morton."

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated April 12, 1859.

911. D. Doiz, of Manchester, Engineer. Improvements in the construction of gas lamps. A communication from W. G. Ginty.

Dated April 18, 1859.

967. J. Luis, of Welbeck-st. An improved machine for raising water. A communication from M. Dupré.

969. W. Prosser, of Dorset-pl., Dorset-sq., Gentleman. Improvements in apparatus employed in the production of light.

971. J. Whitaker, of Leigh, Agricultural Machine Maker. Improvements in mowing machines.

973. M. A. F. Mennons, of Paris. An improved disinfecting compound. A communication from W. E. Lynch.

975. J. Izod, of Hoxton, Dealer in Fancy Goods. A safety cigar, vesuvian, or fusee box or case.

977. J. Freer, of Rothley, Leicester, Agricultural Implement Maker. Improvements in machines for planting grain and seed, and an improved seed feeder and meter for planting machines.

979. A. Dalrymple, of Sheffield, Tailor. Improvements in the mode of covering crinoline, and in machines used in connection therewith.

981. F. and W. Edwards, of Coventry, Machinists. Improvements in looms for weaving ribbons and other like goods.

983. J. Boydell, of Gloucester-crescent, Regent's-park. Improvements in the apparatus applied to the wheels of locomotive traction and other carriages to facilitate the draught.

Dated April 19, 1859.

985. P. and J. Reynolds, of Belfast, Engineers. Improvements in machinery or apparatus for hackling flax and other fibrous materials.

987. I. Dutton, of Tipton, Whitesmith, and R. Martin and T. Phillips, of Dudley, Coke Merchants. New or improved machinery for preventing accidents in coal or other mines, by the drawing of skips or cages over their pullies.

989. O. Maggs, of Bourton, Dorset. Improvements in cheese presses.

991. A. V. Newton, of Chancery-lane. Improved machinery for weaving seamless bags or other articles with hemispherical, or regular or irregular ends or forms. A communication from J. Pender.

Dated April 20, 1859.

993. J. Wotton, of Birmingham, Manufacturer. An improvement or improvements in raising or shaping metals.

995. A. W. Williamson, of University College. Improvements in obtaining extracts from the liquorice root.

Dated April 21, 1859.

999. A. F. Vanhulst, of Brussels. An improved kiln for drying malt.

1001. T. Dawson and J. Avery, of Essex-st. Improvements in pencil-cases, watch seals and keys, toothpicks, and other like articles of jewellery, lockets, penknife handles, porte-monnaies, and other like articles.

1003. J. Alison, of Hainault Forest, Essex, Gentleman. An improved instrument for extirpating thistles, docks, and other deep-rooted weeds.

1005. D. Auld, of Glasgow, Engineer. Improvements in machinery or apparatus for supplying steam-boilers with water.

1007. E. Lewthwaite, of Halifax, and G. Ambler, of Queenshead, near Halifax, Watch Makers. Improvements in clocks, watches, chronometers, and other time-keepers.

1009. G. Roberts and J. Bridges, of Vauxhall-bridge-road. Improvements in the manufacture of candles.

1011. J. H. Pepper, of Kilburn Priory. Improvements in apparatus for showing stereo-scopic pictures.

Dated April 23, 1859.

1013. R. Gray, of Sheffield, Crinoline Manufacturer. Improvements in crinoline skirts. A communication from J. Hobson.

1015. J. Edwards, of Aldermanbury. Improvements in the manufacture of buttons.

1017. J. Gillies, of Glasgow, Wood Turner. Improvements in branding or marking wood for casks, barrels, and other purposes.

1019. W. Dicks, of Leicester, Boot Maker, and W. Hopwell, of Leicester, Machinist. Improvements in machinery for making screws, and applying them in fixing the soles of boots and shoes.

1021. P. F. Mutel, Gas Burner Maker, and L. H. Blan-

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chard, Gentleman, both of Paris. Improvements in gas burners.

1023. W. Gibson, of St. Leonard's-road, Engineer. Improvements in steering apparatus.

1025. J. Marshall, jun., of Selby, Gentleman. Improvements in filtering and depurating fluids.

1027. F. C. Maguire, of Stamford, Gentleman. Certain improvements in the utilization of sewage manure.

Dated April 25, 1859.

1029. W. P. Balfern and M. McKay, of Hammersmith, Soap Manufacturers. The manufacture of sweet-figged soft soap.

1031. G. Ward, of Blackburn, Thread Manufacturer. Improvements in machinery or apparatus for making healds.

1033. T. A. Weston, of King's Norton, Accountant. A new or improved pulley.

1035. J. Holmes, of Somerset, Accountant. Improvements in applying eyelet holes to boots and shoes, and in binding boots and shoes.

1037. E. Humphrys, of Deptford. Improvements in steering apparatus.

1039. H. C. Hurry, of Wolverhampton, Civil Engineer. Improved means of and apparatus for obtaining motive power.

1041. S. L. Taylor, of Cotton End, Bedford, Agricultural Engineer. Improvements in agricultural implements, in obtaining motive power for actuating such implements, and in apparatus connected with the application of steam power.

Dated April 26, 1859.

1043. H. Allman, of Hampstead-road, Consulting Engineer. Certain improvements in the construction of window-blind mountings, and in apparatus connected therewith.

1045. W. E. Newton, of Chancery-lane. Improvements in the manufacture of nitric acid and its application for the production of artificial nitrous or nitric salts. A communication from M. Lefebvre.

1047. W. Marshall, of Leith-walk, Mid-Lothian, Engineer. Improvements in steam-engines.

1049. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in steam-boilers. A communication from T. N. Meynier and L. A. Le Bleu, of Paris.

1051. J. H. Johnson, of Lincoln's-inn-fields. Improvements in machinery or apparatus for grinding and polishing knives and other articles of cutlery and tools. A communication from J. Dodge.

Dated April 27, 1859.

1053. G. Pearson, of Bugbrook, near Weedon, Contractor. Improvements in apparatus for cutting and shaping trenails.

1055. H. R. Fanshawe, of Old Kent-road, India Rubber Manufacturer. Improved apparatus or mechanism for drawing-off, filtering, and guaging liquids in butts, barrels, casks, and such-like vessels, preserving the contents from deterioration from contact with atmospheric air.

1057. J. R. Smith, of Glasgow, Gentleman. Improvements in obtaining motive power.

1059. C. Hamp, of Harrow-road. Certain improvements in locks.

1061. T. Lacey, of Grafton-st., Westminster, Gas Engineer. Improvements in gas regulators.

1063. T. Gauntley, sen., of Nottingham, Lace Manufacturer. Improvements in the manufacture of fringes.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1075. W. M. Cranston, of New Broad-st., Agent. A grass-cutting machine. A communication from W. A. Wood. Dated April 29, 1859.

1110. J. Morse, of Massachusetts. An improved power printing press. Dated May 3, 1859.

1111. L. R. Blake, of Massachusetts. A new and useful or improved machine for sewing a sole on a boot or shoe. Dated May 3, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, May* 10, 1859.)

2962. F. W. Turner. Steam-engines, condensers, and boilers.

2989. R. A. Brooman. Washing and drying machinery. A communication.

2990. R. A. Brooman. Fire-arms. A communication.

2991. R. A. Brooman. Embroidering. A communication.

2992. R. A. Brooman. Splitting hides, &c. A communication.

3001. M. D. Wyatt. Wall coverings.

1. J. T. Pitman. Bungs. A communication.

3. A. Anderson. Governors.

4. B. J. Gosteau. Gridiron.

5. J. E. Drouot. Bakers' ovens.

12. P. E. Guérinot. Railway locomotives, &c.

17. J. Harris. Regulating the pressure of fluids.

19. G. Skinner and J. Whalley. Tiles.

22. A. L. Lévêque. Subduing horses.

23. J. B. Morgan. Propelling.

24. J. Luis. Candles. A communication.

30. J. Furnival, T. Furnival, J. Derbyshire, and F. J. Emery. Kilns and ovens.

33. J. B. Joyce. Wool-combing.

34. W. Hood. Racks and water cisterns.

35. A. Bedborough. Chimney cowl.

39. J. Howard. Plough.

40. R. Rumney. Printing and dyeing.

51. W. Spence. Photographing on wood. A communication.

60. H. Harden. Fire-bars for furnaces.

100. R. Mushet. Metallic alloy.

101. R. Mushet. Cast steel.

121. T. Sampson. Feeding steam boilers.

132. R. Mushet. Cast steel.

134. R. Mushet. Cast steel.

141. W. E. Newton. Sewing machines. A communication.

234. W. E. Newton. Life-preserving vests. A communication.

253. W. Crowther. Prussiates of potash, or soda.

310. H. C. Jennings. Paper, parchment, and gelatine.

332. N. Greenhalgh, W. Shaw, and J. Mallison, jun. Yarns.

443. H. Y. D. Scott. Cement.

594. W. Gossage. Treating ores of copper.

715. G. Gregg. Leather.

939. E. Partridge. Axles.

961. J. Sidebottom. Tubes.

988. A. W. Williamson. Liquorice root.

997. L. P. Porter. Knitting machinery. A communication.

1005. D. Auld. Supplying boilers with water.

1009. G. Roberts and J. Bridges. Candles.

1017. J. Gillies. Branding wood.

1023. W. Gibson. Steering apparatus.

1047. W. Marshall. Steam-engines.

1057. J. R. Smith. Motive power.

1075. W. M. Cranston. Grass-cutting machine. A communication.

1110. J. Morse. Power printing press.

1111. L. R. Blake. Sewing soles on shoes.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed May 6, 1859.

2482. A. Fryer.
2490. J. Platt.
2494. A. H. Dendy.
2496. T. MacSweney.
2497. W. Hale.
2502. E. E. Allen.
2504. J. F. Dickson.
2505. J. L. Jullion.
2507. A. Henderson.
2508. J. Felix.
2515. R. A. Brooman.
2516. R. M. Ordish.
2522. E. Humphrys.
2528. J. Blethyn.
2531. F. H. Maberly.
2535. J Rae.
2545. J. Wadsworth.
2555. A. B. Woodcock and J. M. Dunlop.
2566. W. Clark.
2567. W. Clark.
2599. C. Cowper.
2675. J. Luis.
2683. J. Luis.
291. M. Loam.
303. I. Clements.
391. J. Grimes.
527. J. Leigh.
569. H. Leonard.
628. N. Washburn.

Sealed May 10, 1859.

2258. J. Saxby.
2518. J. Corner.
2520. W. G. Taylor.
2524. A. J. Brooks.
2527. C. T. Judkins.
2534. T. Gray.
2542. G. T. Bousfield.
2546. W. Ashton and T. Cartmell.
2560. T. R. Butcher, F. Stevens, W. T. Johnson, and T. Jarvis.
2588. M. Scott.
2594. J. Platt and H. Chubb.
2604. J. Leslie.
2630. T. S. Cressey.
2666. A. V. Newton.
2692. W. Richards.
2700. H. L. Pattinson.
2784. W. E. Newton.
2792. J. Dawson.
2964. R. Hornsby, jun.
380. B. Burrows.
570. W. Tucker.
580. J. Leigh.

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1057. W. Bulmer and I. Sharp.
1068. R. A. Brooman.
1071. W. J. Curtis.
1076. L. G. Perreaux.
1088. A. V. Newton.
1095. F. Potts and T. Vann.
1099. W. Basford.
1101. G. Simpson.
1102. R. A. Brooman.
1113. B. Beniowski.
1287. A. Watson and A. H. Williams.

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ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned no to produce them without acknowledgement:—

STEAM ENGINES, &c., 2199, 2202, 2233.

BOILERS AND THEIR FURNACES, 2218, 2220.

ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 2196, 2221, 2227.

SHIPS AND BOATS, including their fittings, 2186, 2205.

CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 2193, 2241.

FOOD AND BEVERAGES, including apparatus for preparing food for men and animals. *None.*

FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 2190, 2194, 2204, 2206, 2214, 2216, 2224, 2228, 2230, 2238.

BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c., 2225.

LIGHTING, HEATING, AND VENTILATING, 2195, 2223, 2237.

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 2198, 2226, 2231.

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2183. J. J. RUSSELL. *Improvements in furnaces for heating iron and steel, suitable for the manufacture of welded tubes and other articles.* Dated Sept. 30, 1858.

Here each furnace is made with several fire-places at one end, which are separated from the body of the reverberatory furnace by a bridge. At the back end of the furnace is formed a hollow bridge, over and under which the flames pass from the fire-places and the body of the furnace to the chimney. This hollow bridge forms an oven from side to side of the furnace, for the introduction of the iron or steel, in order to the same being preparatorily heated. *Patent completed.*

2184. F. J. MONEY. *Improvements in the construction and adaptation of sewers.* Dated September 30, 1858.

The inventor constructs sewers with a pipe or connected pipes laid therein throughout their entire length, to afford separate channels, one for the liquid and the other for the sewage. He further arranges the sewage pipes that they may be connected with dwellings by branch sewage pipes independent of the ordinary water drains leading therefrom to the main sewer. *Patent completed.*

2185. W. BLAKE. *An improved portable fire-escape.* Dated October 1, 1858.

This fire-escape consists of a metal frame, in which a floor or panel is fixed, forming a platform which rests on the wooden sill of the window, and connected by rings at the back thereof is a tube, having an inner sliding tube, which, when extended, is kept so by a screw through the outer tube, or by studs at ends thereof, fixing into plates secured to window, thus forming a rod or bar across inside of window opening—a spring being enclosed and attached to the inner tube draws in same when released. *Patent completed.*

2186. J. T. P. NEWBON, T. SMITH, and J. BROWN. *An improved method of lifting and lowering ships' anchors.* Dated October 1, 1858.

The patentees employ a bevel or spur wheel for each anchor fixed vertically in openings made in the deck, and worked with one or more pinions with a connecting-rod or shaft if required. By arranging this handle or lever-rod as a socket-bar or a moveable capstan head for working each apparatus, it can be removed from out of its place on deck, and when not required the deck is disencumbered, and the socket holes into which the socket-bars or capstan heads are shipped may be fitted with flap covers or plugs. A friction-lever and brake is added. *Patent completed.*

2187. M. HIPP. *Improvements in electric telegraphs.* Dated October 1, 1858.

This consists in a novel application of the induction current, and differs from the systems hitherto used, in that the telegraphic signals are produced exclusively by the induction current at the moment of the primary circuit being broken, and that the induction current produced at the moment of the completion of the primary circuit only serves to increase or strengthen the effect of the former. *Patent completed.*

2188. J. W. WILKINS, and J. B. DUNN. *Improvements in constructing electric telegraph cables.* Dated Oct. 1, 1858.

The interior of this cable is made by the use of a helix produced by a narrow band or strip of copper. This helix is formed by bending the strip of metal on a cylindrical mandril. On this helix a coating of gutta-percha, &c., is applied, so as to produce a cylinder on which is placed a series of narrow strips of copper, the edges of which are kept separate and at a distance apart. These bands are bent spirally around the cylinder of insulating material, forming very long spirals, the strips of metal only slightly inclining to the central axis of the cable. Over these, gutta-percha, &c., is applied. To complete the cable a band or bands of hemp is bound around the last coating of insulating material. *Patent abandoned.*

2189. SIR E. BELCHER. *Improvements in the manufacture of telegraphic cables.* Dated October 1, 1858.

The interior conducting wires of the cable are first covered with beads of glass, porcelain, bitumen, resin, &c. The wires so covered are then passed through a fluid cement of resin, and are then immediately covered with a tube of gutta-percha, so as to retain the non-conducting cement in a fluid state within the tube of gutta-percha. The tube of gutta-percha may then be surrounded with animal or fish glue, and then by a coating of wire. *Patent abandoned.*

2190. T. PRESTON. *Improvements in the manufacture of looped fabrics.* Dated October 1, 1858.

According to this invention the lower guide bar has as

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many guides as there are needles, and it is caused constantly to lap over one needle first in one direction and then in the other. Another improvement consists in arranging the lower guide bar to be shogged or moved to the extent of two needles, and the guides are caused to lap first on one of such two needles at one course and then on the other needle for the next course. Another improvement consists in combining the use of printed or parti-coloured yarns or threads in knitting machines with the use of points to take off and change the loops from some of the needles to other of the needles of the machine. *Patent completed.*

2191. H. BRADBURY. *Improvements in producing printing surfaces from engraved plates.* Dated October 1, 1858.

This invention was described at page 257, No. 16 of the MECHANICS' MAGAZINE (New Series). *Patent abandoned.*

2192. J. ROGERS. *Improvements in submarine electric telegraph cables.* Dated Oct. 2, 1858.

Here the wire or strand of wires has laid round it, longitudinally, a number of plated bands of fibre, so as entirely to surround it, and the bands are secured to it by binding them round with twine. The whole is then covered by plaiting over it yarns or cords of fibrous material. *Patent completed.*

2193. L. D. OWEN. *Improvements in ploughs for digging up potatoes, and for other purposes.* (A communication.) Dated Oct. 2, 1858.

This consists in having the support or standard of the beam of the plough shaped so as to form a coulter, with a pointed foot, and on or to the point or front part of such foot the share is fixed by screws, and on or to the back part of the foot which usually forms the mould-plate or board-prongs arms are fixed or placed in a kind of conical form at a convenient distance apart, the centre prong or arm, or that which is the top from the ground, is supported by or on a projection on the standard made thereon, and is fastened to the standard, or to the mould or frame-plate, as may be desired. There are several modifications included. *Patent abandoned.*

2194. W. BRIERLEY. *Improvements in looms for weaving carpets and other fabrics.* Dated Oct. 2, 1858.

This relates chiefly to the weaving of Scotch carpets by power, and consists in so arranging and applying mechanism or apparatus in connection with a jacquard-machine as to render such looms self-acting in the production of the various figures or designs required in such fabrics. *Patent completed.*

2195. H. MONIER. *A new gas burner.* Dated Oct. 2, 1858.

This consists, 1, in using vitrifiable transparent materials for manufacturing gas and other burners. 2, in certain new forms and arrangements of the said burners, shown in the drawings, without reference to which the invention is not described. *Patent completed.*

2196. B. SAMUELSON. *Improvements in the wheels of carts and other carriages to be used on common roads.* Dated Oct. 2, 1858.

The patentee claims, 1, the construction of wheels to be used on common roads with bent wrought iron or steel spokes of hollow section, so placed that when the wheel is complete the flat convex external part of the spoke shall be next to the tyre, and the opposite hollow or concave part shall be toward the nave, the hollow form giving stiffness, and its position facility for riveting, and space for rivets of good size. 2, varying the angles of the spokes to the centre of axle by regulating pieces attached to the moulding-box, in which the nave is run upon the spokes. 3, the application of steel or steeled tyres to common road carriage wheels of this improved or any other construction. 4, the use of tyres which are hollow towards the nave, in connection with wrought iron or steel spokes; the stiffness of the wheel being, in this case, derived chiefly from the tyre itself, so that the form of the spokes is less material than when a tyre of the ordinary form is used. *Patent completed.*

2197. H. G. COLLINS. *Improvements in the production of blocks or surfaces to be used in printing.* Dated Oct. 2, 1858.

Here the drawing, device, &c., is obtained on a block or surface to be used in printing, from a drawing, device, or matter on a lithographic stone or other surface, whether the same has been produced thereon by hand, transferred, or otherwise, by subjecting the drawing, device, or matter on the lithographic stone or other surface to a series of processes similar to that in which a lithographic stone is inked when about to be printed from in the ordinary manner; but the ink or composition used is to be mixed with suitable driers, so that each succeeding coating of the composition may quickly dry or set before the next coating is applied. By these means the lines and parts constituting the drawing, device, &c., on the stone, which would be inked and printed from if used in the ordinary manner, becomes more and more built up or raised, and when such raising has been sufficiently accomplished a cast in wax or other suitable material is taken, from which an electrotype is obtained, as is well understood. *Patent completed.*

2198. J. C. and E. W. HOLMAN. *An improved pianoforte action.* Dated October 2, 1858.

According to this invention, which has reference chiefly to upright pianofortes, the "dampers" are placed so as to act immediately beneath the hammer heads, and are connected with the keys in such manner so as to afford greatly increased facility for adjustment, and to maintain the same weight of touch whether the loud pedal be in action or not. *Patent completed.*

2199. A. V. NEWTON. *An improved governor for marine and other steam engines.* (A communication.) Dated October 2, 1858.

This consists of a small steam-engine working independently of the engine whose speed is to be governed, and applied so as to drive certain mechanism which offers an unvarying resistance to its motion, and is combined with mechanism driven by the engine to be governed, the whole of the mechanism being so combined as to work a regulating valve, which controls the supply of steam to the last-named engine. *Patent abandoned.*

2200. S. STIMPSON. *An improved construction of faggot or fire-lighter.* Dated October 2, 1858.

To give the fabric increased stability, the inventor arranges the pieces of wood of which it is to be formed so that they will lock together somewhat like the stones of an arch, and thus integrant portions will have less tendency than heretofore to slip out of place when subject to rough handling. *Patent completed.*

2201. R. DOLBY and J. GATES. *An improved process of transfer printing, and ornamenting on glass and other transparent substances.* Dated October 4, 1858.

The inventors take a composition of boiled linseed oil and lamp black, and transfer it to the glass or other transparent substance, after which they coat it over with an enamel, cement, or other hardening material. *Patent abandoned.*

2202. L. A. NORMANDY, jun. *An improved apparatus for the prevention of boilers exploding from a deficiency of water.* (A communication.) Dated October 4, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

2203. L. A. NORMANDY, jun. *Improvements in the manufacture of sulphate of copper.* (A communication.) Dated October 4, 1858.

That which constitutes this invention is the solution of metallic copper, and the production of sulphate of copper by heat, and with apparatus consisting of a succession of tubes used in a peculiar manner. *Patent completed.*

2204. M. VAN PETEGHEM. *Improvements in looms for weaving figured fabrics.* (A communication.) Dated October 4, 1858.

This relates to an arrangement of the parts of looms for weaving figured fabrics, whereby reading off the pattern to be woven may be effected automatically in the loom itself during the process of weaving. The pattern to be woven is painted or printed upon a sheet of wire gauze or perforated metal with some substance of sufficient consistency to resist the push of a set of needles with which the meshes are successively brought into contact as it is caused to travel onwards. These needles are made to act upon a set of rocking levers, whose other extremities are connected with the warps. It will therefore be understood that, as the needles are presented to the wire gauze, those needles which do not come into contact with the pattern will pass through the meshes and remain inoperative, whilst those needles which do come into contact with the pattern will be thereby prevented from passing through the meshes, and will, by acting on their respective rocking levers, act upon and raise those warps required to form the pattern. *Patent abandoned.*

2205. F. TREVITHICK. *Improvements in applying sails and keels to boats and vessels.* Dated October 4, 1858.

The patentee constructs the sails of ships of strips of thin sheet metal, which he combines by chains or wire ropes stretched between yards or booms, and for fore and aft sails the strips of metal may be arranged in an upright position, and connected by chains or wire ropes, so as to wind round a revolving mast. In applying keels to boats fixed tubes are used at intervals, parallel with the centre or keel of flat-bottomed boats or vessels. Through these tubes chains or cords are passed, to which the keels are attached, and other cords or chains pass over the sides of the vessels which are also attached to the keels, and by which the keels may be lifted into the vessel, or be brought to act as lee-boards. *Patent completed.*

2206. J. MILLS. *Certain improvements in machinery or apparatus for roving, slubbing, or spinning cotton and other fibrous materials.* Dated Oct. 5, 1858.

This applies to "roving frames" and "slubbing frames," which machines (when used for flax) are sometimes called spinning frames, and consists in a novel arrangement and construction of the "bush" or support in which the spindles revolve, the improvement being effected by steadying the spindle from the outside of the bush, by attaching the "bobbing-braid" to an inner revolving bush, either by screws at the top or otherwise, leaving sufficient space between the outer and inner bush to prevent any friction of contact. *Patent completed.*

2207. A. BESSEMER. *Improvements in the manufacture of iron and steel, and in apparatuses to be employed therein.* Dated Oct. 5, 1858.

This invention is described and illustrated on another page of this Number. *Patent completed*

2208. C. E. OLDERSHAW. *An improved method of constructing electric telegraph cables.* Dated Oct. 5, 1858.

This consists in constructing telegraph cables so that they may be sufficiently buoyant as to remain at from about 100 ft. to 200 ft. below the surface of the ocean. The conducting wire or wires is or are first insulated with gutta-percha, &c.; round this is applied a layer or coating of cork, and the whole covered with two layers of cord in a spiral direction, the one layer being in reverse of the other. These fibres may be protected by tar, caoutchouc, or other protecting agent. To prevent the shore ends of the cable from resting upon the bottom of the sea, and being injured by friction upon the ground, a covered duct, tube, or channel is used at both ends, and carried sufficiently far from the shore to enable the cable to be suspended free from rocks, &c. *Patent abandoned.*

2209. W. MENELAUS. *Improvements in machinery for straightening rails and wrought-iron bars.* Dated Oct. 5, 1858.

This consists of a block or standard, carrying a bell crank lever, in which two or three rams, or sets of rams, are fitted, one ram or set of rams to act horizontally, and the other ram or set of rams to act vertically; and of an angular bar, in which the rail or bar to be straightened is supported. The bar rests upon, and is received against, two sets of bearings, each set being composed of two or more blocks, three being preferred. The rams are so placed, with respect to the blocks, as to work between them. At every stroke of the lever the two sets of rams are brought into action, and as fast as each portion of the bar is straightened it is pushed forward by the action of the machine, or otherwise, until its whole surface has been acted upon. The invention also consists in adjusting the stroke of the rams by means of screws, or other equivalent agents. *Patent completed.*

2210. M. HENRY. *Improvements in the means of or arrangements for working steam expansively.* (A communication.) Dated Oct. 5, 1858.

This consists in certain means for working steam expansively. Separate slide valves are employed for effecting the induction and eduction of the steam, which separate valves have such gear or appliances, and are so arranged and acted on, that they may be regulated independently of each other, and the induction may thus be controlled without interfering with the regulation of the eduction, and *vice versâ*. *Patent completed.*

2211. J. H. BROWN. *Improvements in the manufacture of projectiles.* Dated Oct. 5, 1858.

Here, in the manufacture of projectiles, the forward ends of which are conical or tapering, a conical or tapering internal passage is formed in each projectile, in which passage is made one, two, or more spiral internal projecting threads. These balls or projectiles have no surrounding grooves to receive the lubricating matters, but in place thereof two thin discs, by preference of metal, are used to each projectile, one against the base or hinder end of a projectile, and the other a short distance away therefrom. Between these discs the lubricating matters are placed, and over these, and also over the end of the projectile, a cap of properly-prepared paper or of properly-prepared animal skin is used. *Patent completed.*

2212. G. HAMILTON and W. H. NASH. *Improvements in locks.* Dated Oct. 5, 1858.

According to one part of this invention a lock is constructed of two or more discs, which turn around a common centre, and a portion of the circumference of each of the discs projects beyond the frame or case of the lock and serves as a bolt. A portion of the circumference of each of the discs is cut away, so that the discs may be all turned round into such a position that no portion of them projects behind the frame, and when they are in such a position the lock would be unlocked. The discs are placed at a distance apart from each other, so that the portion of each of the discs which projects beyond the frame when the lock is locked may fit into slots cut in the striking-plate or piece into which a bolt is ordinarily shot. Between the discs there are friction-plates, which keep the discs in any position in which they may be placed. A portion of each of the discs is cut away at the centre, and projections on a key enter the spaces so formed, which projections act on the discs and move them round into such a position that no portion of their circumference projects beyond the frame when the key is turned into a certain position. *Patent completed.*

2213. J. H. BROWN. *Improvements in the manufacture of cartridges.* Dated Oct. 5, 1858.

In this invention cases are made of a slightly-conical form, of paper, or of other material, so as to be shaped into thin tubes. The diameter of the lower part of the tubes is made to agree with the bore of the gun. The tubular cases are of such strength as to admit of the contents being forced through by a ramrod into the gun, when the lower end of the cartridge is introduced into the muzzle of a gun or fire-arm. The balls are placed in the upper ends of the lining or inner cases upon the powder, where they fit tightly, but readily admit of being forced inwards by the ramrod. When the ramrod presses a ball into its case, it opens the closed end of the lining or inner case, and the powder and ball are forced into the barrel free from the case and lining. *Patent completed.*

2214. J. MILNES. *Improvements in weaving fabrics where cross-weaving is employed.* Dated October 5, 1858.

This relates to a former patent granted to E. Heywood. The present improvements consist in combining the use of Jacquard, or perforated cards, or chain of pins or pegs with such description of looms, in order that such looms may be caused to work for any desired length of time to produce cross-weaving, and then, by reason of the perforated cards, or chain or pegs, to change the character of weavings produced, and to combine the working of the loom for such change of weavings of any desired length of time; then again to change back to the weaving of cross weaving, and so on, according to design, the perforated cards or pattern surfaces being suitably arranged to produce the extent of cross-weavings and other weaving which shall be produced in succession. The "take up" of the looms is arranged so that when the looms are working to produce cross-weavings, the speed of the "take up" shall be greater than when making to produce other weavings, so that more picks of weft may be thrown in when not making cross-weavings. And such changes in the "take up" come into action by the working of the looms at the times when the classes of weavings are changed. *Patent abandoned.*

2215. G. LOVETT. *Improvements in portable apparatus for administering hot air, vapour, and shower-baths.* Dated October 5, 1858.

The vapour and shower-baths being usually administered in close succession, the inventor constructs the apparatus so that the patient may receive them both at one sitting. *Patent abandoned.*

2216. M. JACOBY and F. R. ENSOR. *Improvements in the manufacture of bobbin-net, or twist lace, and other fabrics made in twist lace machines.* Dated Oct. 5, 1858.

This is applicable, 1, in the manufacture of breadths of twist lace, and other fabrics, with scolloped edges; 2, when making breadths of twist lace with pure edges. To make scolloped edges to breadths of fabrics made in twist-lace machines, the carriage threads, which go to make the scollops, are arranged to work so that they may, as the width of work decreases when making scollops, be progressively moved towards the opposite selvages of the breadth, and work in the other parts of the work, or be otherwise employed; and again, as the width of the work increases in making a scollop, the carriage threads, which go to make the scollops, are progressively brought into the scollops, and so that when making the widest work the carriages are ranged to act with their warp threads, as a single tier of carriages regularly spaced with their warp threads. *Patent completed.*

2217. J. LUIS. *A new method of joining sheet-iron, cast-iron, gutta-percha, and other tubes, by means of muffles.* (A communication.) Dated October 6, 1858.

This invention is not described apart from the drawings. *Patent completed.*

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2218. G. HEPPELL. *Improvements in the construction of boilers, furnaces, and flues.* Dated October 6, 1858.

The inventor proposes to have one boiler, which he calls the steam-generating boiler, and another completely enveloping or encasing the former, which he calls the heating boiler. His arrangement is, therefore, to have the inner or steam-generating boiler heated by contact with the water and steam in the outer boiler, which in its turn is heated by peculiarly-arranged furnaces. *Patent abandoned.*

2219. G. COLLIER. *Improvements in winding machines.* Dated October 6, 1858.

The object here is to obtain a uniform speed to the yarn or thread in laying it on to the bobbins, pins, or such like forms. The patentee gives a varying speed to the driving cylinder or cylinders, to drive such cylinder or cylinders faster when the yarn or thread is being wound on to the smaller part of the required form, and slower when being wound on to the larger part. *Patent completed.*

2220. M. HARNETT. *Improvements in preventing incrustation in steam-boilers.* (A communication.) Dated Oct. 6, 1858.

This consists in introducing oil, or oleaginous matter of any kind in a liquid state into the interior of steam boilers or generators, whereby the incrustation, so injurious to boilers, is effectually prevented. *Patent abandoned.*

2221. C. HILL. *Improvements in omnibuses and in apparatus for upholding the windows of omnibuses, and other carriages.* Dated October 6, 1858.

The patentee applies a raised footpath from end to end of an omnibus, the space below such footpath being open or clear for the feet of the passengers occupying seats. That the window of an omnibus, &c., may be upheld in any desired position, a strap is fixed thereto at its lower end as heretofore. This strap passes over a roller, and under an eccentric which turns on suitable necks or axes. This eccentric is grooved or roughed where it comes in contact with the upper surface of the strap, so that the weight of the window when partly raised will by drawing on the eccentric surface cause it to press the strap strongly between its surface and the surface of the roller below, and thus securely uphold the window. *Patent completed.*

2222. J. RIDSDALE. *An improved reservoir or fountain pen.* Dated October 6, 1858.

This consists mainly in adapting a flexible tube to a metal or similar tube or penholder, so that the end of the flexible tube nearest the pen shall be drawn to a small or capillary bore, and the other end of the said tube be hermetically sealed. On squeezing the tube, so as to compress it throughout, or nearly throughout its length, the contained air will be pressed out, in which state if the pen be dipped into ink until the open end of the tube touches its surface and pressure is removed, a certain quantity of ink will be raised into the tube by atmospheric pressure as the elastic tube expands to its accustomed size and bore. Another metal or other like tube may be slipped over the exposed top portion of the flexible tube, and slid on to the penholder, so as to lengthen it and render it more convenient for use; and a portion of the metal tube may be cut away sufficient to allow the fore-finger to press on the flexible tube to force a flow of ink when desired. *Patent completed.*

2223. W. MALAM. *Improvements in apparatuses for the manufacture of gas.* Dated October 6, 1858.

This consists in a new arrangement of apparatuses for the manufacture of gas from oils and grease, alone, or combined with gas from coal or other like carbonaceous materials. Over a fire, protected by fire-lumps, the patentee places two retorts into which oil is fed through gauze tubes from above. Over these retorts in a chamber he places coke, and above this chamber he fits a vessel containing fat or grease. Flues from the furnace at the bottom of the apparatus surround the coke chamber and grease vessel. The gas generated from the fat or grease is made to descend and mix with that from the oil, and is passed through one or more strata of cleansing material. Instead of coke ordinary coal may be placed in the coke chamber, when it becomes an ordinary retort, and the gas generated from the coal may be mixed or not with that from the oil and grease. *Patent completed.*

2224. D. SCATTERGOOD and R. W. SMITH. *Improvements in machinery for the manufacture of looped fabrics.* Dated October 6, 1858.

The object here is the construction of straight hosiery frames for making plain and ribbed selvage work, whereby more speed in working is obtained than heretofore, and the frame is less costly, and less liable to get out of order than the ordinary hosiery frames. *Patent completed.*

2225. C. BAYLIS. *An improved mode of constructing and arranging underground chambers in populous cities or towns for the reception of gas and water-pipes, and telegraph wires.* Dated October 6, 1858.

These underground chambers are composed of lengths of cast iron or other tubing of any suitable or convenient size and form, and joined together at their ends so as to form a continuous chamber or gallery in which openings are made at top, either in all the lengths of tubing or at such convenient intervals as may be desired. *Patent completed.*

2226. D. NICOLL. *Improvements in the manufacture of cloaks and other garments, and for their application to purposes to which they have not hitherto been applied.* Dated October 7, 1858.

This consists, 1, in manufacturing cloth by power or by hand looms for cloaks and other garments in separate circular forms or webs with a finished edge, selvage, or border. 2, In cutting these and other garments by steel stamps or knives actuated by the pressure of a heavy weight or spring. 3, In the application of these garments to purposes of covering in lieu of tents in the field. 4, In the application to cloaks and other garments of strong stays composed of flax or some strong fibre, such stays to be either introduced in the process of weaving the circular forms or webs of cloth, or subsequently by being attached to the same and in parts where additional strength is required to resist pressure. *Patent completed.*

2227. C. H. THURNHAM. *Improvements in the construction and application of certain mechanical arrangements to be adapted to the wheels of locomotives, carriages, and other vehicles for facilitating their traction and draught.* Dated October 7, 1858.

This consists in a peculiarly-constructed ring which can be slipped over the tyre of the ordinary wheels of vehicles of every description, and is retained in its situation by being channelled so that the carriage wheel can work therein, and while itself rotating, will rotate the external ring, which thus becomes a kind of annular railway or tramway for the several wheels of vehicles thus provided to travel upon. *Patent abandoned.*

2228. E. J. SEYD and J. W. N. BREWER. *An improvement in the preparation of paper to render writing thereon indelible.* Dated Oct. 7, 1858.

This refers to a preparation of paper by applying to it an aqueous solution of ferrocyanide of potassium, which paper so prepared, when dry, and written on with common writing ink, renders such writing indelible. *Patent abandoned.*

2229. J. C. NOUVIAT. *Improvements in stopping or stoppering bottles and other vessels containing non-gaseous liquids.* Dated Oct. 7, 1858.

The patentee employs a stoppering cap which is fitted to the bottle or vessel, and is provided with such arrangements as to keep the contents of such bottle or vessel hermetically closed, but which arrangements are so contrived that, when it is desired to pour out the contents, atmospheric air may be caused, without having to detach the cap, to communicate with and exert pressure on the liquid, so as to balance the pressure of the atmosphere on the spout or exit, and permit the outflow. *Patent completed.*

2230. D. NAYLOR. *Improvements in looms for weaving carpets and other fabrics, and in the methods of manufacturing the same.* Dated October 7, 1858.

This consists, 1, in employing in connection with the Jacquard apparatus a series of shuttle-boxes at each end of the slay or lathe, which are governed in their motion by suitable hooks acted upon by the cards; 2, in a double weft motion, the forks of which are near each end of the reed, and placed at right angles with the slay or lathe; 3, in forming the picking shafts of two or more parts, which can be disconnected as required by hooks and pattern cards, thus making the pickers perfectly independent of each other, and providing the means of allowing one to be stationary while the other is working, or putting them both out of gear when the pattern is adjusted; 4, in employing edging levers with projections above and below for guiding the wefts and regulating the selvages of the cloth, the said levers being governed in their action by hooks and pattern cards; 5, in attaching to the stop-rod certain inclined or cam-formed levers which act against studs or rollers in order to prevent any pressure on the swells at the time of picking; 6, in causing the catch of the ratchet-wheel to be lifted off by a hook and cards, or connecting it with the stopping apparatus, so that the pattern of the cloth or carpet may be varied, or the ratchet-wheel stopped when separate motion is required, either for the loom or Jacquard apparatus; 7, in employing wires, cords, or strips for preventing the numerous threads of weft from entanglement, in making grooves in the Jacquard cylinder, and placing in them bands of gut, &c., connected to elastic bands or springs to obtain the certainty of throwing off the card when it has done its work; and also in furnishing each shuttle with one or more extra drag pins, and delivering the yarn at the bottom instead of through an eyelet in the side; 8, in forming an improved texture of cloth or carpet by picking one pick of ground and one pick of colour, both of which are governed by two cards, another card being employed for raising the shed of the warp in two equal heads, so as to be able to throw a pick of wadding, yarn, or other material between the two cloths, and thus bind them together. *Patent completed.*

2231. N. FELLOWS. *Improvements in tea-kettles and other like domestic vessels.* Dated October 7, 1858.

This consists in forming the bottom of tea-kettles, &c., concave, and carrying a pipe from the bottom through the body of the vessel and out at the side or top thereof, so as to form a flue or flues through which flame and heat may pass, thereby presenting a large heating surface and preventing the kettle, &c., choaking the fire. *Patent abandoned.*

2232. F. RANSOME. *Improvements in preserving wood.* Dated October 7, 1858.

Here the wood is either coated or impregnated with a solution of silicate of soda or potash, and then with a solution of chloride of calcium, or with a solution of chloride or other soluble acid salt of iron, copper, zinc, lead, or barium. *Patent abandoned.*

2233. E. R. HANDCOCK. *Certain improvements in machinery applicable to engines to be worked by steam and other motive power.* Dated October 7, 1858.

This invention is said to consist in changing a rectilinear into a circular motion without dispensing with the crank action or its use. *Patent abandoned.*

2234. J. LUIS. *A new cutting and stamping press.* (A communication.) Dated October 8, 1858.

The principles upon which this invention rests are, 1, on the screw and nut being placed inside the piston or running box; 2, on the piston being guided internally and externally by the eye of the frame or cage and by the nut; 3, on the nut depending on the eye or fixed in the eye; 4, on the suppression of all the tie-pieces, braces, &c., fixed on the frame for guiding the piston. The presses, punches, &c., vary in size and form according to the use to which they are to be applied. The eye, whatever be the size, strength, or use the press is intended for, is composed of but one frame, either of cast iron or other metal; and adapted to this are, first, the nut either formed with the eye or adapted to it; second, the piston; third, the screw; fourth, the cap round stop-bar or springs for raising the piston. The invention is not described apart from the drawings. *Patent completed.*

2235. J. LEITCH. *An improved method of constructing fire-arms.* Dated October 8, 1858.

The inventor constructs the barrel and breech of the gun much in the ordinary way, except that the back end of the breech is bored entirely through, the back being closed by a cylindrical metal plug larger in diameter than the bore, placed with its axis at right angles with the barrel of the gun. The upper side of the plug has a channel grooved through it to allow the charge to be inserted through the back end of the breech, when, by turning the plug a quarter round, the cylindrical surface of the plug is presented to and closes the back end of the breech. Its action somewhat resembles that of a common water-tap. The connection of the barrel with the breech not being disturbed, a gun so constructed may be used indiscriminately either as a muzzle or a breech-loading fire-arm. *Patent abandoned.*

2236. E. V. RIPPINGILLE. *The improvements of fire-arms and artillery.* Dated October 8, 1858.

This invention is not fully described apart from the drawings. *Patent completed.*

2237. T. WALLER. *Improvements in stoves and fire-places for the prevention of smoke and the better ventilation of apartments.* Dated October 8, 1858.

This consists in admitting streams of atmospheric air through slots or apertures formed in the sides or backs of stoves or fire-grates just above the incandescent fuel, and of constructing the sides of the grates or stoves so that the rising smoke shall be caused to impinge thereon, and be intermixed with atmospheric air, whereby most of the products of combustion will be converted into flame, and the production of opaque smoke be prevented. *Patent abandoned.*

2238. J. and H. MITCHELL, and T. ENGLAND. *Improvements in means, machinery, or apparatus employed in spinning wool, mohair, alpaca, silk, and other fibrous substances.* Dated October 8, 1858.

This relates, 1, to spinning mottled yarns, made by combining two rovings of different colours, which are drawn simultaneously, and spun together, and that the proportions of such colours may be varied and still have the rovings from which they are made or spun of equal thickness, the patentees employ an additional pair of "back rollers," each pair being driven independently of the other pair, which, by change gear, they can vary in relative speeds. 2. The invention relates to combining long and short wools in the same yarn, and consists in having the framing or stands which carry the aforesaid two pairs of back rollers so arranged that each pair can be set or adjusted to the particular length of staple or length of fibre of each sort or substance. *Patent completed.*

2239. R. SEARLE. *Improvements in insulating and preserving and laying submarine and other telegraphic wires or cables.* Dated October 8, 1858.

This consists, 1, in the application of caoutchouc, wood, cork, or cork wood, for insulating the insulator of submarine telegraphic cables. 2, In the application of the before mentioned substances, or any of them, for reducing the specific gravity of submarine telegraphic cables. 3, In the application of the before mentioned substances, or any of them, as buoys for sinking or sustaining submarine telegraphic cables. 4, In the application of tubes composed of metallic wire, whether spiral or otherwise, in covering and protecting submarine or other telegraphic cables. *Patent abandoned.*

2240. A. NICHOLLS and T. WALKER. *An improved spring-hook, catch or fastening.* Dated October 8, 1858.

This consists in so shaping and arranging one piece of metal (say steel) to act as a spring when doubled or bent about the middle, and having the one end so formed as to lap slightly over the other, and thereby making a spring hook, catch, or fastening, which is applicable as a spring hook and eye when employed in securing wearing apparel. *Patent completed.*

2241. W. A. MUNN. *Improvements in horse-hoes.* Dated October 8, 1858.

This consists of an apparatus for thinning young growing crops by rotary knives, cleansing them from insects, and destroying such insects by rotary brushes and rollers combined with an ordinary horse-hoe, and which admits of the said several processes of thinning, cleansing, and ordinary hoeing being carried on simultaneously or separately. The invention is particularly applicable to the cultivation of turnips. *Patent completed.*

2242. T. ROBERTS and J. DALE. *An improved process for obtaining salts of soda and other alkalies.* Dated Oct. 8, 1858.

This consists in a method of producing nitrate, arseniate, and stannate of soda or potash or other alkalies. And the process for producing nitrates of the alkalies consists in passing the nitrogenous gases evolved in the manufacture of arsenic acid from nitric acid and arsenious acid, and this the patentees effect by pouring upon arsenious acid a quantity of nitric acid, sufficient to convert the arsenious acid into arsenic acid. The evolved nitrogenous gases are made to pass into the alkalies or their carbonates, but they prefer to use the alkalies in the caustic state. The vessel containing the alkalies is provided with agitators, so as more effectually to mingle the nitrogenous gases with the alkaline solution; or they pass the nitrogenous gases into a tower, through which is made to flow the alkalies in question, whereby they produce nitrates of the alkalies employed. It also consists in a method of producing arseniates of soda, potash, or other alkalies, and this they effect in the manner following:—They take chloride of sodium, chloride of potassium, or chloride of ammonium in a suitable vessel and add to any such chloride so much arsenic acid in solution as shall be sufficient to decompose these chlorides, whereby they obtain arseniates of the alkalies employed and solutions of muriatic acid, or they take nitrates of the alkalies, whereby they obtain arseniates of the alkalies and liberated nitric acid. It also consists in obtaining the salt known as stannate of soda, by taking metallic tin, to which they add a solution of caustic potash or soda. These are brought up to the boiling point in an iron vessel. They now add so much nitrate of soda as shall be sufficient to effect the solution of the tin. The metallic tin is rapidly oxidised by the decomposition of the nitrate employed, whereby is produced stannic acid, and ammonia. The ammonia is collected or conducted into arsenic acid, and the stannic acid combining with the soda or other alkali, produces stannite of such alkalies. There are various modifications included. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, MAY 20, 1859.

THE IRON STEAM FRIGATES OR RAMS.

It is now decided that the Thames Iron Company is to build the first of the huge iron-coated steam frigates or rams for the Royal Navy. The design selected by the Lords of the Admiralty was prepared by the Surveyor of the Navy at the beginning of the present year, before the competing designs lately submitted to them were sent in. It is due, however, to Mr. Scott Russell to say that he had previously placed a design in the hands of the Admiralty; but with the details of this we are not at present acquainted. We have on former occasions spoken of the marked ability with which the construction department of the Surveyor of the Navy's office is conducted. One or two facts connected with the design for the singular ship now about to be built may be cited in confirmation of this view.

No less than fifteen designs were submitted to the Admiralty, by Messrs. Laird, Mare, Napier, Palmer, Scott Russell, Samuda, Thames Iron Company, Westwood and Baillie, and the Master Shipwrights of Her Majesty's dockyards. The only conditions stipulated for were that the ship should carry 36 guns, with certain men and provisions for four months, should travel at 14 knots per hour, and should be covered over a certain portion of its length with 4½ in. iron, backed by two feet of solid timber. All other elements, such as dimensions, horse-power, &c., were left entirely to the discretion of the designers. And strangely indeed did these gentlemen differ from each other in their ideas of what these undetermined elements were required to be! We are not at liberty to publish an analytical statement of the elements of the whole; but we may mention some of the extremes between which certain measurements of the several designs ranged. While the length, for example, of the least was 340 feet, the length of the greatest was no less than 430 feet. The breadths varied between 52 feet and 60 feet; the draughts of water between 21 feet 9 in. and 26 feet 6 in; the horse-power between 1,000 and 1,800; and the tons burthen between 4,887 and 7,544! In order to afford to the shipbuilder some clue as to the kind of structures proposed, we may also add that the proportions of the weight of hull per ton (exclusive of armour plates) to the burthen in tons, ranged between ·48 and ·86.

Now, the curious fact to be noted, and one which speaks so strongly in favour of the Admiralty constructors, is this—that their design, which was prepared, as we have said, *before* the others, turns out to be, in all her principal elements, as nearly as possible *a mean of all the other designs*. That is to say, if the *average* length of all the other designs be taken you get her length, which is 380 feet; if their average breadth be taken you get her breadth, which is 58 feet; if their average displacement be taken you get her displacement; if their average horses-power be taken you get her horse-power, which is 1,250. The average quantities obtained are not, of course, exactly her's in any case; but they are so nearly her's as to fully justify the view of the facts here presented.

These facts, it will be admitted, although they demonstrate nothing, serve nevertheless to indicate both the skill and the care exercised in the construction of our ships of war. It should be remembered, moreover, that the design in question was for a ship of an altogether novel character; on this account the department deserves the greater commendation. It would be well, indeed, for the country if in all our public departments the ability of the servants of the Crown were found to bear so severe a comparison with the private talent of the country with so much honour to itself.

GOVERNMENT ELECTRIC TELEGRAPHS.

THE electric telegraph is an agency which has not been altogether neglected by British Governments. Some small use was made of it during the late Crimean war; and in the more recent war in India it has unquestionably been turned to good account. But that any Administration has yet sufficiently comprehended the advantages which are to be gained by its means, or has sought to secure all those advantages for the country, we must entirely deny. Even as an auxiliary to the defence of this island, for which it is so eminently applicable, how little has it been yet adopted? The Government have under their own control one pair of wires putting them in instant communication with Woolwich, Chatham, Sheerness, and Deal; and they have another pair extending to Portsmouth and Gosport, from which a branch is led off to Aldershot; and these are all which belong exclusively to them. On the other hand, notwithstanding all our talk of coast defences, there is no direct electric telegraphic communication whatever between such places as Brighton and Portsmouth, Dorchester and Exeter, and so forth. Yet what could possibly be more necessary, in case of our coasts being menaced, than a continuous chain of telegraphs along our shores, connected at all points with the seat of Government?

If we turn our eyes to our possessions abroad, the facts are no more cheering. Up to this moment successive Governments have utterly neglected to put us in direct and independent telegraphic communication even with Gibraltar and Malta—important as those possessions are, and seriously as they would be endangered by some of those naval combinations of which we have lately heard so much! View the matter with as much lenience as we may, it is still manifest that submarine telegraphs to such places as these have become as essential to the security of our possessions as fleets and armies themselves, and that every hour of inaction in respect to them is attended by terrible responsibilities. It is little less than sheer fatuity to rely upon despatch vessels, and other like means of communication in this day, with an instrument like the electric telegraph in our hands. It is not less absurd to trust, as we are now trusting, to lines of telegraph which are as much in the hands of those who may any day become our enemies as in our own.

What appears to us to be necessary is, the instant establishment of a Government Department designed expressly and exclusively to work out and put in operation a system of electric telegraph communication, either apart altogether from commercial undertakings of a like nature, or in some prudent connection with them. A permanent staff of telegraphic engineers is henceforth, we submit, indispensable. Hitherto the practice has been to take private persons into temporary employment under the Government, and then to dismiss them whenever it has been thought convenient. We need not say that no kind of Government work can be done well or economically under such a system as this. There must be security, there must be permanence, in all such occupations; and in none more than that of which we are now speaking, because there is no occupation in which experience, and the skill which springs from it, are more indispensably necessary.

These suggestions are made in the earnest hope that something useful and reliable may be attempted in the shape of a Government organization without delay. We refrain from entering into considerations of cost, and matters of that kind, for fear of encumbering a very simple but, as we believe, important suggestion with needless details. The only hint of the kind that we will here venture to give is a recommendation to the Government to see, in laying down cables of their own, that efficiency is not sacrificed by excessive economy in the construction of their submarine cables. The cable from Malta to Corfu, for example, is much too fragile. One eminent electrical engineer informs us that £150 a mile should be spent on a cable for connecting our shores with our Mediterranean possessions, and that for this a cable excellent in all respects for the purpose could be produced. Another mentions a much lower amount per mile as sufficient. But whether it cost little or much this cable in particular should be made and laid down without delay.

SIR WILLIAM ARMSTRONG'S SPEECH.

SOME of our friends are expecting from us, we are informed, a somewhat severe comment upon Sir William Armstrong's late speech at Newcastle. But, unfortunately, we are not in the least angry with Sir William for what he said, and therefore we really do not see how we are to satisfy their expectations. It is quite true that Sir William fell into an error or two, and thus seemed to bear rather hardly upon us in one or two of his remarks. He makes, for example, a statement respecting the manner in which his gun is loaded, in which he very solemnly misrepresents us, as will be seen if we bring an extract from our Magazine by the side of his observations, thus:—

Sir William Armstrong's Speech, May 10, 1859.

"All the writers who have undertaken to give information upon this gun have spoken of a large screw working in the breech end of the gun, and pressing against a stopper for the purpose of closing the bore when the gun is loaded; but they all ignore the fact of that screw being a hollow screw, or they have misunderstood the purpose of its being so. There can be no secret about a process which is now daily performed; *the guns are both sponged and loaded through the hollow screw*, and it is a great mistake to say that the charge, or shot, or sponge can be introduced by the narrow slot or opening which is spoken of as receiving the stopper."

MECHANICS' MAGAZINE, *March 6, 1859.*

"We find that in the Armstrong Gun, as now made, *the large screw at the breech is formed hollow, and the charge is passed into the gun through it.* With this arrangement, the moveable breech-piece is only required to close the breech and receive the force of the explosion. Both the slot and the breech-piece are, therefore, smaller than they would require to be were the gun loaded through the slot."

Sir William does not speak of any variation in his practice in respect to this part of his gun, as he might have spoken. Again, he is certainly guilty of a little want of candour when he says the "stopper" is chained to the gun "to prevent the possibility of its being lost by casualty"—omitting to say that recourse was only had to this contrivance after one "stopper" had been blown away, and was never found more. Perhaps if Sir William had been disposed to speak all he knew and felt he would have also told his audience that but for the article in the MECHANICS' MAGAZINE he would never have opened his mouth in public at all about the con-

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struction of his gun. But we could scarcely expect him to do this, as part of his business in making this speech may have been to lead the public on a wrong scent.

But these are considerations which we do not feel at all disposed to urge unduly. Sir William has spoken, and to a certain extent has spoken satisfactorily; and notwithstanding the points to which we have referred, we give him credit for having indulged in nothing splenetic or rancorous. It would be wrong to charge him with purposed misrepresentation even in the passage above quoted. For aught we know he may never have seen the particular paragraph in our Magazine which we have placed by the side of it. Sir William has had something else—and, we do not scruple to say, something better—to do for the last three months than to watch and scrutinize all that we and others have had to say respecting his invention. He is a man of action—pre-eminently so just now—and we, like all other writers, are, in our editorial capacity at least but men of words; and we have no desire to swell our work into undue importance. It has not been for the information, or even for the perusal, of Sir William, that we have written from time to time upon his gun—of which, we honestly confess, we are becoming somewhat weary. If we have enlightened those who, but for us, would have known nothing on this subject, we are quite content.

There is one very satisfactory feature about Sir William's speech, to which we would for a moment refer. Sir William is very confident of the powers of his gun and projectiles. He is an honourable man, and this confidence of his—making all due allowances for his position—is very re-assuring. Let us hope for the best.

ON TIMBER FOR SHIPBUILDING.

FROM the Paper read before the Society of Arts last week, by Mr. Leonard Wray, it appears that the aggregate tonnage (register tonnage, we presume) of the merchant shipping of the United Kingdom was last year 4,325,242 tons; and that of the Royal Navy is certainly not less than 1,000,000 tons more. When we consider that a very large proportion of these vessels are built entirely of wood, and that in twenty years at the farthest these magnificent fleets will have fallen into decay and disappeared, we may well view with interest any attempt to point out the means of increasing the durability of the materials of which they are composed, or obtaining fresh supplies for their constant reconstruction. In addition to the demands made for timber for these purposes, it appears, from an estimate which enters with considerable minuteness into detail, that ten times as much is required for the construction and repair of buildings, implements of husbandry, machinery, canals, bridges, docks, &c.

The proportion of this vast amount of timber material which could by any possibility be grown on our own soil is very small. It was found in 1816, when the demand was more limited and our stock of timber much greater than now, that the cost of timber imported was equal to the value of that grown on the soil; and since this time the deficiency in the home supply has been constantly increasing. We have seen ships standing week after week, and month after month, in our Royal Dockyards, while the purveyors were out in the forests endeavouring to find suitable timber, not only for stems and stern posts, and other principal portions of the frame, but even for the catheads from which the anchors were to hang; and any one may see by a visit to our dockyards with what difficulty the frames of ships now on the Government slips are obtained, and how greatly the amount of work on them is increased by the chocking and patching to which the builders have to resort. But we are beginning to be reconciled to this state of things, and to look forward with some degree of complacency to the time when our little island must cease altogether to supply her hearts of oak to furnish homes for her seamen. The bare possibility of such a catastrophe was viewed by our forefathers with horror. We find Henry VIII. passing stringent laws for the preservation of timber, "perceiving and right well knowing the "great decay of timber and wood universally "within the realm of England." By Elizabeth it was enacted that if any idle person cut or spoiled any wood or underwood, pales, or trees standing, and could not pay the satisfaction required, they were to be whipped. Receivers of such wood, knowing it to be so, incurred the same punishment. The 15th of Charles II., cap. 2, is an act to render that of Elizabeth more effective; and it enacts further punishment, because the destruction of wood tends to destroy the commonwealth. It is therein declared, that the officers of justice may apprehend even on suspicion of having carried, or in any way conveyed any burden or bundle of wood of any kind, underwood, poles, young trees, bark, or bast of any tree, gate, stile, post, rail, hedgerow wood, broom, or furze. For the first offence, on conviction, to be fined at the discretion of the justice, not exceeding ten pounds; or be sent to the house of correction for any time not exceeding one month; or be whipped. For the second offence the offender was to be sent to the house of correction for one month; for the third he was to be deemed an incorrigible rogue. In Scotland it was enacted in the reign of James I. that every heritor worth one thousand pounds of yearly valued rent, was to enclose four acres of land yearly, at least, and plant the same about with trees of oak, elm, ash, plane, willow, or other timber, at three yards' distance; and that all other heritors were to enclose and plant for the space of ten years in proportion to their yearly rental. Such enclosed lands were to be free from all taxes whatever, or quartering of horses, for nineteen years. Any person destroying timber not being their own property, were to pay £20 for each tree, or work six weeks for the person injured for their meat and drink only. Similar laws were passed for Ireland in the reign of William III., besides which it was required that 260,600 trees should be planted in the kingdom under the direction of the parish officers. And by George III. it was enacted for Ireland that any person who should have in his possession any timber tree, or any kind of wood, pole, stick, &c., and could not give a satisfactory account of how he became possessed of the same, or should stick up branches or shrubs of trees having the leaves on them, in any church, chapel, &c., holly, bay, yew, or laurustinus, and should be convicted on oath, should pay a fine not exceeding £5, or be imprisoned not exceeding six months.

In our own times we sometimes hear enthusiasts proposing to compel railway companies to plant oak trees along the lines, and to take other active means for staving off the threatened calamity; but people seem generally prepared to accept it with resignation. One cause of this probably is, that the comparative cheapness of foreign timber has brought it into very general use, and another that iron has taken the place of wood so largely. This latter cause holds with regard to ship-building timber, not only on account of the large present consumption of iron, but from our faith in its powers, and in the vastness of our store should we be driven to its nearly exclusive use.

Mr. Wray has, however, done well in the very interesting paper which will be found in another part of this Number, in bringing under the notice of ship-builders numerous valuable woods of which no use has hitherto been made. In addition to those given by him, we believe there is excellent timber, perfectly accessible, on the Atlantic seaboard of Brazil. There is in particular the *Secupira preta*, the growth of which is very crooked. Its weight is said to be from fifty-eight to fifty-nine lbs. per cubic foot, *i.e.*, slightly greater than that of English oak; the grain is curly, and not liable to split with fastening. It is used by the Brazilian Government in the construction of their vessels, especially in the curved parts of the frames. There is a frigate belonging to that government, called the Prince, now in use as a sheer hulk in the harbour of Rio de Janeiro, which was built of this wood forty years ago, and is reported to be in good preservation. The *Secupira preta* can be obtained in abundance at Alagoas, a place near Pernambuco, which is a seaport and a mail station. There is another very crooked and useful wood, called *Pao d'arco*, or arch wood, weighing fifty-five and a-half lbs. to the foot, and growing at Bahia, also on the sea-coast; and another, *Canella preta*, still lighter—about fifty and a-half lbs. to the foot—but equally durable, and grown on the southern portions of their seaboard. When we consider the cost of English oak—as much as 9s. per cubic foot of the largest sizes—its great scarcity, involving serious delays in the construction of ships, and much costly and clumsy patching, we think it high time that the Government took steps towards introducing some foreign timber for the frames of our ships-of-war. In the merchant service—as may be seen from Mr. Wray's paper—several kinds of foreign timber are admitted on equal terms with English oak. In the Government service it is not so. If we except Polish and Italian larches and Pitch-pine, which are occasionally admitted in small quantities, the *frames* of all ships built in the home yards are of English or Italian oak. We do not believe there is the least necessity for this—but that on the contrary, there are many and unanswerable reasons for discontinuing the use of oak timber of home growth, at least in the *frames* of ships, altogether. The feeling is, however, so strong in favour of English oak, that merchant builders still employ it largely, though in the majority of cases they pay dearly for it—for the timber which they can afford to use is small, and, to a great extent, spring-felled and unseasoned, and therefore subject to early and rapid decay.

It was our intention, had space permitted, to go into the question of the preservation of timber. We know something of the specifics which have been received into favour at different periods of our naval history, and we quite dissent from Mr. Wray's statement, that there are "simple, well-known remedies" for the prevention of dry-rot. That he is right, however, in predicting that dry-rot will make swift havoc in the newly-converted steam-ships we think probable, and we purpose taking an early opportunity for considering the question. In the meantime, if Mr. Wray, or any of our readers have any well-authenticated experiments on the preservation of the frames of ships by the application of antidotes to dry and wet rot, we shall be very glad to consider them, and to lay them before our readers.

OUR SILVER COINAGE.

IT has been demonstrated in previous articles on the state of the British Coinage that there exist great defects in it, and that the let-it-alone tendency of the public—so notoriously characteristic of the English—has permitted the

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copper coinage especially to degenerate until it has become a positive nuisance. It is now our purpose to refer to the silver coinage of the kingdom, and to urge the Government to adopt such improvements therein as shall ensure the advantage of a circulation of legible coins, instead of the plain and polished discs which at present slip through the fingers of shopkeepers, and require a stretch of credulity to make one believe that they ever bore a Mint mark at all. It is, as we have previously stated, a fact that £10,000 are voted every year for the purchase of worn silver coins, and that pieces to that value, of the various denominations, pass yearly through the melting-pots of H. M. Mint, to be re-issued in the form of newly-struck money. It is equally a fact, nevertheless, that this renewal does not keep pace with the rapid deterioration constantly going on. The wear and tear of the hardworked sixpence, for instance, is enormous. It is the medium useful coin, which is allowed no respite from its duty, but is compelled to move unceasingly. The percentage of worn sixpences annually consigned to the Mint crucibles is far higher than that of any other coin.

So far as this amount of annual exchange goes, the evil of which we complain is met; but it is unfortunately a remedy quite unequal to the disorder. Our silver currency, in spite of the infusion of £10,000 worth of new coins yearly, is growing gradually worse and worse, and the bad consequences attending this state of things increase hourly. It is not of the direct material importance to the mercantile classes perhaps, that a worn *gold* currency—the value of whose individual units depends on exactness of weight—would be; but in other senses it is of most serious import to the whole community. To the counterfeit maker, a worn and defaced silver coinage is serviceable in the highest degree; as it is also to the utterer of his spurious productions. The imitation in other metals of defective money is comparatively easy to the contraband artist; whilst in company of each other true and false coins are difficult of distinction. A used-up coinage, in fact, invites fraud in a hundred ways, and is a positive curse to tradesmen and others among whom, principally, it circulates. It involves loss of time, and is a heavy pecuniary tax. We need not, indeed, particularise all the inconveniences arising from this evil; they are patent, and the thing is to suggest a cure.

It is a fact as well known to the Government as to ourselves, that during the last fifty years the trading and commercial transactions of Great Britain have increased enormously. They are happily, too, still increasing. It is plain then—without invoking Adam Smith or John Stuart Mill—that the gold, silver, and copper tokens of value we use must, as a consequence, have, say, treble the amount of duty to do that they had in the days of our fathers. The effects of heavy duty are only too plainly exhibited; and the images and superscriptions of George III., George IV., William IV., and even of our good Queen Victoria, are scarcely recognizable on the coins of their respective reigns. There is nothing for it but to make the supply equal to the occasion. Where one sixpence, for example, was coined in times past there should be now coined six; and, moreover, the age of all coins should be limited. There must be enacted a compulsory retirement clause for old half-crowns, shillings, sixpences, and threepennies—(groats are dying a natural death, for no more are to be struck)—after they have circulated for a certain number of years, say ten or twelve, their places being filled by new, intelligent, and intelligible candidates for public service. This would be systematic and practicable. Data might be obtained from the dates of the present silver coinage, as to the longevity in a useful condition of all denominations of coins, and the tenure of office of new monies would be made to expire with their fitness for active duty. It is no fanciful theory which we are propounding, but a necessary improvement, which ought, nay must be carried out.

If the Mint on Tower Hill be not of sufficient extent for effecting speedily the alterations, let its mechanical resources be augmented. Much, however, might be done, we are convinced, by the existing establishment in giving effect to our suggestion. The Mint, in days gone by, has done much when pressure required it, and its productive powers are now, as was shown previously, far greater. The entire silver coin in circulation in these realms represents a value of £12,000,000, or thereabouts, and the annual returns of the Mint show an average issue of about £340,000 worth. When, in 1816, it was determined to exchange the old silver coinage of the country for new, the Royal Mint appears to have done exceedingly well. It commenced striking the new coinage on the 16th of July in that year. By the 3rd of February, 1817, £2,500,000 worth was completed, and by the 4th of March following, £2,738,041. This consisted of the following kinds of coin:—

Half-Crowns	3,924,423
Shillings	36,025,750
Sixpences	17,848,025
Total	57,798,198

This labour involved many nights and some Sundays; but double the quantity might now be coined at the Mint without invading the hours of rest or of religious exercises. At that period it was resolved to effect, if possible simultaneously, the exchange of old for new silver, and the transaction did occupy actually only a fortnight. The whole of the old silver coinage was thus exchanged and withdrawn, and after the 1st of June, 1817, it ceased, by proclamation, to be a legal tender. The demand for coin continued urgent for several years after, and by the end of 1821 £7,500,000 worth was produced—a proportion of two and a-half to one of the old coinage. The old Bank of England tokens of 3s. and 1s. 6d. were next called in. In 1826, the Irish tenpenny and twopenny pieces, valued at £700,000, were also withdrawn, and replaced by pieces of the then modern mintage. The existing silver coinage of the United Kingdom, augmented by the small additions named above, consists of the products of the Mint from 1817 to 1826; and surely there can be no question that the time has again come for an entirely new issue. If so much work was done then, what may not be accomplished now? And how much more creditable to this great nation would it be to have a unique and beautiful coinage of silver—whether on the decimal plan or otherwise—rather than the present shabby, slippery, and meaningless collection of coins which betoken neither our high character as a State, nor our shrewdness as a trading community?

THE ENGINES OF HER MAJESTY'S SHIPS OF WAR.

BEFORE proceeding further with the Admiralty Report on marine engines than we last week went, we must add a few additional remarks upon those portions of it which then came under our consideration.

And, first, with regard to the Committee's observations on the preservation of the engines and boilers of Her Majesty's ships, it is, doubtless, of great importance that efficient means should be adopted to ensure the bringing home of the blame of any injury that may occur to machinery on board ship, through carelessness or neglect, to the proper person; and we naturally expected that such a Committee would, after possessing themselves of all the facts of the case, devise and submit a new and efficient remedy. Such has not, however, been the course adopted in this instance, for we find the very remedy which they suggest is now, and has for some time been in operation, not at Devonport alone, as the Committee seem to suppose by the prominent mention made of it, but at all the other yards also. The practice has been for the crew—*i.e.*, the engineers and stokers—when a vessel is about to be paid off, to open up the engines and boilers, and these men are detained until this work is done even after the other part of the crew has left, when that is necessary, so that the machinery may be ready for the examination of the inspector of machinery of the port. If this officer is competent to do his duty, we do not see any good reason for employing an officer from the factory, who has other matters requiring his attention.

In order to form a just estimate of the advantages of the Committee's suggestion respecting the best method of repairing the machinery, it is necessary to inquire whether it is intended that the present number of engineers and stokers of the steam reserve are expected to perform the additional repairs proposed to be done at the floating factory. If it be true that they are capable of doing more than is at present required of them, and if it is simply proposed to employ their time more fully and more profitably, there can be no doubt of the propriety of the proposed outlay for additional means. On the other hand, we do not believe that it would be a profitable way of employing a greater number than are required for the ordinary crews of vessels. Sea experience, no doubt, will give engineers a good knowledge of what is required in the working of engines; but it must also be borne in mind that, while this is gained, mechanical practice is generally lost, which is certainly of the highest importance, for it affects not only the quality but the quantity of work done. In repairing engines on board ship, those well acquainted with general work in addition to the working of the engines, are best adapted for doing such trifling repairs as occur; but it is well known that in large establishments, such as Government factories, the way to get work well and economically done, is constantly to employ each man on that kind of work at which he excels; and this can only be done where sufficient men and machines exist for embracing the great variety of work which presents itself.

We come now to that portion of the report which treats of "the construction and use of "steam machinery, and its adaptation to the "most scientific and economical principles"—a rather curiously-expressed title! This subject is divided into several different heads, the first being on high-pressure steam, which has occupied much of the attention of the committee. For many years high-pressure steam was considered altogether unsuited for marine purposes, more particularly in men-of-war; but during the Russian campaign, when there was so much demand for gun-boats, recourse was necessarily had to the high-pressure steam-engine, because there was not sufficient time to construct the more complicated condensing engine; and the experience thus gained afforded a favourable opportunity for forming generally an opinion on the merits of the high-pressure steam-engine when the boilers are supplied with salt water. The committee do not enter into particulars on the general question. They express, they say,

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their own opinion relative to the advantages of condensing and non-condensing engines in an engineering point of view when they quote the following paragraph from Main and Brown's well-known work, "The Marine Steam Engine:"—

"The condensing engine is more economical in the consumption of fuel, because a vacuum is obtained on one side of the piston, and thus effective pressure is gained without any extra consumption of fuel, except that required to work the additional machinery, such as the air-pump, &c., connected with these engines; and likewise, since the steam used is of a lower pressure, and therefore at a lower temperature, the loss from radiation is less than that which occurs in non-condensing engines; also, since the feed-water comes from the hot well, and is consequently warm, an additional saving is effected. . . . . Therefore non-condensing engines will only be used where fuel can be readily obtained, and it is important to save space and weight. Hence they are used as locomotive engines on railroads, and are serviceable for very short voyages in steamers, especially for river navigation, because of the very small space occupied by the engines; but for long sea voyages, where a great store of fuel has to be taken on board, the extra space required for the additional fuel outweighs the advantages that would be gained by engines of smaller size."

The saving of weight alluded to in the passage quoted is, says the committee, not of much consequence, because although high-pressure engines are on the whole of less weight than condensing engines, still it should be remembered that high-pressure boilers are heavier than condensing boilers, and as regards the saving of space the advantage is only trifling. But the great and paramount evil of the high-pressure engine for marine purposes, and which the committee think ought to decide the question, is the necessity of using salt water in the boilers. The salt soon accumulates about the tubes, in spite of every care that can be taken, and full power can only be used for a very short time. The boilers themselves deteriorate before their due time, and the efficiency of the vessel as a man-of-war, that ought to be ready to act at a moment's notice, is lowered. Upon this head all the witnesses examined agree that they see no means of remedying the inconveniences that accrue from being obliged to use salt water in the high-pressure boiler. After making an experiment upon the Clinker gun-boat, at Devonport, by fitting her with a condenser, the committee recommend that when any of the high-pressure engines placed on board the gun-boats or steam-batteries require repairing, that a condenser and two air-pumps should be fitted. They do not, however, propose to disturb the present arrangement of exhausting up the funnel, in the event of its becoming necessary at any time to return to the use of high-pressure steam. Whenever boilers, however, may be required, they recommend that their construction should be so much modified that, without the least forcing of the furnaces, such a draught may always be obtained as will ensure a good supply of steam for condensation at 35 lbs. pressure.

To these suggestions the Surveyor of the Navy, replies that few at present would advocate high-pressure steam; for special purposes, however, it may have its value. The difficulties attending its use, as was expected, are entirely confined to the boilers; but these difficulties, although aggravated by having to use salt water, will it may be hoped, he says, be gradually surmounted, or at least in part. Be this as it may, the recommendation of the committee to convert all the engines of the gun-boats into condensing engines does not appear to him to be based upon sufficient experience. He says the Clinker has not been thoroughly tried; she is now under trial, and it seems proper to withhold the expression of any decided opinion one way or the other until sufficient and unquestionable facts are obtained for forming it; most assuredly, at present, it would be rash to offer one.

The committee next make some remarks upon the construction of the boilers for the steam-engine, as applied to marine purposes, upon which they write as follows:—"On board a steam man-of-"war there are peculiar circumstances that must "be attended to in the construction of boilers; "for instance, the space for them is not only "limited, but they are still further limited by "being necessarily below the water-line. Now "the great desideratum has been not only to "adapt the boiler to this limited space, but "further, to spare weight as much as possible; "and with this to put in a boiler that would "have the power, not only of generating steam "economically, but with sufficient rapidity to sup-"ply the engines. For this purpose what is com-"monly called the tubular boiler has been adopted, "and no doubt the reason it answers so well is this, "that thereby the greatest possible amount of "heating and grate surface is obtained. By it "the steam is quickly got up and quickly gene-"rated. But as tubes are not only expensive, "but apt to get out of order, choke up, &c., "many attempts have been made to dispense "with them. As long, however, as persons "projecting other plans for boilers have con-"formed to the limits assigned to them in men-"of-war, they have been failures, and for this "obvious reason,—they cannot obtain the same "amount of grate and heating surface as can be "done by the tubular boiler: the result is, they "have been unable to generate steam with the "required rapidity, and in the attempt have "injured their boilers. All this only proves, "that it must end in disappointment to sup-"pose that inventions can succeed that are op-"posed to recognised laws. Until new laws "and new powers of nature are discovered, we "must be satisfied to submit to those with "which we are at present acquainted. After all "the consideration that they could give to the "subject, the committee are decidedly of opinion "that the common tubular boiler is, of all "known boilers, the best adapted for men-of-"war, whether applied to high-pressure or con-"densing engines." The only other species of boiler that has come under their cognizance, and that has been actually tested at sea, at all likely to answer on board Her Majesty's ships, is, they say, Lamb and Summer's patent boiler: they are largely used in the mercantile marine, and are no doubt well planned; but after mature examination, the committee do not recommend them to the Admiralty for trial. "At the "same time it is but justice to state, that they "do not see any positive objections, nor could "it be thought a wasteful expense to give them "a trial." Meagre and contradictory enough all this, truly! The committee, when at Sheerness, examined the boiler patented by Admiral Tucker and Mr. Blaxland. After stating at some length the results of experiments which they instituted with the new boiler, and which they considered unfavourable, they say from what they have seen, and from and after all the inquiries they can make, "it has not been proved "to them that the patent boiler, either in its "present state, or with the proposed alterations, "is suitable for the use of the navy; the com-"mittee giving no opinion how far this boiler, "by alterations which as yet have not been "proposed, might be improved. If the present "boiler, either as it is, or as it might be made "by any improvements, becomes likely to be at "all more economical for the mercantile marine "than the present tubular boiler, the patentees "may be assured that it will immediately at-"tract general attention, as the committee can "state from their own personal knowledge, that "every plausible plan of improvement for steam "navigation is sure to receive immediate ex-"amination and trial by the northern great en-"gineering firms." All we can at present say on this subject is, that the decision of the committee—if it may be called a decision—is contrary to the experience of abler men than themselves.

When first the tubular boiler was introduced into the navy the tubes were made of iron; that metal has now been abandoned in all cases, and brass tubes are substituted, except where high-pressure engines have been placed in steam vessels, and in these cases iron tubes are now used. There can be no doubt that brass tubes are much better adapted for naval purposes than iron ones. One objection to iron tubes is that they deteriorate so rapidly when the vessel is laid up in harbour as to become unserviceable after long inaction. On this account the committee directed their attention to ascertain if brass tubes, with which the boilers of our high-pressure gun-boats had formerly been fitted, and which, on account of their leakage, had been removed, could not be made to answer in the boilers of these vessels. One of the committee, Mr. Nasmyth, proposed that bent brass tubes should be tried in the boilers of the Clinker high-pressure gun-boat. The same has been done, and these bent tubes are now on trial. On other points the committee report as follows:—

"From the evidence taken by the committee, it appears that in general the boilers supplied to our men-of-war are deficient in generating steam, and that full speed in consequence can only be maintained for a short time. Now the remedy to that defect must necessarily involve the whole question of the amount of space that can be allotted for the boilers, the committee therefore consider that they need not enter into further details, and that they do their duty by simply, and without comment, bringing the question before their Lordships. The difficulty of keeping the safety-valves of the boilers without leaking was also a point which was carefully considered, and the plan of a safety-valve proposed by Mr. Nasmyth, a member of this committee, was inspected, and as this valve has been found to answer on shore, and as the expense would not be greater than what is incurred by the present safety-valve, the committee deem it worthy of full consideration and trial. The committee do not think that sufficient attention has been paid in our men-of-war to the consumption of smoke. On board many of our mercantile steam-vessels there are several plans adopted, which, although they are quite simple, do appear, however, in some respects, to answer the purpose. One, for instance, which is much used at Glasgow, is boiler furnace fire-bars, by means of which a portion of air is heated in its passage to the furnace. It will be sufficient merely to recommend this plan to the consideration of the Government engineers. The obtaining a good draught in the engine-room and its vicinity, and preventing the hot air from spreading through the decks of a man-of-war, is most decidedly to be considered a desideratum. The committee went on board the Goliath, with Mr. Baker, the engineer of Chatham Yard, who showed them his invention of an apparatus for that purpose, and at the same time explained to the committee the mode by which it had been fitted on board the Goliath, although it was now withdrawn from that ship. Mr. Baker considered that it had answered the purpose intended, and that was also the opinion of Mr. Boulton, chief engineer of the Goliath, who transmitted to the committee a written account of the effect produced. The committee, whilst visiting some of our steam men-of-war, observed in one or two instances that platforms had been formed with gratings, and in one case iron plates had been so placed as to impede ventilation. The committee recommend that no gratings or iron plates that can in any way affect this important object be allowed to be placed in the engine-room or its vicinity, without the sanction of the proper steam authorities."

To all this relating to boilers the Surveyor makes no reply.

The committee next make special remarks upon the construction of marine steam-engines. "But they would first wish to draw attention,"

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say they, "to a principle which, if carefully "kept in view, will, they think, prevent much "future difficulty and misunderstanding." What oracular revelation is coming now? Here it is:—"All the marine engines, whatever may be "the particular plan of construction adopted, "which have been lately made in this country "by the manufacturers of established reputa- "tion, when they come to be examined with "mathematical accuracy, and when their motion "has been analysed, have been found to give "out so nearly the same amount of power, that "the difference amongst them is hardly worthy "of consideration. Professor Airy, the present "Astronomer Royal, investigated the steam "engine known by the name of the 'Gorgon "Engine,' in this manner, and by comparison "with other engines, the results were found to "be as above stated. Now, the Gorgon en- "gine was almost an extreme case, as it pos- "sessed, in an engineering point of view, many "serious faults. From all this, your commit- "tee would conclude that the practical value "of marine steam-engines is not to be obtained "mathematically with any approach to exact- "ness. There are other and most important "points to be considered, and which materially "affect the problem; for instance, if the con- "necting rod is too short, the power is unequally "given out and may have a tendency to injure "the engines; simplicity in the construction of an "engine is another point of great importance; "and besides these, there are many other points "which are quite unnecessary to detail, but "must be carefully considered before any "just comparison can be made between engines "formed upon different plans."

On seeing such a mouse as this delivered from such a mountain, the Surveyor contemptuously says:—"No person having any knowledge of "theoretical mechanics ever doubted that 'the "amount of power' given out was necessarily "exactly the same; so nearly the same, that "the 'difference is hardly worthy of considera- "tion.' Mr. Seaward was perfectly well ac- "quainted with this elementary truth, and his "object in publishing Mr. Airy's approximate "calculation was simply to remove the preju- "dice of persons unacquainted with mechanics. "All the evils of a short connecting rod are of "a practical character, respecting the existence "of which there can be no difference of opinion; "it is admitted by all; but there is a great "difference of opinion respecting the amount of "the evils, some holding them to be serious, "and others of very little moment, the manu- "facturers whose forms of engines compel them "to adopt short connecting rods constituting "the latter class." We need hardly say that all science, as well as all common sense, is here on the side of the Surveyor.

After giving a page of general considerations, which it is not worth our while to reproduce here, the committee state, first, with respect to paddle-wheel engines, that the "oscillating" and "double cylinder" engines are the two best, the latter (patented by Maudslay and Field) especially where great power is required; and then they direct attention to the choice of an engine for driving the screw, which part of the subject they consider far more difficult, as it certainly is far more important. When screw propulsion was first introduced into the navy, say they, a great variety of engines of different construction were proposed, and, in process of time still further additions were going on, when it was resolved to adopt exclusively the direct action, that is to say, to drive the screw without gearing. During the period when this transition was taking place, from paddle to screw, and then from screw to screw without gearing, as might be expected, numerous mistakes were made in the construction of the engines to be used for the latter purpose. Indeed, in consequence of mistakes, and inexperience in this important point, the screw engines belonging to several vessels had to be taken out and broken up.

From the experience thus gained, the committee conclude that of all the variety of engines that have been purchased by Government for our screw ships of war, the following are so far superior to all others, that no engines of an older make should ever again be put on board. The engines to which they refer are:—1st. The single piston-rod engine, with the connecting rod attached direct to the crank shaft, and with a single flat guide. 2nd. The engine commonly known as the Trunk Engine, and patented by Messrs. Penn and Son. 3rd. The double piston-rod engine. They have no doubt that these three forms of construction are better suited for men-of-war "than any [other] modifica- "tions of the steam-engine that have as yet been "constructed."—(The committee do not write very good English; we have added the word in brackets in order to make sense of what they say.) The committee have arrived at the conclusion, that for very small engines, the single piston-rod engine, as adapted by Messrs. Humphreys, Tennant, and Dyke, (the first of the three classes just mentioned) is the engine best suited for the navy. "Indeed, it seems now to be almost "universally admitted," they say, "that the "single piston-rod engine is superior to all other "known engines for very small power; and it "may be noticed, that for the later built gun- "boats, two of our most eminent engineering "firms adopted that construction. The Com- "mittee are of opinion, that with our present "knowledge of steam machinery, that up to "300 collective nominal horse power, there is "no engine for men-of-war superior to the "single piston-rod engine, with a single flat "guide, and they are not prepared to say that "above that power its qualities may not be "found equally good. And that the trunk en- "gine, as constructed by Penn and Son, has "answered so extremely well, more particularly "where great power is required, that the Com- "mittee recommend that, with such improve- "ments in the details of these two engines, as "experience points out, they should be con- "sidered for the present the naval engine. . . . . "The committee have also made investigations "into the relative advantages of the arrange- "ments adopted by the different firms who have "constructed the double piston-rod engine, and "they are of opinion that in the general con- "struction, Messrs. Maudslay and Field's en- "gines are more simple than those of other en- "gineers who may have adopted this species of "engine; and they think also that the parti- "cular parts of their engines are more accessible "and more easily removed."

There is something very strange, and not a little suspicious, in the care with which the committee repeatedly limit the single piston-rod engine of Messrs. Humphreys and Tennant to very small powers, the more so as they have, after all, to admit, although with manifest reluctance, that "they are not prepared to say that above that power [300 H. P.] its qualities may not be found equally good." Now, this class of engine was first supplied by Messrs. Humphreys and Tennant to H. M. Ship Harrier in 1853. Since then they have supplied similar engines to the Brazilian, Portuguese, Turkish, and Russian Governments. For the last Government they set to work, in the summer of 1858, engines of 450 horse power on this plan, and have since, to our knowledge, received orders for engines of 600-horse power for a 120-gun ship of the Russian navy, with strict injunctions to make them of precisely the same arrangement. From these facts, as well as from other considerations, the remarks of the committee will be seen to be uncalled for, and calculated to prejudice the manufacturers of a very efficient form of engine, and one which is as applicable to large powers as to small.

Before concluding these observations upon the efficiency of steam-engines suited to the navy, the committee refer to the trials of men-of-war at the measured mile; and they consider a sufficient time is not always allowed to test the machinery. They believe that merely running a measured mile with a good supply of steam is no criterion of the real capabilities of the engines and boilers of a steam-vessel. They therefore recommend that in all trial trips of steam-ships, whether to test new engines and boilers, or after the old ones have been repaired, that besides running a measured mile, the trial should last at least six hours. "The speed, "consumption of coal, and, above all, the capa- "bility of the boilers to supply, without push- "ing the fires, steam at full power during the "whole time, should," say they, "be carefully "registered."

On the other hand, the Surveyor contends that no invariable rule on this subject could be acted on. Sometimes men cannot be spared without interfering with more important services to ballast a ship in order to bring her to a proper draught of water. Then the trial is deferred until she is brought forward for commission, or the first division of steam ordinary, and when this occurs in the winter months, the shortness of the days and the state of the tides frequently render it necessary for the ship either to leave and return into the harbour within six hours, or to anchor outside. The latter sometimes cannot be done without incurring serious delay in completing her equipment, as well as that of other ships. The committee, he says, are perfectly correct in their views, and if they had inquired into the matter would have seen that there was no difference of opinion as to the desirableness of lengthened trials, but that considerations such as above indicated, which probably the committee were not fully aware of, were, in the minds of those with whom the responsibility rested, of still greater importance.

The working of steam expansively is the next subject approached by the committee. It has long been a complaint, and a just one, say they, that, owing to the quick motion of the direct-acting screw-engines, the expansive gearing on board our men-of-war seldom acts for any length of time. It is found, either that they have to be removed on account of breaking, or from the apprehension of their breaking, the link motion, now generally adopted in the navy, is left as the only means of expanding the steam. In order, if possible, to obviate the above complaint, they, at an early period of their labours, directed their attention to the improvements that could be made in the direct-acting screw-engines, so as to enable steam to be used expansively with the greatest advantage. They soon saw, that with the direct-acting screw-engines, to work the steam expansively by means of cams was out of the question, and, after much inquiry and examination, they came to the decision of recommending that, to all new engines, and to those undergoing repairs, should be fitted what is called the "expansion flat grid-iron valve." This valve is worked direct from the shaft, with a separate eccentric. This arrangement has been largely adopted by the Glasgow engineers for the direct-acting screw-engine, and has been found to answer very well. "One remarkable "instance of economy, when this species of

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"valve was used, came to their knowledge," say the Committee. "The pressure on the "safety-valve was 25 lbs., and the steam was "superheated, or rather dried, to the extent of "eight degrees; the length of the stroke was "three feet, and the steam was cut off by the "valve which is now recommended for the "navy, after it had entered the cylinder nine "inches. By these means the consumption of "coal was reduced to 2·5 lbs. for each indicated "horse power, and the speed of the vessel was "at times 13 knots per hour."

To this the Surveyor replies:—

"The improvements suggested in the construction of engines are two, namely, an expansive and a safety valve; the latter is now under trial, and the former has long been well known to engineers; but as its action, however modified, is not precisely what is wanted, while other constructions, although difficult to execute practically, are comparatively perfect in this respect, the gridiron valve worked by an eccentric has hitherto been adopted by very few engineers. There is doubtless the want of a good and simple expansion valve fit for quick-working engines, although it is practically of less importance now than formerly, for in the present day all such engines are fitted with what is termed a link motion, which, within certain limits, does all that can be desired, and beyond those limits goes far to meet the remaining requirements. Still a good and simple expansion valve is a desideratum, and it has occupied the attention of marine engineers for a long time. The fact that such a valve has not yet been designed, if we except that of Messrs. Maudslay, applied by them to some of their more recent engines, and which may, perhaps, be found practically unobjectionable, sufficiently shows that the difficulties are not easily surmounted. The one suggested by the committee, which has not the testimony of any eminent engineer in its favour, together with many others, have been fully investigated; its action, however, is admitted to be imperfect, and this is probably the reason why it has not been preferred to others. The desire is to obtain one which shall do all that such a valve is intended to do, and at the same time be simple and durable, but the particular valve now under consideration certainly does not appear to have that amount of merit in these respects as to render it advisable to make its use imperative."

The question of increasing the elasticity of steam by superheating it after leaving the boiler has been for many years a subject of experiment and controversy. In examining the various results which have been obtained by those who have given attention to the subject, there is nothing sufficiently definite, say the committee—and we quite agree with them—to afford an accurate estimate of the actual diminished consumption of coal with the same speed. As the results of all the inquiries that they could make, they submit the following remarks:—"Steam, as generated from the boiler, "whatever be its temperature, contains such "a quantity of moisture as makes it act in "some measure as a lubricator to the cylinder. "If, however, the steam were sufficiently su- "perheated apart from the water, so as mate- "rially to increase its elasticity, the consequence "of its drying qualities upon the working parts "in the cylinder would be such as to cause "either leakage or much friction. From this it "may be deducible that the superheating of "steam out of contact with water can only be "beneficially employed for the evaporisation of "any priming water carried out of the boiler "by the steam pipe. For the above reason, "the drying of steam, rather than its superheat- "ing, is a most important auxiliary to expan- "sion. . . . . From what has been here stated, "the reasons may be explained why the expe- "riments made on superheating steam have "given such different results. When the "boilers were indifferent, and there was much "priming water to evaporate, the gain from "using this process appeared large; with good "boilers, on the other hand, the gain appeared "small. If it is desired to secure to the navy "advantages of the process of drying the "steam, the committee would recommend an "addition to the steam space to be made round "the uptake of the funnel."

The Surveyor replies that for many years all doubt has vanished respecting the fact that considerable economy arises from the use of superheated steam, the degree of economy depending, as might be expected, upon the extent to which the principle is carried out, and upon the mode adopted for superheating the steam. But the late Dr. Haycraft's experiments, and others, as well as those recently made in the Black Eagle, and now being continued in the Dee, prove incontestably the fact of economy, which generally, at a moderate estimate, may be taken at about 20 per cent. "The "main points yet to be satisfactorily deter- "mined are," he says, "1st. Will no mischief "be done, or greatly increased wear occasioned "to the working parts of the engines in contact "with this kind of steam at a high temperature, "and whether, without greater care and atten- "tion than can be insured, is serious damage to "the machinery likely to happen occasionally? "2nd. What is the most practical mode of "carrying the principle into effective operation? "It may be sufficient here to say, that, on the "whole, great hopes are justly entertained that "very beneficial results will be produced, more "particularly in vessels which make long "voyages, and do most of their work under "steam. In ships of war, whose expenditure "of fuel is comparatively small, the saving "would, of course, be proportionally small; at "the same time, probably greater difficulty "and expense will have to be encountered in "carrying out the principle, owing to the neces- "sity of keeping the apparatus considerably "below the water's surface to be out of the or- "dinary reach of shot. The subject cannot now "be lost sight of, or fail to be prosecuted with "assiduity. All persons interested in steam "matters are fully alive to its importance, and "well acquainted with what is being done."

We next come to a very important-looking dissertation, "On the amount of steam power "that can, with most advantage, be placed on "board men-of-war;" but this we must leave for a concluding article in our next Number.

GREAT GUN-MAKING AT WOOLWICH ARSENAL.

At the Royal Arsenal, Woolwich, the practical experience gained by the officials in the gun factories is being put to the severest possible test. As if for the very purpose of making the managers and workmen perfect in the various duties pertaining to the art of heavy-gun-making, a two years' noviciate, as it were, has been permitted them; but now, in presence of the dark war cloud which overshadows this land as well as others, the hour of their trial has come, and that "with a vengeance." It is to be hoped that the rate of production, and the quality of the articles produced, may, therefore, be such as to justify the expenditure incurred, and prove the ability of all employed in the important task confided to them.

It is our present intention to further elucidate the operations necessary for the successful manufacture of these deadly weapons, and thus to supplement some previous information communicated to the public at large, first through our pages, and then through the press generally.

The qualities and characters of the irons most eligible for this kind of work have been already explained, as have the means of melting, and the kinds of furnaces best suited for the purpose. It may now be further stated that the patterns for the different-sized guns cast at Woolwich are themselves made of iron. They are put together in lengths, varying in number according to the dimensions of the guns to be produced, accurately fitted and bolted to each other by means of inner flanches. These iron gun patterns, indeed, greatly resemble the great guns of which they are the foreshadowers. The metal of which they are composed is about three-fourths of an inch in thickness. Much pain is taken in fitting the divisions together, and, when entire, they are carefully turned from end to end, then polished, and, in order to ensure their leaving the mould without tearing away the sand, are afterwards bronzed. The last process is highly important, and cannot be neglected without risk of failure. Supposing, then, that the smooth and well-finished pattern of a large gun is made ready for the foundry, by having "sight patches" and "vent fields" attached, and such other little arrangements made as would be essential in preparing for an ordinary casting, and which need not be described here, the moulding box is the next point to be regarded. At the Arsenal this may be said to be a very strong cast-iron pipe, made in two longitudinal halves, which are flanched outwardly from top to bottom. These flanches, which have been accurately "faced" to each other in the planing machine, are drilled for the reception of a large number of 1¼ inch bolts, and supplied at intervals with steel steady-pins. When it is said that the moulding box is a pipe, it may be explained that it is a pipe put together like the pattern, in lengths, and these lengths have outside latitudinal flanches perforated for holding bolts as in the longitudinal ones. These flanches are all faced in the lathe, and the alternate recesses and projections in them are turned to gauges almost mathematically. The greatest possible care is also taken to make the divisions of the box agree exactly in length with those of the pattern. To each half box a wrought-iron trunnion is firmly fixed. When the half boxes are united, a centre line through these trunnions would pass through the centre of the mould, whilst a centre line drawn vertically would pass through the centre of the box and mould. By these means facilities are gained for dealing with the mould, whether for the purpose of blacking, repairing, or alterations of any kind. Suspended in the slings by the trunnions, the whole affair may be moved in any direction by the application of the strength of a child. It has been said that the moulding box is strong; and much need is there that it should be so. It is composed of the best iron, and for a 68-pounder weighs five tons. Seeing that this womb for great guns is subjected to repeated heatings and coolings, and the frequent pressure of a solution of molten iron 17 feet in height and 28 inches in diameter at the base, it will be readily conceived that these precautions on the score of strength are not unwisely taken. In the pattern for a 68-pounder gun, there are seven lengths, and there are, too, seven lengths of moulding box to correspond. These, before the operation, are all detached, and are arranged side by side and opposite to each other, like a company of soldiers standing at ease. In commencing to mould the gun, each portion of the box is put over its corresponding portion of the pattern, great care being taken that they are centrally and truly so planed. This done, each division of the box with its enclosed division of the pattern is bolted down vertically to a cast-iron circular surface plate placed to receive it. The operation of filling the spaces—which circular detachable rings make equal—between the mould-box and pattern with prepared sand is now commenced. This sand is composed of natural sand from the neighbourhood, coke dust, and occasionally, for the breech end of the mould, of cow hair. The proportion of coke dust to sand as now used is as 1 to 12. The whole is incorporated in a pug mill. This composition is rammed "home" in each case with a narrow-headed rammer very carefully, and it is fed in small quantities. When one of the seven receptacles is filled with the sand or loam, an iron straight-edge is passed over the upper surface to make it true with the flanch. The circular plate at its base naturally performs a similar task, and both ends are thus made even. All the seven

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parts being treated in this way, a travelling crane suspending a beam of wrought-iron with two pullies placed at the same distance from each other as the trunnions, and furnished with endless chains, lifts them one by one from the patterns, and suspends them for examination and "blacking." The Woolwich blacking is made of the very best oven-burnt coke (ground as finely as possible under heavy runners), charcoal blacking, and clay-water, mixed to about the consistency of paint, and with paint brushes it is applied to the moulds. Drying is the next part of the performance, and this is effected in stoves about 20 feet long, 9 feet bread, and 8 feet high, and covered by brick arches. These stoves are important auxiliaries to the successful manufacturing of heavy guns, and next week, when this paper will be concluded, a further account of their nature and construction will be given.

(To be concluded in our next.)

Proceedings of Societies.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

May 3.—W. Fairbairn, F.R.S., &c., President, in the chair. The Librarian, on behalf of the widow of the late distinguished Professor Jobert, presented to the society about 100 copies of that gentleman's "Philosophy of Geology," and an equal number of his "Ideas," partly bound and partly in sheets.

"A Notice of the Geology of the Australian Gold Fields," by W. S. Jevons, Esq., late of the Sydney Mint, communicated in a letter to Professor Roscoe, was read.

Mr. H. M. Ormerod produced two specimens of iron used in building, which had both become oxydized so as to injure the buildings which they had been used to strengthen. One, an iron cramp, taken from the north-west buttress of Manchester Parish Church, about one foot long and three-eighths of an inch thick. This had become treble the thickness by rust, and had split the buttress, in the centre of which it was inserted, lifting about twelve feet of wall. It had been inserted about ninety years since. The other, a small wedge, from the steeple of St. Mary's Church, in Manchester, about three-eights of an inch thick at the broad end originally, but now seven-eighths. These wedges had lifted all the stones which they were meant to keep in their places, splitting some, and allowing all the rain to penetrate. The steeple was erected about 1756, and the upper part has now become so ruinous and dangerous from the original faulty construction, and the expansion of the iron cramps and wedges, that it is being taken down, pursuant to notice from the city surveyor.*

A paper, communicated by Dr. Smith, was read by its author, Dr. Roberts, Physician to the Royal Infirmary, "On the Effect of Food on the Reaction of the Urine."

Dr. Joule having taken the chair, a paper was read by the President, W. Fairbairn, F.R.S., entitled "Experiments to Determine the Effects of Different Modes of Treatment on Cast Iron for the Manufacture of Cannon."

After commenting upon the importance of the treatment of iron in the manufacture of cannon, and on the want of knowledge upon this subject, exhibited in the failure of many of the guns employed in the Russian War, the author proceeds to describe the processes usually adopted in the foundry for the improvement of iron, under the heads mixing, remelting, and prolonged fusion. The value of remelting and mixing iron has long been recognised, and their effect in increasing the tenacity of the metal has been fully demonstrated by experiments. Lately the influence of prolonged fusion had also been the subject of inquiry, and the conclusion had been arrived at that a continual exposure of liquid iron to an intense heat augments the cohesive powers of the iron in proportion to the duration of the exposure, up to some not well ascertained limit where the opposite effect begins to be produced, and the iron deteriorates.

The author then proceeds to narrate the results of some experiments in which he was engaged in 1855, on the improvement of cast iron ordnance. Five twenty-four pounder guns were cast of a carefully selected mixture of the following qualities of iron:—

Blaenavon, No. 1	2.2 per cent.
Blaenavon, No. 2	16.7 „
Blaenavon, No. 3	28.9 „
Lilleshall, No. 2	35.5 „
Pontypool, No. 3	16.7 „

In casting these guns it was sought to determine the effect of various modes of treatment in the foundry: hence,

Gun A was cast in the usual way, with 3 feet 6 inches head.

Gun B was cast from the air furnace, of iron remelted once before casting into the mould.

Gun C was cast from the cupola, with desulphurized coke.

Gun D was cast from the air furnace in the usual way, under a pressure of 17 feet 6 inches of head.

Gun E was cast from iron remelted once, and then run into mould, under 17 feet 6 inches head of metal.

These guns having been bored and turned, were conveyed to Woolwich Marshes, and subjected to proof by firing, beginning with the usual proof charges, with a gradually increasing quantity of powder and weight of shot, until the gun burst. The result of these proofs is exhibited in the following table:—

Gun.	Number of rounds fired.	Total quantity of powder used, in lbs.	Total weight of shot fired, in lbs.	Total number of wads used.
A	33	364	3,120	91
B	32	350	2,952	90
C	17	150	1,152	43
D	31	336	2,784	89
E	33	364	3,120	91

From this table it will be seen that, whilst the gun cast with desulphurized coke from the cupola exhibited comparatively a great inferiority,* the guns E and A, one of which had been cast in the ordinary way, and the other with remelted iron, under pressure, exhibited very high powers of resistance. The results thus obtained were further confirmed by experiments upon the tenacity and density which gave the following mean results:—

Gun.	Density.	Tenacity in lbs. per sq. in.
A	7.2105	28,516.
B	7.2325	27,219.
C	7.0863	18,101.
D	7.2032	25,954.
E	7.2441	28,516.

After discussing the result of these experiments, in some respects anomalous, gun A being a peculiarly fortunate cast, it appeared that the other guns were improved by the remelting and pressure of head, so as to give the best result with E, which had been subjected to both these processes. In conclusion, the author alludes to experiments on guns cast with a core, and expresses his belief that the great practical difficulties which beset that process must prevent its application, although theoretically calculated to produce guns of greatly increased strength.

THE GEOLOGICAL SOCIETY OF LONDON.

May 4.—Prof. J. Phillips, President, in the chair. M. Moggridge, Esq., Swansea; F. J. Mitchell, Newport, Monmouthshire; and T. Wright, M.D., Cheltenham, were elected Fellows. R. F. Williams, Esq., P. D. Tuckett, Esq., and J. Phillips, Esq., were admitted. The following communications were read:—1. "On the Ossiferous Cave, called, 'Grotta di Maccagnone,' near Palermo." By Dr. H. Falconer, F.R.S., F.G.S. 2. "On the Jurassic Flora." By Baron Achille de Zigno. Communicated by C. Bunbury, Esq., F.G.S. 3. "On a Group of supposed Reptilian Eggs (*Oolithes Bathonicæ*) from the Great Oolite of Cirencester." By Prof. J. Buckman, F.G.S. 4. "On some Sections of the Strata near Oxford." No. I. By Professor Phillips, Pres. G.S.

MEETINGS FOR THE ENSUING WEEK.

MON.—*Royal Agricul. Society*, General Meeting at 12 a.m.
Royal Geographical Society, Anniversary, Monday, May 23rd, at 1 p.m., when the Gold Medals will be awarded to Captains Burton and Palliser, by the President, Sir R. I. Murchison, who will then deliver his Address on the "Progress of Geography." The Dinner will take place at the Freemason's at 7 p.m.

TUES.—*Zoological Society*, at 9 p.m.
Inst. Civil Engineers, "On the manufacture of malleable iron and steel," by Henry Bessemer, Esq., at 8 p.m.
Royal Inst., "General facts and leading principles of Geological Science," by John Morris, F.R.G.S., at 3 p.m.

WED.—*United Service Inst.*, "The acclimation of European Troops in Indian Hill Stations considered in relation to the increasing rates of their sickness and mortality on removal to the plains for service," by Dr. Birch, F.R.G.S., at 3 p.m.
Society of Arts, "On the application of the Conic Sections in Architecture; illustrated by the Obelisk, with some history of that feature of Art," by Mr. John Bell, at 8 p.m.

THUR.—*Society of Antiquaries*, at 8 p.m.
Royal Society, at 8 p.m.

FRID.—*Royal Inst.*, "On the Ossiferous Caverns and ... sures of Devonshire," by William Pengeley, Esq., at 8 p.m.
United Service Inst., "The application of Statistics to Naval and Military Matters," by W. Farr, Esq., F.R.S., at 3 p.m.

SAT.—*Royal Inst.*, "On Modern Italian Literature," by J. P. Lacaita, Esq., at 3 p.m.

THAMES GRAVING DOCKS.

THE report of the directors of the Thames Graving Dock Company announces the successful completion of the undertaking for which the company was formed in April, 1857, and states that Mr. Edwin Clark's patent arrangements have fully realized the expectations entertained of their efficiency. Up to the end of last month eight ships, varying in burden from 500 to 1,800 tons, of wood and iron, sailing ships, paddle-wheel and screw steamers, have been raised, floated, examined, and repaired, with a degree of celerity, security, and ease, utterly unknown under the old system of graving docks. The pontoon recently launched has been employed in raising and floating several ships, and fully answers all the uses for which it was intended. Another will shortly be launched, and four more are in course of construction. During their experimental operations the directors experienced the want of a permanent establishment in the docks, ready to repair the ships sent to them to be lifted and examined. They have met this difficulty by letting one slip and the one available pontoon to the shipbuilding firm of Messrs. W. Rose and Co., of Wapping. The report of Mr. E. Clark, the engineer, states that the works are now complete in every respect. Ten vessels have been raised and repaired, and many of them floated into the shallow docks for that purpose. This number includes timber, screw and paddle steamers of various descriptions, varying in weight from 500 to 1,800 tons. The operation has not occupied more time than was contemplated, a vessel having been raised, examined by Lloyd's surveyors, and again launched in one hour and a quarter. In no case has any vessel been subjected to the slightest degree of unequal strain, and all the shipowners have expressed themselves highly satisfied with the facilities afforded them. We regret to state that we have grounds for questioning the perfect truth of some of these statements.

MATERIALS FOR PAPER MAKING.

AT the Exhibition of the Society of Arts, now open, a case containing eight specimens of vegetable fibres prepared for paper making is exhibited. It contains: 1st. Straw deglutinated and "fibred." 2nd. Straw deglutinated, fibred, and half bleached. 3rd. Straw deglutinated, fibred, bleached, and reduced to pulp. 4th. Sugar cane, trath, or megos deglutinated, fibred, and bleached. 5th. Gunny bag or old jute deglutinated and bleached. 6th. New jute deglutinated, bleached, and reduced to half stuff. 7th. An Asiatic red bark, *i.e.*, the bark of the Sterculia ulens, deglutinated, fibred, bleached, and reduced to half stuff. 8th. Vegetable silk, deglutinated, fibred, and bleached. The three first of these articles are not exhibited as novel articles for paper making, but to show that, by the process to which they have been submitted, they are rendered strong and fibrous, and therefore much better suited for making good and durable papers—far better than the straw papers which are usually found in the markets at present, whilst the evil of preparation is much less than the evil of preparing straw for such purposes generally. The 4th, 5th, and 7th specimens are exhibited as articles well suited to supply the place of finer rags in making papers of superior quality at a lower price than fine rags, which are now every day becoming scarcer in the market, and therefore will not long continue to supply the present increasing demand for paper for writing and printing—a demand which will assuredly go on increasing as education is extended among our growing population. No. 6 is exhibited to show that the gunny bag or old jute is for the use of the paper maker as well suited as the new article. No. 8 is exhibited to show that when it becomes a worn-out article it will be used by the paper maker, which the ordinary silk will not be, and therefore it is calculated in time to become a useful addition to our supply of fine rags.

* After grinding and polishing the iron rust, it presented a black iridescent surface of almost metallic brilliancy, and similar, in appearance, to Elba ore. It was capable of being made into a magnet of considerable power and retentiveness.

* Considerable want of uniformity is observable in iron melted in the cupola, unless retained for some time in a state of ebullition at a high temperature. This will account for the comparative weakness of the gun C, which, under different treatment, would have been greatly improved by the use of desulphurized coke, as was found to be the case in former experiments.

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THE INDUS STEAM FLOTILLA.

IT must have been a proud thing for Mr. Scott Russell to stand the other day upon the deck of what is probably the best light-draught steamer ever built in this country, and, looking along the river upon the magnificent Great Eastern, to know that the forms of both were the products of his own brain. Indeed, the relation in which that gentleman stands to naval architecture in this country has long been a very proud one. It is stating nothing more than every cultivated shipbuilder knows when we say that no other naval architect of the present century has ever both attempted so much and failed in so little as he. Never hesitating to push his art forward by all the means which a daring faculty of invention has suggested, he has nevertheless been singularly successful in preserving in his vessels all those qualities which are essential to their security and to the confidence of the ship-owner. The beauty of his vessels is sometimes questioned; but nothing short of blind prejudice could doubt their general excellence. Such results could only have been obtained by a felicitous blending of faculties which but seldom indeed meet in the same individual.

It is not our present purpose, however, to dwell either upon naval architecture, or upon Mr. Scott Russell's influence upon it; but rather to pen a few remarks by way of accompaniment to the engraving which we this week present to our readers, and which they will, we doubt not, highly value. It is an illustration of the vessel the trial of which was lately noticed in our columns, and has been very carefully lithographed from a proof taken from a copper plate engraved with the well-known and admired skill of Mr. Lowry. Its fidelity, even down to the minutest detail, may be confidently relied upon. With a plate like this before him, the shipbuilder will need no verbal description.

The design of the vessel before us was selected from many which were submitted to the Scinde Railway Company, being considered the most suitable of all for peculiar navigation of the Indus. It was founded upon data supplied by Mr. Yarrow, the engineer of the company. It must be acknowledged that two feet is an exceedingly light draught of water for a steam-vessel, and that more than ordinary skill was necessary in order to construct a fast vessel that should draw no more than that; yet that was the amount fixed upon as the maximum for the Indus steamers, and Mr. Russell has fully succeeded in overcoming all the difficulties of the case. The length of the vessel over all is 200 feet, breadth 38, draught of water at the time of the recent trial 1 ft. 10 in. As a passenger boat, and with average cargo, her speed exceeds 13 miles an hour, and with boats containing 500 tons of cargo in tow she can be depended on to average eight miles an hour on the Indus. The hull is constructed in a peculiar manner, in order to carry the weight and sustain the propelling action of large machinery. Two longitudinal wrought-iron girders run the whole length of the vessel, rising nearly ten feet above the deck, so as to form the bulkheads of the deck cabins. These girders constitute the main portions of the hull, and are applied in a manner peculiar to Mr. Scott Russell, and which he has already employed in the construction of the Great Eastern and other vessels where great strength and great length are necessary. The engines are of 120 nominal horse-power, but work up to more than 600. They are constructed upon Mr. Russell's patent three-cylinder principle, which was fully described and illustrated in this Magazine a few weeks since.*

We hear much of the light-draught steamers of America; but there is good reason to doubt if anything so well-contrived as this Indus vessel exists in the United States, all the circumstances of the case being considered. If our excellent cousins fancy they have anything superior to it, we hope they will do us the favour of sending it over. At any rate, Mr. Russell has succeeded in solving a very difficult problem in a very satisfactory manner, and has provided the means of adding largely to the commercial prosperity of our Indian Empire.

THE EFFECT OF THE INTRODUCTION OF THE ARMSTRONG GUN ON NAVAL ARCHITECTURE.

BY CAPTAIN J. GARDINER FISHBOURNE, R.N.†

I AM to show the necessity for a change in the present practice of naval architecture, in order that the country may obtain the full benefit of Sir William Armstrong's admirable invention. I propose to give, 1st, a sketch of the advantages it affords; more would not be proper. 2nd, a sketch of the practice of naval architecture that it is requisite to change. The great results obtained from rifle muskets, both as to range and precision, made the adaptation of breech-loading cannon a necessity that could not long remain unsatisfied. It seems a guarantee for the continuance of our prestige, that no sooner is there a want really felt than genius and skill start up to afford an ample supply. The principle on which Armstrong's gun is constructed is so correct, and the details of its carriage-slide and missiles so simple and complete, that it will be the work of but a short time to satisfy the most incredulous as to their great value. The precision of fire attainable by it is alleged by competent authority to be fifty times greater than that obtained with the ordinary service-gun throwing solid shot of equal weight, each at a distance of 1,000 yards; indeed it is six times more accurate at 3,000 yards than the ordinary smooth-bore gun at 1,000 yards. To arrive at the accuracy of fire, range, and penetration realised, there have been used, 1st, elongated shot, by which, while equal momentum has been preserved, a very great reduction of the area of resistance has been effected. 2nd. By the rifle principle rotatory motion is communicated to the shot, by which, together with the right adjustment of the centre of gravity, and of the form of its anterior surface, the longer axis during the flight is preserved parallel to the axis of the gun, and great accuracy attained.

Hitherto, owing to the extreme difficulty, amounting almost to an impossibility, of casting homogeneous spherical shot, the centre of gravity was never found in the centre of the sphere, hence the shot in their flight were diverted from their proper paths, by which great disparities in range and deviation in direction were occasioned. By using a ball which fills the cylinder of the gun much cause of error is avoided. The ordinary spherical shot not filling the cylinder, in its motion it strikes one part or the other uncertainly, and becomes proportionably uncertain both in its direction and range. Everything which contributes to remove the causes of deviation tends to increase range, and increase of range tends to precision of fire; as, under such circumstances, less elevation is required for a given distance, the shot travels nearer the earth, and will strike objects of a moderate height that intervene.

Greater Safety.—The superior principle upon which this gun is constructed is a greater guarantee against its bursting; and it cannot reasonably be doubted but that loading at the breech will be attended with less danger from accidental explosion of charges; also, the danger to men (increased by the introduction of rifles) while loading at the muzzle will be avoided, and the occasional danger from fire left within the gun is disposed of by the use of a moist sponge.

Greater rapidity of fire—by which I mean the delivery of *effective* fire.—I use the expression *effective* advisedly, as a comparison as to the rapidity of firing without aiming at an object has been sometimes absurdly instituted. Armstrong contemplates firing four times in a minute. The facilities for delivering a rapid fire from this gun are great, because the distance which the cartridge and shot have to travel is much less—because the position of the loader is more advantageous for effecting his object, which, in comparison of muzzle-loading, is enhanced in proportion to the weight of the shot used; and, should an accident occur to the rammer—not uncommon to the long handles of those used for smooth-bore guns—this can be loaded by hand The gun has not to be run up each time, nor does it require to be pointed each time, unless the object or battery be in motion; even then the facilities for pointing are greater than in the ordinary guns. The power of delivering a rapid fire may not with propriety be estimated for a limited period, but rather be connected with the adaptation for comparatively continuous fire. As the charges are considerably less than half those ordinarily used, and, as the moist sponging and the rush of cool air from the open breech tend to keep the gun cool, the fire could be continued very much longer than from the ordinary guns.

Economy.—In estimating this, owing to its increased efficiency, it would be impossible to set off the cost of gun against gun, but rather against the cost of the number to which, owing to greater range, precision, and power of dispersion, it in effect is equal to.

Convenience.—This hardly expresses the increased value of this gun due to its greatly reduced weight; owing to which it admits of easy transport—field-pieces and guns for battering purposes being much less than half the weight of those ordinarily used. Great as are the advantages stated, it possesses greater for ships' batteries, for reasons which I purpose giving hereafter, proceeding first to give a practical illustration of the comparative advantages before alluded to. Lieutenant Dahlgren (United States Navy) mentions that at 260 yards each of ten shot fired from a 32-pounder, were included in four feet square of the screen aimed at, while of ten shot fired from the same gun at a screen 40 feet long by 20 feet high, and distant 1,300 yards, only three struck: that is, at five times the distance, though the target was increased fifty times, only one-third of the shot fired hit it. One hundred shot fired from Armstrong's gun at a target nine foot square, and distant 1,500 yards, struck nearly every time, knocking it down several times; after which it was fired at, still on the ground, and was hit several times; and yet all this occupied but two and a quarter hours, and the temperature of the gun at the termination was only 150°. Although this illustration tells very much in favour of the latter gun, such estimates, founded upon mere "hits" of large targets, by no means mark its immense superiority; for, as the value of guns is in proportion to their power of throwing shot into embrasures, of hitting a narrow and definite line for

* MECHANICS' MAGAZINE, No. 4, New Series, for Jan. 21, 1859.

† Slightly abridged from a lecture recently delivered at the United Service Institution, on "The Effect of the Introduction of Rifled Cannon on Naval Architecture."

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breaching purposes, or of throwing shot into ships' ports, or of hitting them "between wind and water," so must estimates of their comparative value be drawn from the precision with which they strike *small* objects. The additional value of those described for ships of war arises from the fact of their being so much lighter, and from the small amount of their recoil (*practically none*), owing to which they will not require ships of such great breadth. This involves very great general naval efficiency and economy. The small external diameter, particularly at the chase, will admit of smaller ports; no inconsiderable advantage should ships' sides be covered with plate-iron. It is not my purpose to state all the advantages to be derived from this admirable invention; sufficient has been said to show the necessity for its introduction, and that doing so at an early period will cost the country much less. The efficiency of the navy also will be increased in proportion to the promptness with which it is applied, provided its value is not rendered nugatory by an absence of adaptation in the forms of the ships. The wonderful success described has been obtained by an accuracy of detail that some, who pique themselves upon being practical, I say not how correctly, would, *à priori*, have characterised as theoretic and crotchety, but which nevertheless has proved to be eminently practical.

If the practice of naval architecture is to be progressive, if, in fact, we are to elevate it to the rank of a science, which it is now only in part, whatever professional architects may say to the contrary, we must follow out our observations and experiments with similar accuracy of detail. The present practice, for war purposes, bears the relation to what it ought to be, that the service ordnance does to Armstrong's guns. Not that ships may be designed that shall sail or steam fifty times faster than at present; but they may be made some indefinitely large quantity more valuable for war purposes—it may be, in some cases, fifty times more so, and at less cost.

It has been said that the introduction of steam and progress of scientific discovery necessarily entailed rapid and extensive changes—say, rather, that this progress has found us pursuing an unscientific course. Science moves with measured strides, like "coming events casting their shadows before;" her every step is the subject of law, and none can follow, however distant, but must be so far in harmony with her designs as not to need at any time to have recourse to more rapid or to radical changes. Thus, the lengthening of new ships' bows ought not to have been required, as the long bow should have formed part of the original design, its value having been proved full fifteen years previously; indeed, the longest adopted are still shorter than that which science would dictate.

We condemned a whole fleet of ships; and yet, whatever were their defects of size, for correctness of design, and for adaptation to the purpose for which they were intended, as a whole they are unsurpassed, nay, unequalled by their successors. Let me not be misunderstood. It is true that the latter were larger and, in the ordinary sense of the term, finer ships; yet, had we adhered to the principles contained in these earlier forms, we should have more efficient ships than we now possess.

Again, when steam-power was introduced, the authorities had embarked at a cost of three millions in building another fleet* of ships of great proportionate breadth, and of a general form that was opposed not only to the authority of the best standard treatises on the subject, but to the accumulated experience of ages; nor was it the introduction of steam that opened our eyes to the fact that in building such vessels we were steering vastly wide of the track which science would have dictated—that fact was made patent by the sailing squadrons of 1846 and 1847, which led to the abandonment of the extreme peculiarities of the forms alluded to. No doubt, however, the expensiveness of steam as a motor forced upon reluctant minds the fact, that ships of greater proportionate length than had ever been adopted were more easily driven, whether by sails or steam. Long before that, however, merchant sailing-vessels of this and other countries had yielded abundant proofs to that effect. Why we should not have drawn inspiration from such sources it is difficult to understand.

But, while the discovery that we were far wide of the proper track led to a decided improvement in our practice, it did not lead us to the re-adoption of those sounder principles of design which characterised some of the older models, both French and English. This is attributable in some respects to the same cause as that which led to the adoption of great proportionate breadth and rising floors—viz., the undue importance attached to great speed, and the misapprehension how that quality might best be obtained. This had the effect, not yet wholly got rid of, of obscuring what one might have supposed to have been very obvious—viz., the fact that it is impossible to exaggerate one quality in a ship without proportionally diminishing one or more others.

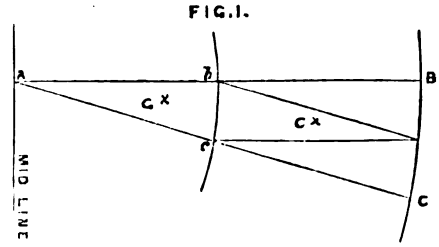
It is too much the habit of professional men to assume that laymen cannot understand these things; they, therefore, deliver their opinions *ex cathedra*, and afford us no proof: on the contrary, I profess to be a sailor, and have long acted upon the principle, that, if I could not explain to an intelligent mind or indeed educate an uninstructed one up to a comprehension of any point connected with my profession, the fault was in myself. Now, what we require is, that naval architects will cease to obstruct those who are searching for truth, acknowledge—what all are beginning to discover—that there is an amazing amount of ignorance on the subject of naval architecture even amongst those who have studied the subject most, and join us in our search. Enough of time and money has been wasted in experimenting without system, and too often in violation of principles; no plans should be accepted without proofs of their correctness, or without being tested by the application of carefully-arranged statistics.

As our information in some respects is only comparative, we may thus inquire what the fact is as respects some of our modern ships of war. If there is an adherence to principle in their designs, we shall be able to trace a consistency throughout—that is, a definite relation in the proportions of one dimension to another, as length to breadth, depth to breadth, and in screw vessels between the area of screw and its depth of immersion, and the area of greatest section, or only such a departure as was indispensable, and as did not mar the design.

There are two things which have always been held as ruling the proportion of breadth to be given to vessels of war—a sufficiency to obtain stability and a good platform for guns. The precise quantity necessary has been for some time a vexed question, therefore an opinion from any one cannot be deemed sufficient. Nevertheless, what is not a proper quantity may be arrived at, and much fairly inferred from that. *Ceteris paribus*, stability increases as the cube of the breadth, the moment of sail or power that produces inclination not increasing in so rapid a ratio, consequently the larger the ship the less is the proportion of breadth required to produce a sufficient amount of stability.*

When a vessel inclines she immerses a prism on one side and emerges an equal one on the other; by the volume of these, and by the distance of their centres of gravity from each other, is a vessel's stability compared with that of another. Suppose fig. 1 to represent one of these prisms for each of two vessels, one double the breadth of the other; from this it will appear that *A b c* is only one quarter that of *A B C*, and *G* is only half the distance from *A* that *C* is, therefore the effect of the larger prism is equal to $4 \times 2 = 8$;

FIG. 1.



in other words, the stability of a vessel of double the breadth is eight times that of the smaller; but 8 is the cube of 2.

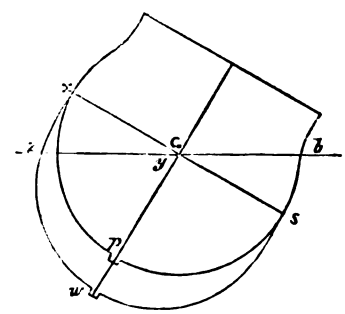
The following dimensions—

	Length.	Breadth.	Ratio of Length to Breadth.
	feet.	ft. in.	ft. in.
Marlborough...	245	61	4 0
Renown.....	245	55·6	4 ⅜
Racoon	200	40	5 0

show that the smaller vessels have the least proportion of breadth, which is the reverse of what adherence to the law above described would require. Nor can it be said that this arose from the necessity for a wider battery in the larger vessel, for the Racoon carries guns on her broadside of equal length and calibre with those carried by the Marlborough.

There is another dimension—viz., the depth, which exercises an important influence on the properties of ships; this, also, has been treated as if there was not a proportion of it to breadth that was more correct than any other.

FIG. 2.



If we suppose Fig. 2 to represent the cross section of a vessel, which may be taken as far as the principle involved is concerned to represent all her sections, and she to be inclined to the angle *x y z*, this will be as if the emerged solid *x y z* were carried over to *y b s*, and the power requisite to effect it will be great as the volume of these solids is great in proportion to the whole volume of the ship. If we suppose the ship's immersed depth to be only from *y* to *p*, then the volume of these solids will be greater in proportion to the volume of the ship than if her depth be increased to *w*; that is, suppose it possible while the vessel is inclined, that an increased volume were given between the line *x p s* and *x w s*; the volume of the solids *x y z* and *y b s* not being increased, the effect would be to float the keel up, and diminish the stability. This is what takes place when a vessel is made deeper in proportion to her breadth, yet, strange to say, the smaller vessels are those which are chosen to be made deeper, and so their proportionate stabilities are further reduced, though already small from their limited size, and less also, because they have received a less proportion of breadth to length; thus:—

	Mean draught.		Half-breadth.		Difference	
	feet. in.		feet. in.		feet.	in.
Marlborough .	25 0	to	30 6	=	5	0
Renown	24 0	to	27 6	=	3	6
Racoon	18 5	to	20 0	=	1	7

Now, if the smaller ships have sufficient breadth of beam for stability and for a good battery, then

* This will account for the great number of ships of the line which we possess, and which it is proposed should be allowed to rot.

* By stability, here, I mean the power to resist inclination from the pressure of the sails, a quality which conduces under certain circumstances to fast sailing.

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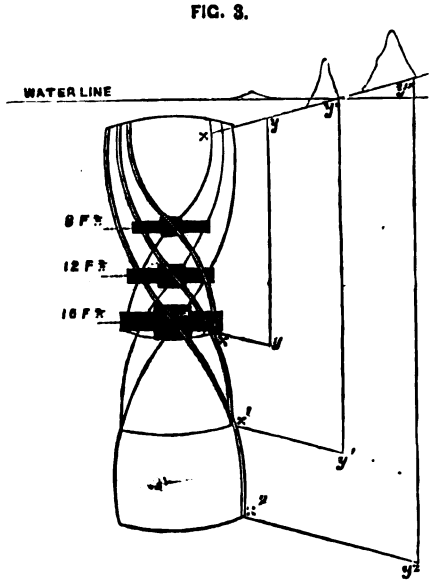
the larger ships must have too much; that they have will further appear from other considerations, for it cannot be said that the Renown, because of having a deck more than the Racoon, requires fifteen feet more breadth. Again, in order to obtain satisfactory results with a screw, that is, speed economically, it is necessary that the area of the screw shall bear a certain relation to the area of the greatest section, and that the screw shall be sufficiently immersed to obtain sufficient resistance to its thrust. From the following diagram it will be clear that the greater the diameter of the screw, the greater is the distance it should be immersed to obtain proportionate effect.

Suppose Fig. 3 to represent the forces given off by screws supposed proportionate to their di-

FIG. 3.



ameter—for it would be impossible to apply a large power to a screw of small diameter—then the lines $x\,y$, $x^1\,y^1$, and $x^2\,y^2$ may be taken to represent the direction and force of the thrust from each of 8, 12, and 16-foot screws respectively; from this it is clear that, if the larger screws are not more immersed than the smaller in proportion to their size, that part of their thrust will be lost in throwing up water at y^1 and y^2, instead of propelling the ship; this view of the case is confirmed by experience. This points to another ground of objection to giving great proportionate breadth to depth.

The area of greatest midship section, representing the principal element in resistance, will be the same whether the breadth and depth are—

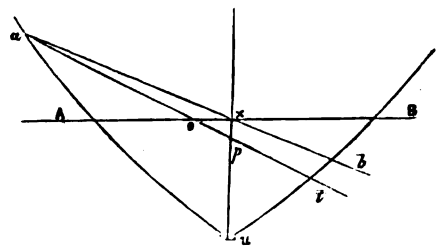
Breadth.		Depth.		
as 44	×	18·2	=	800·8
or 40	×	20·0	=	800

But in the one case the screw could be immersed two feet more, and its effective results proportionally increased. In illustration of this fact it may be stated, that, if the Diadem had been two feet deeper, though her displacement were also in that proportion increased, she would have been a faster, as she certainly would have been in every other respect a more efficient ship.

It has been stated that Sir William Symonds gave great beam to our ships, and that his successors did well to continue it; this is not true in fact, and, nominally, only true of the three-deckers, which, being larger, have equal breadth no doubt, but less in proportion to their length; still I assert that great beam is an unmixed evil.

The ships in question were uneasy, and it was assumed that, owing to the form of the solids immersed and emerged as they rolled, their centres of gravity rose and fell; that this was the sole cause of such motions; and that if their sides near the load water-line had been straight, or equally curved, this motion would not have taken place. This is a mistake, and one that has injuriously

FIG. 4.



affected nearly all our modern ships. The defect may arise from a different cause. 1st. I may explain the effect of the inequalities alluded to:—

Suppose $A\,B$, Fig. 4,* to represent the surface of the sea, and $x\,y\,u\,t\,r$ the outlines of a section of a vessel floating upright; for convenience of illustration, suppose the sea line moved on this section from $A\,B$ to $a\,b$; this supposes the vessel to have moved round z as the centre of her longitudinal axis, which cannot be, as the solids, emerged and immersed, must eventually, though not instantly, become equal, which is contrary to the supposition; consequently, the ship must rotate round some point, suppose o, at the inter section of the two planes that form two equal solids of emersion and immersion, in which case z and the centre of gravity equally will have been raised a perpendicular height equal to $z\,p$. In proportion as ships have this form near the load water-line—and all have it more or less at their extremities—will their centres of gravity be subject to a similar motion—the less, however, the better.

But a similar motion may arise from a form, the sides of which are "either perpendicular or equally curved" immediately above and below the load water-line.

The bottom of a ship is subject when afloat to an infinite number of pressures which act at points perpendicular to the surface with which they are in contact, and sustain her by their joint action; and, though there is ordinarily easy play amongst the particles through which these pressures proceed, yet, when motion round a longitudinal axis is communicated rapidly to such a body, the water resists proportionally, as though it were rigid, and the effect is somewhat similar to that which takes place when a body is rolled upon a rigid plane surface; this will take place whatever may be the force which communicates the motion, so that it be rapid in its action. If the force be applied at one side the body will rotate round some point on the other side of the centre of gravity from that on which the force is acting, and more distant as the form of the body is less circular, and less deep than wide. Suppose the inclining forces to be waves, which are the forces we have in most cases, these to be of equal dimensions, and to arrive at the side of each of figs. 5 and 6. Suppose y and y^1 to be the position of their centres of gravity; from a bare inspection of fig. 6 it will be evident that the common idea that when a vessel inclines she revolves round her centre of gravity, cannot possibly hold, even approximately, in vessels of

* This figure is exaggerated for better illustrating the point in view.

such a form; for if, on the wave arriving at the side of fig. 6, we suppose her to revolve round y^2, we must suppose a rapid and deeper immersion of one side of her bottom, from s^1 to t^1 against the pressures already on it, when she would assume the position represented by the dotted lines, which is obviously impossible. What takes place is, that the buoyancy added lifts the vessel high in proportion to its amount and the length of lever through which it acts, as compared with the resistance on the opposite side offered to greater immersion—the position the vessel would assume would be rather that of II, II than the dotted figure III, III.

It is equally obvious that the wider the vessel and the less the depth in proportion, the greater will be the amount of buoyancy added during the

FIG. 5.

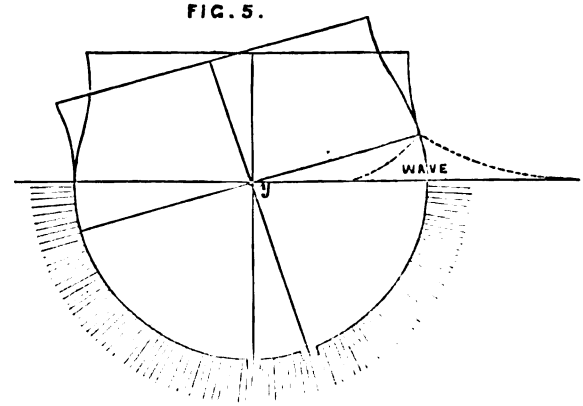
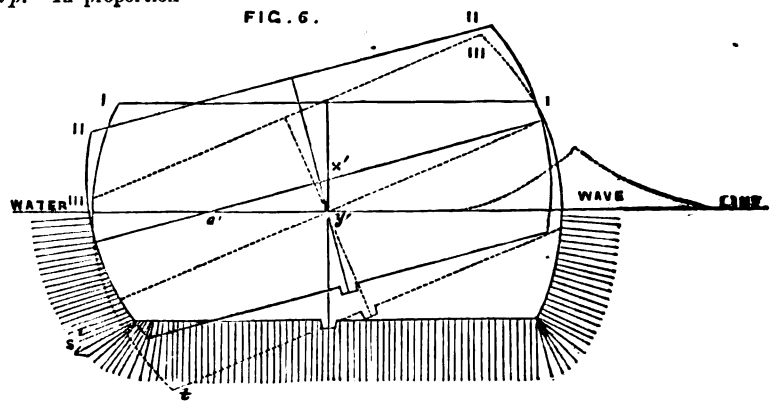


FIG. 6.



passage of a wave across the centre line of the vessel, the greater the lever to lift her and the higher will her centre of gravity be raised; the vessel will in reality rotate round some point, say o, and her centre of gravity will rise from y to x; when the wave passes the middle line of the vessel an opposite action will be set up, equally great in proportion to the breadth, but still greater and more rapid from the acceleration caused by the fall of the centre of gravity from the greater height, which will occasion the centre of gravity to rise proportionally higher on the succeeding roll. These motions will be violent, and something like that of a wheel going over a stone.

In vessels of the form of fig. 5 there is little of this motion, arising from the fact that the points of pressure are all equidistant from the centre, in consequence of which there never arises a sudden demand for a deeper immersion of any part than that which ordinarily obtains.

The motions alluded to above will take place irrespective of the position of the centre of gravity in the vertical plane; though its position might aggravate the evils described, no arrangement of weights could mitigate the evils of such bad forms as that of fig. 6.

(To be concluded in our next.)

"A letter from Rome states," says the *Builder*, "that the Pope has administered absolution to King Bomba by the electric wire. This is not only a new telegraphic process, but a new process of salvation, by electricity."

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SIR WILLIAM ARMSTRONG ON HIS GUN AND PROJECTILES.

In addition to the remarks quoted in our "Gossip" of last week Sir William Armstrong spoke as follows in his speech at Newcastle:—"The percussion arrangement is such that the shell, while in the hands of a friend, is so safe and quiescent that it may be thrown off the top of a house without exploding, but when among enemies it is so sensitive and so mischievous that the slightest touch will cause it to explode. The reason of this is, that the shock which the projectile sustains in the act of firing puts the percussion arrangement from half to full cock, and it then becomes so delicate that a shell has been exploded at Shoeburyness by being fired against a bag of shavings. Moreover, the fuse may be so arranged that the shell explodes at the instant of leaving the muzzle. In that case the pieces spread out like a fan, and act as grape shot. I could give hundreds of examples of the effect produced by those shells; but I will confine myself to a single instance, which I select merely because it took place before the Duke of Cambridge, and many other officers of distinction. Two targets nine feet square were placed at a distance of 1,500 yards from the gun, and seven shells fired at them; the effect of these seven shells was that the two targets were struck in 596 places, and with so much force, that although one of the targets was three inches thick it was riddled through and through with the fragments. Similar effects were produced at much longer distances, extending in some cases to 3,000 yards. I leave you to conceive what would be the effect of these projectiles in making an enemy keep his distance. For breaching purposes, or for blowing up buildings, or for ripping a hole in the side of a ship, a shell of a different construction is used. The object in that case is to introduce the largest possible charge of powder. To go back to the commencement of my experiments, and give you a brief history of my proceedings. They commenced upwards of four years ago; my first gun having been commenced in December, 1854, and finished early the following spring. Although this gun was, in fact, constructed upon precisely the same principle as those now making, it did not, on trial, afford satisfactory results. Schemers, whose inventions only figure on paper, have little idea of the difficulties experienced by those who carry their inventions into actual practice. I met with my full share of difficulties, for it took me three years of continual application to surmount them. In the height of summer my experiments were conducted at the sea-shore, between the hours of three and six o'clock in the morning. People after that time began to move about, and were apt to get in the way. I dare say I owe an apology to many of my neighbours for disturbing them at very untimely hours. At other seasons I went to the moors of my friend Mr. Beaumont, at Allenheads, and there I had a hut constructed on a ridge 2,000 feet above the level of the sea, with a large valley beneath, with nothing more almost than the grouse or sheep running the risk of being shot. I used to awaken the denizens of the heath by the firing of my shells at my distant targets in the middle of the night. At the end of the three years all began to go right. I then succeeded in making several guns upon my own responsibility, and incurred very considerable expenses; but all those expenses were reimbursed by the Government. I take this opportunity of mentioning this because some misapprehension prevails upon the subject. General Peel, Lord Panmure, the Duke of Newcastle, the three Ministers who held office during my operations, as well as all the permanent authorities of the War Office, uniformly accorded to me all the support I could desire. At the beginning of last year a committee was appointed to investigate the whole subject of rifle cannon, and for a period of five months this committee gave nearly their whole time to the guns, projectiles, and fuses which I submitted to them, and finally gave a unanimous verdict in favour of the whole system. With regard to the precision and range attained with these guns, I have but little to add to what General Peel has already stated upon the subject. Since those statements were made, improved results have been obtained by means which it is not necessary, and would not be proper to explain. At a distance of 600 yards an object not larger than the muzzle of an enemy's gun or the crown of a man's hat can be hit almost at every shot. At 3,000 yards a target 9 feet square, which at that distance appears a mere speck, has, on a calm day, been struck five times out of ten. A ship affords a target large enough to be hit at a very much longer distance, and shells may be thrown into fortresses from distances exceeding five miles. To do full justice to this weapon when used at long distances, it would be necessary that gunners should undergo a much more refined and scientific course of instruction than they are now accustomed to. I hope and believe both the naval and military departments will take measures to afford the necessary instruction both to officers and men. It is an interesting subject to consider what will be the general effect of the introduction of these weapons upon the various operations of war. And first, as regards ships being opposed to ships on the open sea, it appears to me they would simply destroy each other, if made of timber. The time has gone by for putting men in armour, but I suspect it is only approaching for putting ships in armour. Fortunately no nation in the world can play at that game so well as we can, for our resources, both in the production of iron and in its application to all manner of purposes are unbounded. As regards a ship opposed to a battery, the advantage will unquestionably be in favour of the battery. It has a steady platform of guns, and it is composed of less vulnerable material. In cases of invasion, the possession of artillery of this description is all-important to the defenders. I believe it would be quite impossible to effect a landing if opposed by batteries of these guns, or if a landing were effected, the attacking forces would have to be most awfully cut up.

ON TIMBER FOR SHIP-BUILDING.

(Continued from p. 319.)

GUIANA is another country from which we may reasonably anticipate a very much larger supply of timber than we now obtain. Already it furnishes two out of the eight first-class woods recognized by Lloyd's, viz., the mora and the greenheart; but there are in the country several other most valuable timber trees, such as the kakaralli, the locust, the cabacalli, the bullet tree, the sewari, the carana or red cedar, the kuraki, the determa, the cuamara or tonka, &c., &c. If well-directed efforts were, however, made to increase the supply of the greenheart and the mora alone, immense quantities of both might be obtained. Greenheart is very abundant within 100 miles of the coast, and can be had almost to any extent, but the mora is even still more abundant. "This most majestic of all the forest trees of Guiana towers above every other, often attaining a height of from 100 to 150 feet, the lowest branches being 60 ft. from the ground. The wood is extremely tough, close, and cross-grained, so that it is difficult to split, which renders it peculiarly adapted for ship-building. The trunk makes admirable keels, timbers, and beams, and the branches, having a natural crookedness of growth, are unsurpassed as knees. Were men-of-war ceiled with this wood, little mischief would be occasioned by splinters during action. In most respects it is superior to oak, particularly in its exemption from dry-rot. It is abundant along the rivers of the coast region, and extends as far south as lat. 3° N. It grows luxuriantly on sandy reefs, and on tracts of barren clay, known as "mora clay," a soil so sterile as not to admit of profitable culture. Sir R. Schomburgh, referring to this tree, says, "In all my former travels in Guiana I have nowhere seen trees of this description so gigantic as on the land adjoining the Berima, at its upper course. On this upper part of the river the mora is so abundant, and grows to such a size, that the whole British Navy might be reconstructed, merely from the trees which line its banks; a circumstance well worthy of consideration, for the river being navigable for vessels of 12 feet draught, those intended for the transport of the timber might load at the very spot where the trees are cut down." There can be little doubt, then, that these two famous woods can be obtained in quantities limited only by the supply of labour that can be applied to this particular pursuit. Unfortunately, labour is both scarce and expensive in Demarara, presenting an obstacle more difficult to surmount than may be imagined. I am not quite sure that it would not be a good plan to induce the immigration of 100 Honduras wood-cutters, and establish them on some choice timber locality, so that whilst they are pursuing their accustomed labour, they might gradually draw around them those wild and adventurous spirits who would prefer the excitement of such a life to the dull monotony of a sugar estate.

I do not believe that any great increase in the exports of timber can be anticipated from India Proper; but I think that the exertions of Government might induce a very large supply from Assam. I have in my possession various lists by Dr. Wallick, Mr. Masters, Major Hannay, and Mr. Martin, of the timber woods of Assam, amongst which we find a light and valuable kind of teak, the Saul (*Shorea robusta*), the Dalbergia Sissoo, the oak, and numerous others most important and valuable. Assam has the most complete water-carriage (the Calcutta steamer even going up to Gowhatti), and a population whose habits are well suited to such an employment as woodcutting; so that if proper measures were adopted, an immense quantity of first quality timber might be annually sent down from this rich country. The Tenassarim provinces are perhaps more abounding in fine valuable timber for shipbuilding than any other country in the East.

A quantity of teak has, for many years, been exported from Moulmain and other ports along the coast; but the field which this healthy and most pleasant country still presents is so inexhaustible, that I consider it to stand unrivalled as a timber-producing country. Hitherto teak alone has been exported, but there are others which are considered quite equal, and even superior to it. The following list of some of the best timber woods will serve to give an idea of the capabilities of these neglected provinces:—

Anan.—One of the hardest and most compact woods known.

Ahnaun.—Strong and very durable; used in ship-building.

Keoun-lac (*Rottlera*).—Excellent for rudders.

Kat-wat-nu (*Cedrela*).—Large timber, 40 to 70 feet long; used for shipbuilding.

Ka-nyeng-kyaung-khyay.—For shipbuilding; contains an aromatic oil, and is not attacked by insects.

Kyep-yo.—Similar to teak.

Kud-doot-alain.—A large tree; used in ship-building.

Kunnazoo.—Very large tree; very hard and durable timber.

May-maka.—Used in shipbuilding.

May-rang.—Said to be very durable.

May-tobek.—Used for the bottoms of ships; considered preferable to teak.

Mayam.—An indestructible, strong, heavy, dark red wood.

Podauk.—A beautiful, compact, and hard wood, sometimes called "Rosewood."

Pengadoh.—Strong and durable.

Pien-mahne.—Yields very strong knee timber.

Pyan-ga-dean.—Hard, dense, and durable; called "iron wood."

Soondra.—A very tough, elastic wood; said to be the strongest of all the Indian woods.

Thab-ban.—Fine solid timber, sometimes 70 feet long; used for boats.

Than-kya.—A species of wood similar to saul.

Tha-nat.—A kind of grey teak.

Tha-nat.—More resembling saul.

Than-that.—A capital wood, like saul.

Theet-ya-han.—A species of teak—close grained.

Theng-gan (*Hopea Odorato*).—An enormous tree, of the saul tribe; yields a strong, compact, and excellent timber, considered superior to teak—also a quantity of good dammer, or resin. Insects never attack this wood, nor is it liable to rot.

Tirbbac (*Quercus Amherstiana*).—An oak; a large tree, used in boat-building.

Thounsanga.—A large tree, used in boat-building.

Thingan-kyaup.—Close grained, strong, heavy wood; used in ship-building.

Thubbae (*Mimusops*).—Used in ship-building.

Thuhbor (*Uvaria*).—A large tree, used in boat-building.

Toung-byeng.—A kind of red saul.

Thym-bro.—Good, strong, durable wood; used in boat-building.

In this list I have mentioned but a few of the truly valuable timber woods abounding in the provinces of Amherst, Tavoy, and Mergui; and it must be understood that I have not included the well-known teak, which has so long been the grand staple product of the country, although enormous quantities of this celebrated wood yet remain.

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Under the old system of the East India Company, the "rules and regulations" for teak cutting were stringent enough, but were rarely acted up to. Licenses were granted only on the conditions, first, that the selected trees were to be barked all round, so as to kill them, two years previous to their being felled, in order that only seasoned wood should be sent to market; and secondly, that for every tree cut down, another young teak tree should be planted carefully out, for the benefit of the country hereafter. I do not know whether these "rules" still continue in force. It will be seen that timber cutting, therefore, has long formed one of the most important occupations of the people residing in Tenassarim; but we may go very much further than even the knowledge of this fact would lead us, inasmuch as we may view the Muggs, the Taliens, and the Burmese, as being all more or less expert in the use of the axe and the adze, as well as in the knowledge of the various qualities and uses of their forest trees. There would be no difficulty, then, in organizing large bodies of these men, as "timber gangs," their wages being 10s. a-month; but, as these provinces are scantily populated, any additional number of men might be procured (if necessary) either from among the Hill Coles, or from the adjoining territories of Siam, both of whom I have myself largely employed, and can vouch for their being excellent woodsmen. Under any circumstances, these labourers would not cost more than 12s. per month. On the score of climate, it may be said that there is not a more healthy tropical climate in the world, both for natives and for Europeans. In fact, the late Dr. Helfer, Mr. Riley, and others, long resident in the country, have expressed themselves most enthusiastically in respect of it. The three provinces are thoroughly intersected and opened up by water communication for the woodman, by the Great and Little Tenassarim, the Tavoy, the Ye, the Attaran, the Gyne, the Houndran, the Lenya, the Pak Chan, and numerous other rivers and streams. Along the banks of these rivers vast quantities of timber exist, which with the greatest facility may be floated down to the sea. The numerous beautiful islands forming the Merguian Archipelago also present advantages of the highest character, and contain harbours scarcely surpassed by any in the world.

Malacca (under which head I comprise our three settlements in the Straits of Malacca, viz., Pinang, Malacca, and Singapore) abounds in valuable timber woods, which are almost wholly unknown in Europe.

My friend Mr. J. W. Westerhout, the Assistant Resident of Malacca (where he was born, and has always lived), has furnished the following list of its principal woods:—

Tampanees, Blean, Murbouw, Tamboosu, Tampang, Kalat Merah, Medang Katanahan, Natoo, Galam Tekoos, Madang Boagah, Rangas, Madang Konjcet, Madang Lawang, Laniooso, Madang Paranas, Madang Langadee, Rassaak, Madang Kawan, Madang Samenjaak, Saraya, Marantee, Lida Karabouw, Pisang Pisang, Mangaranan, Pataleng, Madang Taloor, Dalle Dallee, Baloon Ejook, Salomar, Bintangoor, Bonoot, Kampaas, Madang Kaladee, Jabootong, Giham, Paning Paning, Madang Tandook, Sagah, Panagah, Kalat Potee, Pannah, Marsanah Kalat Lapies, Kledang, Tarantang, Pinang Bahie, Chengal, Brombong, Tolang Daleeng, Cheehaar, Menkadoo Ootan, Golam Zekoos, Gombang, Kalaat Merah, and Maraboun Lahoot.

My own experience of these woods (during my residence in the Straits) was principally confined to the following, which I am able to describe and characterise:—

Murbouw.—Very strong, hard, and heavy: used in shipping; not attacked by insects; will last 100 years.

Bintangoor.—Valuable wood for ship-building, especially for planks, masts, spars, &c. It grows in great abundance, especially near Singapore, and is largely exported to Mauritius, California, &c.

Damerlaut.—Hard, tough, and very valuable.

Giham.—A pale yellow wood, close-grained, hard, elastic, very durable, and generally used in boat-building.

Tampanee.—Used for house-building; hard, and exceedingly durable.

Tamboosu.—House beams; considered very durable.

Galam Tikoos.—Hard, tough, elastic; used in boats.

Marantee.—Very large; light resinous wood, much used for planking, and in building boats.

The Straits settlements of Malacca although near the equator, enjoy a healthful and salubrious climate, and have an abundant population of Malays and Chinese, whose wages average three to four dollars a month, without food. The Malays are first-rate woodsmen and boatmen, admirably adapted for such work as procuring timber; whilst Chinamen are most industrious labourers, and extremely enterprising contractors for all kinds of work. I consider this locality, therefore, as affording a promise of a very large supply of timber immediately measures are taken to commence the undertaking, for the natives themselves will not be backward in entering into the spirit of the enterprise.

[We are compelled to defer the publication of the conclusion of this paper until next week.]

GUNPOWDER EXPLOSIONS AT HOUNSLOW.

THE verdict of the jury in the Hounslow Gunpowder Explosion is as follows:—"We find that the deceased Thomas Albone was killed by injuries inflicted in and upon his body by the explosion of a certain large quantity of gunpowder at the mills belonging to Messrs. Curtis and Harvey, but by what means the explosion took place there was not sufficient evidence to prove. In returning this verdict the jury feel it to be an imperative duty to express their opinion that the works of Messrs. Curtis and Harvey, where the explosion took place, have been conducted in an exceedingly loose and dangerous manner, and that the safety of the workmen engaged in such establishments, and of the public generally, requires the immediate enactment of a law for subjecting all gunpowder manufacturers to the stringent supervision of Government inspection and control, with a view to the invariable adoption of the precautions and recommendations similar to those contained in Dr. Thompson's report. The jury think it right to notice that of late years the works in question have been greatly, and as they believe unlawfully, increased, and that gunpowder has been kept in such vast quantities as to be attended with danger to workpeople employed therein, as well as to the inhabitants of the surrounding neighbourhood." The verdict of the jury was scarcely recorded when another explosion occurred at the same establishment, which it is much to be feared, will be attended with fatal consequences. On Tuesday night, at a quarter past 11 o'clock, the inhabitants of Twickenham and the adjacent neighbourhood were greatly alarmed by a succession of explosions that shook the houses and rattled the windows for several seconds. Many persons left their homes, and others who had retired to rest got up to ascertain the cause of alarm. Upon inquiry it was found that the department of the works known as the "incorporating mills," had blown up. These mills, four in number, are situate near the engine-house, in one line of building, through which a shaft runs that turns four pairs of immense iron-edge runners, used for grinding the various articles together of which the powder is composed—viz., saltpetre, charcoal, sulphur. During this process, the composition is kept continually damp by the application of water, and in this stage is called "green charges." The whole of these mills are destroyed, and one poor fellow named Allen has received such injuries that it is scarcely possible he can recover. During the inquiry before the coroner, on Tuesday, it was stated by Mr. Ashby, the manager of the works, that a large accumulation of powder in the various corning and glazing houses was considered more desirable than the risk of transferring it frequently through the vicinity of the mills. There is no doubt that this accident, occurring so immediately after the presentment of the jury, will tend to a new arrangement of the various departments, that shall lead to greater security to the persons engaged, and diminish the excitement and alarm that now exist in the neighbourhood.

Law Cases.

COURT OF QUEEN'S BENCH, Westminster, April 16.—*Sitting in Banco, before Lord Campbell and Justices Erle, Crompton, and Hill.)*

NORTON v. NICHOLLS.

THIS was an action brought to recover damages for the infringement of the plaintiff's registered design for a mantilla shawl. The Court had granted a rule for a new trial, or to enter the verdict for the defendant, and, after argument, had taken time to consider.

Lord Campbell now delivered the judgment of the Court, in favour of the defendant. On the part of the plaintiff five points were made, in respect of each of which it was contended the design of the plaintiff's shawl was new. The design was registered under the 5th and 6th of Victoria, cap. 100, and it was contended that if the defendant had imitated the design in any one particular, the plaintiff was entitled to recover. The shawl was reversible, and had two sides, was scalloped, had a particular border, a particular configuration of the corner, and a newly invented fringe. The great merit of the shawl was, that it could be made into eight several shawls, all seeming to be different. The evidence showed that all the five points relied upon were in public use before the registration of the plaintiff's design; but, it was contended, that the combination of all the five points in the plaintiff's shawl was new. The defendant's shawl was the same as the plaintiff's, only the colour was different. Thus the question arose, whether in respect of such an imitation the action could be maintained? The Court were of opinion that it was not. The Court did not deny that a combination might be a "design" within the meaning of the statute, but this was not so. The registration also was defective, consisting merely in leaving in the registry an entire shawl of the plaintiff's manufacture. That gave no notice of the nature of the plaintiff's claim. Nor had sufficient notice been given to the defendant of the plaintiff's exclusive right.—Rule accordingly.

THE VICE CHANCELLOR'S COURT.

TUCK v. SILVER.

Mr. Rolt and Mr. Fooks moved for an injunction on behalf of the plaintiff to restrain an infringement by the defendants of the plaintiff's patent in respect of india-rubber packing for pistons, piston-rods, and valves. Letters patent were obtained by the plaintiff on the 25th of August, 1854, and, in the specification, the invention of "improvements in packing for pistons, piston rods, valves, and other uses" was described as intended to combine a flexible material of canvas, coated or saturated with a solution of india-rubber, or other suitable composition, with an elastic material, so as to cause the former to be constantly kept in contact with the rubbing or tearing surface by the elasticity of the latter, this object being accomplished by constructing the packing with a block or core of india-rubber, or other elastic material, surrounded by folds of flexible material. The packing manufactured in accordance with the patent had acquired considerable reputation, and was known as "Tuck's Patent Elastic Core Packing." The defendants carried on business as outfitters and general merchants at Bishopsgate-street-within, and were also proprietors of a factory at Woolwich, known as "Silvertown Works." In August, 1856, the plaintiff, having discovered that the defendants were infringing his patent, wrote to them on the subject. On the 28th of August, 1856, the defendants replied that they were not aware of the existence of the patent until they had received the plaintiff's letter, and that they had discontinued the manufacture and sale of core packing, and would on no account resume them. The plaintiff had recently discovered that the defendants were selling elastic core packing similar to that manufactured by him under his patent, at exactly half the price, under the name of "Silvertown Packing." To restrain this alleged infringement of his patent the plaintiff had filed his bill, and now moved for an injunction.

Mr. W. M. James and Mr. Baggallay, for the defendants, contended that there had been no infringement: that the specification of the patent was vague, and did not state the employment of vulcanized india-rubber, which was alone available for such purposes, and that the patent itself was of doubtful validity, and, at all events, ought to be legally established before the plaintiff could obtain an injunction in this court.

The Vice-Chancellor said, that upon the two grounds of long and uninterrupted enjoyment under the patent, and of the special circumstances of conduct by the defendants, the plaintiff was entitled to the interlocutory injunction. The enjoyment had been for five years without interruption and with acquiescence. But the conduct of the defendants was alone sufficient to induce the Court to grant an injunction. After the assurance by the defendants in August, 1856, that they would on no account resume the manufacture or sale of "core packing," the plaintiff had no reason to suppose that he would be undersold behind his back, nor that the defendants were going to set up an adverse right and dispute his patent. But for the assurance given by them, the plaintiff would have tried his right more than two years ago, and he had been grievously wronged by the representation then made to him. This was alone sufficient ground for granting the interlocutory injunction. His Honour, after adverting to the arguments as to the patent being void for want of novelty, said that these were questions which would be for a jury to consider. There were material questions to be tried, and the plaintiff had established quite a sufficient *primâ facie* case to entitle him to an injunction until the hearing. With respect to putting him upon an undertaking, although the practice was modern, yet it was convenient and consonant with justice, more especially after the Act of last year, which enabled the Court to assess damages, and thus to complete justice between the parties. There would be an injunction until the hearing, the plaintiff undertaking to bring an action, and to abide by any order as to damages the Court might make at the hearing.

On Monday last Mr. John Laird launched from his shipbuilding yard at Birkenhead an iron steamer for the Russian Government, the first of three boats which he is building for river service. The second boat will be launched in about a fortnight, and the third immediately afterwards. These boats are said to be capable of being turned into gunboats at pleasure.

On Saturday last a large anvil block was cast at the foundry of Messrs. Morrison and Co., Ouseburn, Newcastle-on-Tyne. The block is for an immense hammer to be used at the making of Sir William Armstrong's guns at the Elswick Engine Works near that town. When finished it will weigh upwards of 21½ tons. It was cast in one run, and the quantity of metal melted for it was 23 tons. The size of the base of the block is 6 ft. 6 ins. by 9 ft., and its thickness 9¾ inches, and the size of the body part 3 feet 10 inches by 3 feet 9 inches. In consequence of the great heat still in the casting it will have to lie a week before it will be possible to raise it.

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NOTICES.

The letter of P. M. stands over until next week.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

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Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

THE demand for Mr. E. J. REED'S paper—

ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY, IN RESPECT OF DIMENSIONS, FORM, MEANS OF PROPULSION, AND POWER OF ATTACK AND DEFENCE,"

has been so great that the Journal of the Society of Arts, the MECHANICS' MAGAZINE, and all other Scientific Journals in which it appeared in December last, are now out of print. The demand still continuing, it has been deemed desirable to reprint it in a separate form. An 8vo. edition of it, in large type, and on fine paper, has, therefore, been prepared, and may now be had at the Office of this Magazine, price 1s.

Our Weekly Gossip.

IN confirmation of the views expressed in our leading article on ship-building, we may state what we have just learned, viz., that the Admiralty are about to send an additional purveying officer out to Sardinia to assist in providing still larger quantities of Italian oak, for the frames of our ships of war, than are at present obtained. Even now, when the timber is used almost as soon as it is cut, without any time being allowed for the seasoning of it, the supply falls considerably short of the demand.

We have received, from Mr. Leonard Wray, a copy of a long letter addressed by him to the *Journal of the Society of Arts*, with a request that we would publish it at length. This we are reluctantly compelled to decline doing, as the letter would occupy too much of our space. An abridgment of it will perhaps answer the author's purpose. He writes in reply to the observations made by Mr. E. J. Reed after the reading of his (Mr. Wray's) paper on "Timber for Shipbuilding," at the Society of Arts. Mr. Wray first questions if "liquid fires" will "ever be adopted by any civilized nation in naval engagements that may be fought in our time," and then proceeds to examine the merits and demerits of war-ships built wholly of iron. His remarks are made upon the assumption that the present object is to make such ships "shot and shell-proof;" and he contends that they cannot be made to withstand a concentrated fire of solid shot. "Mr. Reed said to the members of the society," continues Mr. Wray, "'those present might judge for themselves what would be the effect of half-a-dozen shell-proof frigates making their appearance among a fleet of our wooden ships,' and, with all respect to Mr. Reed, I will answer that inquiry, by declaring that those six redoubtable frigates would be boarded and carried at sword's point in 'less than no time,' unless, indeed, our tars have greatly degenerated." If this be deemed a bold and unsupported assertion on Mr. Wray's part, he takes the "opinions of the dashing Dundonald, the undaunted Napier, and ninty-eight other 'British hearts of oak,'" and see how many of them will contradict and how many will confirm that assertion. He also supports the view by other arguments. He further contends that "to plug up a shot-hole in an iron ship is no such easy matter, partly from the jagged and irregular nature of the hole or rent itself, and partly from the want of adhesion between the iron and the wood; whilst the additional safeguard of planking over the plugged holes could not possibly be effected. During the Chinese war in 1843-44, this was clearly shown in the case of the Queen and one or two other iron war steamers belonging to the Indian Navy." In conclusion, Mr. Wray says, "I did not lightly hazard the opinion which Mr. Reed has attempted to refute; on the contrary, it is the conviction I have arrived at after maturely studying the question in all its bearings; and I trust that our Government, and the public at large, will 'read, mark, and carefully digest' the remarks contained in this communication. I fully agree with Sir John Pakington that, as the French are building thick iron-plated ships of war, we also must have them, and if possible with every available improvement. I am much pleased that Mr. Reed has opened up this question for discussion, as it tends to elicit opinions and facts which may have much practical value." To all this Mr. Reed briefly replies in a letter to the Secretary of the Society of Arts as follows:—"Sir,—On reading Mr. Wray's letter on the above subject, I find that in the remarks which I made at the meeting of your Society on the 6th inst., I negligently substituted the words 'shot' for 'shell,' and 'shot-proof' for 'shell-proof.' I very much regret this error, as it has put Mr. Wray to the trouble of using arguments which would not otherwise have been called for. I would here repeat, what I said at your Society in December last, viz., that 'the attempt to build ships which shall be proof to solid shot—at least to wrought-iron solid shot—is an altogether illusory one.' I shall not presume to follow Mr. Wray in his discussion of the general qualities of iron-coated ships. I will merely say that very destructive shells *are* now used in naval warfare, and I know of nothing to prevent the adoption of others still more destructive; and further—with regard to French shell-proof ships—I think it unwise to trust to capturing them by boarders; and this opinion is shared, I know, by many experienced naval men."

In a recent number of the MECHANICS' MAGAZINE public attention was called to a newly-manufactured substance, the uses of which promise to be innumerable—vegetable parchment. The simplicity of the process by which it is produced is as remarkable as are the qualities it is found to possess. Vegetable parchment, as we said, is blotting paper dried, after being passed through a solution of sulphuric acid—nothing more. From the effect of this operation, the weak, porous, non-fibrous material becomes on drying, tough, hard on the surface, and, in a high degree, fibrous! Its whole character, in fact, is changed. It is different in all respects, save one, to what it was before immersion. That one respect is its specific gravity. A sheet of blotting paper and a sheet of the same size of vegetable parchment are of equal weight exactly. It would be imagined that the thirsty blotting paper must drink up and retain some of the acid. If it does so, by some strange paradox the fragile and perishable paper remains, nevertheless, as heavy as the strong and everlasting parchment. It has been found by practical experiment, that vegetable parchment gives a writing surface far preferable to that of either paper or animal parchment—which latter is indeed troublesome to all but the users of quill pens—and that it receives freely oils and varnishes. For power to resist rubbing it is inferior to the sheepskin, but to paper it is far superior,—even to paper of the toughest kind. It is needless under these circumstances to attempt to catalogue the purposes to which this valuable commercial adjunct, which costs in manufacture little more than paper, and far less than animal parchment, may be applied. Each reader will imagine many such purposes for himself.

We hail with satisfaction the successive numbers of Mr. Charles Dickens's *All the Year Round*. One of the most valuable features of *Household Words* under his management was the series of articles in which scientific topics were very pleasantly and profitably treated. This feature is renewed in the new periodical. The third number contains an article on steam ploughing, which, although not unexceptionable in our judgment, will help, nevertheless, in its own way, to diffuse valuable information on the subject. The only quality of *All the Year Round* which we regard with particularly disfavour is its obtrusive praise of "beer." We are perfectly sure that Mr. Dickens—whose sympathy for the poor and the suffering makes him beloved by all—would do well to abstain from lending such continuous countenance to the most unmanly and degrading habit of this nation.

Some papers on the subject of decimal coinage in Canada have been returned to an address of the House of Lords, and printed. These include certain Acts of the Canadian Legislature (1851 and 1857), for the introduction of the decimal system into Canada, and the 3rd and 4th reports of the Select Committee of the Canadian Assembly on Public Accounts, in the session of 1855. This Committee submitted two resolutions for the consideration of the Legislative Assembly, as follows:—"That after the 31st day of January, 1856, there shall be but one currency of accounts and payment, of which the dollar shall be the unit and standard of value; the public accounts shall be kept in dollars, cents, and mills; and the coinage shall be equal in intrinsic value to that of the United States. That the ton of 2,240 lbs., the cwt. of 112 lbs., the half-cwt. of 56 lbs., and the quarter-cwt. of 28 lbs., be reduced to a ton of 2,000 lbs., and its subdivisions." The result was the passing of the following Act, assented to on June 10, 1857: "Whereas it will greatly facilitate the keeping and audit of the public accounts of the province, that the same be kept in dollars and cents.; therefore Her Majesty, by and with the advice and consent of the Legislative Council and Assembly of Canada, enact as follows:—1. All accounts to be rendered to the Provincial Government, or to any public officer or department in his province, by any officer or functionary, or by any party receiving aid from the province, or otherwise accountable to the Government or Legislature thereof, shall be so rendered in dollars and cents; but any such accounts may have a second column containing sums in pounds, shillings, and pence, equivalent to the sums so stated in dollars and cents, if the accountant shall prefer to render his account in that form. 2. The preceding enactment shall take effect upon, from, and after the 31st day of December, 1857, and not before." There is an immense number of letters and papers on the subject of decimal coinage, which emanated from mathematicians and other eminent authorities in Canada.

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated March 30, 1859.

790. W. Brown, of Bolton-le-Moors, Clog Manufacturer. Improvements in manufacturing clog soles and in the machinery employed therein.

Dated April 2, 1859.

834. T. Williams, of Aberdaron, Engineer, and J. H. Fuller, of Hatton-garden, Tool Manufacturer. Improvements in screw stocks and dies.

Dated April 4, 1859.

838. C. F. Kirkman, of Argyll-st., Gentleman. Improvements in the manufacture of cocoa nut fibre yarn and matting.

Dated April 5, 1859.

848. A. Shanks, Engineer, of Robert-st., Adelphi. Certain improvements in machinery for forging and stamping metals.

856. T. Scott, of Dundee, Gentleman. Improvements in preparing, treating, or manufacturing fibrous materials, and in the apparatus employed therein.

Dated April 9, 1859.

886. T. Spencer, of Euston-road, Chemist. Improvements in the economical treatment of refuse or waste matter containing sulphur.

Dated April 11, 1859.

898. B. Baugh, Manager, of Birmingham. Certain improved arrangements for working fly presses by steam, water, or other power.

900. W. Schofield, of Thomas-st., Blackfriars-road, Mineral Water Manufacturer. An improved effervescing lemonade.

Dated April 13, 1859.

926. R. Coleman, of Chelmsford, Agricultural Implement Manufacturer. Improvements in agricultural implements.

930. J. A. Coffey, of Providence-row, Finsbury, Engineer. Improvements in apparatus for heating liquids.

Dated April 14, 1859.

934. J. Gillett, of Upper Brailes, Warwick, Agricultural Implement Maker. An improved mill used for grinding, crushing, and reducing bones and other mineral and vegetable substances.

936. T. Bird, of Manchester, Engineer. Improvements in the application and use of a certain natural product or products in the manufacture of pickers for looms, drawing rollers for spinning machinery, cop tubes, and for steps and bushes generally where lubrication is required.

938. J. Beattie, of South Lambeth, Engineer. Improvements in the means of preventing locomotive engines and carriages in motion on railways leaving or running off the rails.

940. W. Barnes and S. Pickering, Spitalfields, and J. Roberts, of Limehouse. Improvements in retarding and stopping railway locomotives and trains.

942. W. Sinnock, of Brompton, Kent, Ropery Engineer. Improvements in submarine and subterranean electric telegraph cables, and in machinery for the manufacture thereof.

944. L. J. Higham, of New York, Gentleman. Improvements in billiard tables.

Dated April 15, 1859.

948. J. Chapman, of Wolverhampton, Ironmaster. An Improvement or improvements in the manufacture of angle iron.

950. R. Boot, of Hill-st., Surrey, Leather Dresser. Improvements in treating sheep or other pelts, so as to give them the appearance of rough calf.

Dated April 16, 1859.

952. H. Barrow, of Birmingham, Saddler. A new or improved fastening for fastening trunks, boxes, and articles of dress, and for such other purposes as the same is or may be applicable to.

954. J. Glasgow and S. Hand, of Manchester. An improved variable circular motion, applicable to slotting, shaping, and planing machines, or similar purposes.

956. W. Clark, of Chancery-lane. Improvements in apparatus for separating metals from their ores and other matters. A communication.

958. J. Hamilton, of Glasgow, Engineer. Improvements in apparatus for regulating prime movers driven by water.

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960. H. Harrison, of Blackburn, Machine Makers. Certain improvements in looms for weaving.
962. H. H. Vivian, of Swansea, M.P. Improvements in smelting copper.
964. G. B. Cornish, of New York, Master Mariner. Improvements applicable to fog-horns.
966. J. Moule, of Hackney-road. A new compound liquid for illuminating purposes.

Dated April 18, 1859.

968. R. Warry, Armourer-Serjeant, of Chatham. Improvements in breech-loading ordnance and its projectiles.
970. G. Porter, of London, Gas-Fitter. Improvements in valves or cocks.
972. J. Seaman, of Linslade, Buckingham, Engineer. Improvements in agricultural implements for working or cultivating the soil.
974. J. C. Wilson, of Wood-st., City, Warehouseman. A reversible shawl cloak.
978. J. and H. S. Morton, of Sheffield, Grate Manufacturers. Improvements in hearth-plates or ash-pans.
980. G. Coller, of Harlow, Essex. An improved mowing machine.
982. W. Parsons, of Pontar-Tawe, near Swansea, Tin Plate Manufacturer. Improvements in preparing sheet iron and other metal sheets for japanners and other uses.

Dated April 19, 1859.

986. C. Batty, of Manchester, Collector. An improved means or apparatus for effecting instantaneous communication on railways between passengers and officials.
990. J. W. Matthews, of Poplar, Hat Manufacturer. An improvement in the manufacture of hats and other coverings for the head.

Dated April 20, 1859.

992. Q. Beck, of Belfast, Manufacturer. Improvements in stoves. A communication from J. Cherry.
994. J. M. and E. Johnson, of Castle-st., Holborn. Improvements in the production of ornamental surfaces suitable for advertisement tablets, plates for shop fronts, and for other uses.
996. H. Rawson, of Leicester. Improvements in machinery for combing wool and other fibres.

Dated April 21, 1859.

1000. E. Cottam, of Pimlico, Engineer. Improvements in apparatus employed for cutting or sawing metals and other substances.
1002. J. Napier, Gentleman, of Partick, near Glasgow. Improvements in producing figures or representations upon glass.
1004. J. Davies, of Tetbury, Machinist. A new or improved apparatus for ringing door bells, and a bolt to be used with the said apparatus, and for other purposes to which the said bolt is or may be applicable.
1006. R. A. Brooman, of 166 Fleet-st., London, Editor of the MECHANICS' MAGAZINE and Patent Agent. Improvements in knitting frames. A communication from Madame Hammerlin.
1008. E. Clark, of New York, Gentleman. Improvements in sewing machinery. A communication from I. M. Singer.
1010. T. S. Truss, of Darlington, Civil Engineer. Improvemen's in the construction of pipes, and in the mode of joining the same.

Dated April 23, 1859.

1014. C. Mansel, of Plymouth. A folding travelling case.
1016. J. Armstrong, of Sunderland, Timber Merchant. Improvements in drying and preserving timber.
1018. J. Angus, of Glasgow, Ironmonger. Improvements in saddles.
1020. P. L. M. Debain, of Paris, Gentleman. Improved means for transmitting motive power to ships, pumps, and other arrangements by which the displacement of fluids is effectuated.
1022. P. L. M. Debain, of Paris, Gentleman. Improvements in making heat subservient for producing motive power.
1024. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. An improvement in the manufacture of woollen cloth. A communication from L. V. Lemaignen.
1026. W. Moxon, of Parliament-street, Westminster, Contractor, and J. J. Bennett, of Victoria Park, Civil Engineer. Improved apparatus for raising or lifting and lowering heavy bodies.

Dated April 25, 1859.

1028. W. Stevenson, of Johnstone, Renfrew, Manager. Improvements in spinning, doubling, and manufacturing cotton, and other fibrous materials.
1030. J. Higgin, of Manchester, Manufacturing Chemist. Improvements in treating madder, and plants of the same family, and preparations therefrom.
1032. J. Owen, Designer, and H. Duckworth, Manager, of Blackburn. Improvements in machinery or apparatus for leasing yarns.
1034. T. Buckham, of Gloucester, Civil Engineer. An improvement in railway switches.
1036. A. W. Gadesden, of Leman-st., Goodman's Fields. Improvements in producing solutions of sugar.
1038. W. E. Newton, of Chancery-lane. Improvements in sewing machines. A communication from R. H. and A. D. Morford.
1040. W. Warne, J. A. Fanshawe, J. A. Jaques, and T. Galpin, of Tottenham, India Rubber Manufacturers. Improved compounds applicable for packing the joints of steam or other pipes, which compounds are also applicable for packing or lining parts of machinery in general, or parts of ships, bridges, tanks, or railways.

Dated April 26, 1859.

1042. T. Holt, of Rochdale, Engineer, and J. Brown, of the same parish, Agent. Improvements in apparatus, or an improved apparatus, for heating water for the supply of steam-boilers, which improvements or apparatus are also applicable in some cases for the prevention of incrustation in steam-boilers.
1046. R. Main, of Birkenhead, Carriage Builder. Improvements in wheels for carriages.
1048. R. A. Brooman, of 166 Fleet-st., London, E.C., Patent Agent. Improvements in vulcanizing and colouring caoutchouc, and in the preparation of caoutchouc paints and colours. A communication from T. J. Laballe, of Paris.
1050. J. H. Johnson, of Lincoln's-inn-fields. Improvements in machinery or apparatus for combing wool and other fibrous substances. A communication from C. Whipple.

Dated April 27, 1859.

1052. J. M. Ciroux, of Brussels, Merchant. Improvements in lamp-glasses and shades, applicable to gas-burners, light-houses, and railway-signals.
1054. J. Hyde, of Hollingworth, near Mottram, Engineer, Certain improvements in steam-boilers.
1058. R. J. Laing, of Haggerstone, Engineer. Improvements in wet gas-meters.
1060. J. Holroyd, of Leeds, Cloth Finisher. Improvements in machinery used for finishing woollen and other cloths.
1062. Sir T. T. Grant, K.C.B., of Chester-terrace, Regent's-park. Improvements in ships' cooking apparatus.

Dated April 28, 1859.

1066. R. Jones, of New Kent-road. An improved safety lamp.
1068. N. Libotte, Mechanician, of Paris. A steam brake for mines, which may also be worked by hand.
1072. J. Wheat, of Hinckley, Leicester. Certain improvements in drilling-machines employed for agricultural purposes.
1074. A. Boyle, of Birmingham, Tool Maker. Improvements in the manufacture of certain parts of umbrellas and parasols.

Dated April 29, 1859.

1078. H. Bosshard, of Paris, Engineer. An improved mechanism for obtaining and imparting motive power.
1080. S. de Cazenave, of Regent-street. An improved lubricating compound.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1153. J. Luis, of Welbeck-street. A self-regulating horse machine. A communication from P. I. Garin. Dated May 9, 1859.
1161. G. G. Bussey, of New Oxford-st., Manufacturer. An improved contrivance for carrying cartridges, and to facilitate using them. Dated May 9, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, May* 17, 1859.)

29. W. Renton, T. Renton, and W. Binns. Textile fabrics.
36. C. De Forest. Springs. A communication.
47. W. Renton, T. Renton, and W. Binns. Finishing fabrics.
48. J. Aspinall. Bolts, rivets, and spikes.
54. J. J. Florance. Spooling-wheels.
67. W. Clark. Phosphates of lime. A communication.
69. J. T. Forster. Bed berths.
70. W. E. Newton. Steam-engines. A communication.
72. R. D. Clegg. Signalling apparatus.
78. T. H. Toms. Textile fabrics.
79. E. Agneni. Pictures, landscapes, &c.
81. J. Biers, jun. Carriage break.
84. D. E. Hughes. Insulating wires.
85. B. J. Rubenstein. Dentistry.
87. C. W. Siemens. Supports for telegraph wires.
89. N. P. Burgh. Steam-engines.
90. S. Canning and H. Clifford. Paying out and recovering telegraph ropes.
97. T. Elwell. Governors.
98. W. McNaught. Steam-engines.
103. C. Beslay. Coating iron or steel.
108. H. Critchley. Pistons.
112. D. L. Banks. Suspension roadway.
118. T. Herbert. Warp lace.
129. W. H. E. McKnight. Boiler.
131. D. L. Banks. Suspension roadway.
139. P. A. S. Sicard. Steel.
142. E. Brooks. Locks.
167. J. H. Johnson. Lasts, &c. A communication.
182. H. Sagar and A. Schultz. Cotton fabrics.
183. T. Richardson. Manure.
201. D. Moseley. India-rubber thread.
217. A. Warner. Iron.
251. E. T. Hughes. Biscuits. A communication.
262. H. Watson. Paper.
265. J. Lane. Screws.
269. H. Grissell. Moving ships.
367. J. H. Johnson. Fire-arms. A communication.
432. A. V. Newton. Brushes. A communication.
757. J. H. Johnson. Fire-arms. A communication.
845. D. B. White. Pumps.
901. J. Anderson. Furnaces.
970. G. Porter. Valves or cocks.
996. H. Rawson. Combing fibres.
1003. J. Alison. Extirpating thistles, &c.
1016. J. Armstrong. Preserving timber.
1018. J. Angus. Saddles.
1040. W. Warne, J. A. Fanshawe, J. A. Jaques, and T. Galpin. Packing the joints of pipes, &c.
1042. T. Holt and J. Brown. Steam-boilers.
1058. R. J. Laing. Wet gas meters.
1074. A. Boyle. Umbrellas and parasols.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed May 12, 1859.

2547. J. Courage and F. Bennett.
2548. J. Taylor.
2551. L. Petre.
2552. I. Livermore.
2557. M. Pullan.
2558. J. A. Hopkinson.
2562. G. Davies.
2568. J. G. Bunting.
2569. J. Brennand.
2571. J. C. Boisneau.
2572. A. I. H. Parent.
2573. J. Samuel.
2575. C. J. C. Perry.
2587. J. Robertson.
2641. D. Evans.
2649. F. A. Theroulde.
2669. J. S Nibbs.
2702. G. B. Sander.
2723. D. Evans and G. Jones.
2736. R. H. Bow.
2752. J. Lewis.
2779. J. B. A. Monnier.
18. I. Wood.
83. R. and W. Hawthorn.
137. J. Montgomery.
205. W. E. Newton.
435. J. J. Russell.
437. J. Seguin.
568. W. Score.
577. C. R. Mead.
615. J. S. Russell.
630. A. V. Newton.
642. A. Tylor.
705. A. V. Newton.
729. Sir P. Fairbairn and R. Newton.

Sealed May 14, 1859.

2564. W. G. Armstrong.
2583. C. F. Vasserot.
2584. J. H. Tuck.
2586. E. Welch.
2589. E. Mellor.
2591. J. Brennand.
2592. R. A. Brooman.
2598. S. Riley.
2601. Sir C. T. Bright.
2603. H. Stott.
2608. E. T. Archer.
2612. W. S. Hayward.
2616. W. Hancock.
2618. H. H. Henson.
2619. W. Ramsear and J. G. Scott.
2620. E. A. Pontifex.
2621. H. Bailey.
2622. W. Clark.
2627. A. J. Thorman.
2654. W. Ralston.
2655. W. H. Dawes.
2730. A. E. C. Scheidel.
2764. G. E. Noone.
2773. L. W. Fletcher.
2944. E. Fellows.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

928. U. Scott.
1105. R. A. Brooman.
1124. H. Tucker.
1138. U. Scott.
1150. J. Leck and A. Miller.
1152. H. Greaves.
1162. W. Henderson.
1175. R. Knight.
1185. J., T., and G. Wilkes.
1201. A. H. Dufresne.
1206. A. Allan and T. Hunt.
1246. R. A. Whytlaw and A. Mitchell, jun.
1254. W. Hulse.
1255. C. Cowper.
1270. L. D. Owen.

LIST OF SPECIFICATIONS, &c.

Published during the week ending May 13, 1859.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
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ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINES, &c., 2255.

BOILERS AND THEIR FURNACES. *None.*

ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 2275, 2284.

SHIPS AND BOATS, including their fittings, 2274, 2276, 2290.

CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 2261, 2279.

FOOD AND BEVERAGES, including apparatus for preparing food for men and animals. *None.*

FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 2250, 2252, 2256, 2260, 2285, 2286.

BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c. *None.*

LIGHTING, HEATING, AND VENTILATING, 2257, 2265.

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 2282, 2287.

METALS, including apparatus for their manufacture, 2243, 2289.

CHEMISTRY AND PHOTOGRAPHY, 2247, 2262.

ELECTRICAL APPARATUS, 2245, 2251, 2270.

WAR FARE, 2243, 2246, 2269.

LETTER PRESS PRINTING &c. *None.*

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MISCELLANEOUS, 2244, 2248, 2249, 2253, 2254, 2263, 2264, 2266, 2267, 2268, 2271, 2272, 2273, 2277, 2278, 2280, 2281, 2283, 2288, 2291.

2243. C. W LANCASTER. *A metal or metallic alloy especially adapted to the manufacture of fire-arms and ordnance.* Dated Oct. 8, 1858.

This is composed of copper and aluminium in or about the proportions of 90 parts of copper to 10 parts of aluminum. *Patent completed.*

2244. A. FELTON. *Improvements in instruments used for inserting and fixing metal eyelets.* Dated October 8, 1858.

This consists in the application of knives or cutting edges to the punch or presser of spring nipper eyelet fasteners, so that, when closing the nipper on the eyelet, the knives or cutting edges sever the lip of the eyelet at first when it is being turned over, causing it to separate at several places, whereby the turning over is more uniformly effected, and the eyelet better secured to the leather or other material. *Patent abandoned.*

2245. J. T. SMITH. *Improvements in electric cables.* Dated Oct. 8, 1858.

This consists in the use of a corrugated metallic tube as the conductor for the passage of the electric current, such corrugation being either in unconnected indentations directly transverse to the axis of the tube, or in helical convolutions of one or more helices. *Patent abandoned*

2246. E. BIRCHLEY. *An improved construction of cartridge.* Dated Oct. 8, 1858.

This relates to a method of making ball, shot, and blank cartridges, sufficiently strong to permit of their being carried and handled without liability to injury, and yet admit of their giving way or bursting under the pressure of the thumb and finger of the sportsman or soldier when the discharge of the powder from the case into the barrel of the gun is required. The patentee employs in the construction of the powder chamber two different qualities of fabric, which shall have the one the property of comparative tenacity or strength, and the other of weakness or fragility. These substances are so arrranged as to give strength to the cartridge, and yet permit of its readily yielding to pressure. *Patent completed.*

2247. F. W. GERHARD. *Improvements in the manufacture of aluminium and sodium.* Dated October 8, 1858.

The patentee proposes to use as heretofore the double chloride of sodium and aluminium, or the double fluoride of sodium and aluminium known as cryolite, or both of these substances combined. These substances, when subjected to furnace heat in presence of the proper equivalent of sodium for ensuring the separation or extraction of the aluminium in a metallic form are covered with a layer of fused chloride of sodium, or of a mixture of this substance and cryolite, or of the slag or scoria resulting after aluminium has been extracted, and thus prevent the destruction by ignition of sodium, and consequently obtain a greater quantity of aluminium. In carrying out this part of the invention he employs a reverberatory furnace having two hearths one above the other, or two reverberatory furnaces or crucibles, one higher than the other, which communicate by an iron pipe or discharging passage. He claims the process of pouring the melted substance in the upper furnace or crucible over the contents in the heated lower crucible or furnace, by which means a greater quantity of metal can be obtained. *Patent completed.*

2248. A. E. GALLIARD. *Making self-supplying portable fountains to play water or water perfumed.* Dated Oct. 9, 1858.

This consists, 1, in the application of india-rubber, gutta-percha, or gum-elastic, employed as springs to press the water in a hollow cylinder. 2. In the application to this system of the leather cap or plunger employed in the manufacture of the moderator lamps. This cap is employed with another similar cap in india-rubber, gutta-percha, or gum-elastic 3. In the simplification of this sort of machine by the suppression of the rack and pinion and wire spiral spring, replacing thereby the india-rubber, and cord rolling round as upon a windlass. The improvements are not completely described apart from the drawings. *Patent completed.*

2249. C. E. BULL. *An apparatus for containing and preserving articles of value from loss or damage in cases of shipwreck.* Dated Oct. 9, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

2250. J. TATLOCK. *Improvements in electric telegraphs, and in telegraphic cables or conductors for the conducting of electricity in submarine and underground telegraphs.* Dated Oct. 9. 1858.

Here instead of employing the earth or water for half the conductor, the inventor employs two wires, which he separately incloses in gutta-percha. The invention also relates to electric telegraph indicators and is designed for better developing the power of the electric circuit. The inventor takes two wires each from the conducting wire, and laps one over each side of the magnetised needle, leaving room for the needle to oscillate inside the coil. It also relates to telegraphing by transmitting the electric current always along the same conductor, and allowing it to return along the other conductor. In this case he uses three batteries or currents. *Patent abandoned.*

2251. L. HOPE. *Improvements in electric telegraph cables.* (A communication.) Dated October 9, 1858.

Here the conducting wires are first coated with india-rubber or gutta-percha, in combination with sulphur. The wires are subjected to heat so as to produce the change in the india-rubber or gutta-percha known as vulcanisation, the conducting wires are then further coated with gutta-percha, &c, and the cables are then completed with a coating of wires or other materials as heretofore. *Patent completed.*

2252. W. CHOFFS. *Improvements in the manufacture of fabrics by bobbin-net or twist lace machinery.* Dated Oct. 9, 1858.

This relates, 1, to so combining transverse weft threads, working from selvage to selvage, with longitudinal bobbin and warp threads in bobbin-net or twist lace machinery that strips or stripes of lace or other weavings may be made side by side longitudinally of the fabric. It also relates to forming fabric of the kind referred to with the pattern of a zig-zag character, the pillars or meshes being bent serpentine, zig-zag, or angular by the bobbin and warp threads forming such pillars or fabrics whilst twisting with each other, being caused to travel out of their ordinary straight lines or courses, and being held together by passing through other warp threads. *Patent completed.*

2253. J. B. PASCOE and J. R. THOMAS. *Improvements in condensing and gassing smoke, which are applicable also to forcing and drawing water, propelling ships, and drawing and forcing air to be worked with animal, water, steam, or air power.* Dated Oct. 9, 1858.

This consists in drawing the air and smoke from any distance to any given point, passing it through the machine, turning it into gas or into water; if into water it is to be used as manure. In propelling ships the inventors take the water from the bows of the vessel, pass it through the machine, and discharge it at the stern in as large a column as may be required. *Patent abandoned.*

2254. J. SCRIMSHAW. *Improvements in pumps.* Dated Oct. 9. 1858.

This consists principally in making force pumps of various descriptions to throw one continuous stream of air, water, or any other liquid, and can be used instead of a bellows or air pump. *Patent abandoned.*

2255. A. MILLER. *Improvements in locomotive steam engines.* (A communication.) Dated Oct. 11, 1858.

This relates to a simple and effective mechanical arrangement for varying the action of the blast-pipe of locomotive steam engines, so as to suit its effect to the varying kinds of work which the locomotives have to perform. *Patent completed.*

2256. J. HOLROYD. *An improvement in the knives used for shearing woollen cloths, and cloths made of wool, and other materials.* Dated October 11, 1858.

This consists in grooving, indenting, or incising the spiral cutting knives, or the fixed blade, or both, used in cloth shearing machines, so as to produce a serrated cutting edge thereon. *Patent completed.*

2257. C. F. VASSEROT. *Improvements in constructing reflectors.* (A communication.) Dated October 11, 1858.

The patentee coats the surface of the glass on which it is desired to produce a reflecting surface with a salt of platinum or palladium mixed with a suitable vehicle, and also with a flux, and exposes the glass that is so coated to a heat sufficient to reduce the metal, and, at the same time, to cause the flux to run over and combine with the surface of the glass. *Patent completed.*

2258. J. SAXBY. *Improvements in apparatus for working signals on railways.* Dated October 11, 1858.

This consists of apparatus for the working of signals on railways by the engine or vehicles passing. The engine wheel in passing is made to depress a lever placed at the outside of the rail, which lever working on a centre, and at the same time rising at the other end, disengages a sliding bar which governs machinery for adjusting the lamps and signals to the position for showing danger, when it becomes fixed until relieved by a lever and chain connected with the signal-box. *Patent abandoned.*

2259. J. BEATTIE. *Improvements in locomotive and other steam engines.* Dated October 11, 1858.

The patentee constructs the fire-doors of the furnaces with a tube of iron fixed therein, and projecting externally and internally beyond the water-space surfaces, and he leaves another tube of iron to slide telescopically in such first-mentioned tube, the lower part of the sliding tube being cut away or perforated, so that the atmospheric air, which is admitted through openings in the door, may, when the inner tube is moved forward into the furnace, pass and strike the solid end of such tube, and be deflected according to the inclination or form of such end, or escape through the perforations in such tube on or over the fuel in the furnace; and he fits a tube of iron of smaller diameter into the end of the sliding tube, and such smaller tube is allowed to slide through an aperture in the fire-door, and so form a guide to the sliding tube. The air passes through the perforations in the smaller tube into the sliding one, which forms a chamber, and it thence passes as before mentioned; and in some cases he has two or more of such smaller tubes arranged in a suitable manner. The patentee also has one or both the plates for boilers and furnaces cut in such form that at such distance as may be desired there may be projecting pieces on one or both plates to overlap, and through which one or more rivets may be passed, in addition to the usual line of rivets, to hold the plates firmly together. *Patent completed.*

2260. R. COWEN, jun. *Improvements in dressing lace, and other fabrics made of silk, cotton, or other material, and in apparatus employed therein.* Dated Oct. 11, 1858.

The inventor winds the lace, &c., upon a roller, so as to conduct the same on to an apparatus which is so adapted as to stretch it any required width when it receives the dressing: from thence he conducts it through a hot chamber at such speed that from the time that the lace or other fabric entered in a wet or glutinous state, it shall, without friction or pressure being applied, come out perfectly dry, and in such a similar state as lace, silks, or other fabrics do when they are dressed or got up in the ordinary way. There is also an apparatus for steaming the lace, &c., previously to entering the hot-air chamber, so as to clear the fabric. *Patent abandoned.*

2261. J. L. and F. L. HANCOCK. *Improvements in implements for tilling, breaking up, or pulverizing land, for sowing seeds, and for thinning-out turnips and other crops.* Dated October 11, 1858.

This consists in constructing implements in which the tools employed are made to act gradually upon the land, so that each tool acting upon small portions of the soil, and each acting upon a separate portion, a great quantity is efficiently acted upon with much greater ease than if one tool only acted upon a quantity of soil equal to that moved by the several tools here employed. For sowing seeds the patentees form an implement with two or more depositors, which are so regulated as not to allow of more seeds being deposited from the whole number of depositors than now takes place from every single depositor as now constructed. For thinning out turnips and other crops, the implement carries a series of revolving discs, and between every two discs in the series they fit a knife or cutter. By means of this implement the plants may be removed from the drills, while the revolving discs will prevent the knives from cutting or dragging the roots of those plants which are to remain. *Patent completed.*

2262. J. ENGLAND. *Improvements in apparatus for cleaning the plates used in photography.* Dated Oct. 11, 1858.

The object here is to fix the pneumatic apparatus in clips which hold it firmly, whilst the glass, being fixed on the top of the pneumatic apparatus, and resting upon supports, is steadily fixed in a horizontal and favourable position to be cleaned without the photographer being obliged to hold it with either hand. *Patent abandoned.*

2263. J. PLATT. *Improvements in locks.* Dated Oct. 11, 1858.

Here the inventor constructs a lock with a key having a double set of wards or throwers, which take into fixed and stationary wards in the lock, and also act on levers or tumblers therein. The key has further a cross slit up the barrel or stem, which takes on to a cross fitted and turning in the centre opening, or eye of the keyhole. The lower set of levers or tumblers, upon which one set of the key wards or throwers act, is connected to bars which receive motion therefrom, and move in a direction transversely to the bolt of the lock, with which they underlock, being furnished with projections which are received in notches formed on each side of a chase or slot in the bolt which traverses on them when all accurately adjusted in position by the key. The other ward, or thrower of the key, acts on one or more levers or tumblers, on which the bolt travels. It also throws or shoots the bolt. This lock is made so that the key only turns in one direction, so that when the key is removed the bolt is shot so as to effect the locking action. *Patent abandoned.*

2264. J. NICHOLSON, jun. *Improvements in machinery for cutting and winding strips or shreds of steel, silver, or other metal used for ladies' dresses, measuring tapes, and other purposes, in which the use of strips or shreds of metal is required.* Dated October 11, 1858.

The inventor employs a strong framing of a suitable height, upon one end of which he places a feeding roller, and above it on the upper surface of the frame he places guide rollers and cutter guides for delivering the sheets of metal direct to the cutters. The cutters are circular, and are mounted on axles one above the other, the cutters being male and female. It is obvious that as the axles rotate, and the sheet is drawn between them, the pressure (which is similar in action to shearing) causes the sheet to be cut into strips. Other appendages are attached to, and used with, the machinery. *Patent abandoned.*

2265. A. VON SCHUTTENBACH. *Improvements in lamps.* Dated October 11, 1858.

The inventor employs a lamp, comprising a reservoir for oil, a resort for generating gas from the oil, and suitable pipes for connecting these parts with a burner, &c. *Patent completed.*

2266. T. RIDDELL. *An improved arrangement for sustaining window sashes and sliding panels.* Dated October 11, 1858.

The patentee avails himself of the elastic pressure of vulcanised india-rubber for maintaining sufficient friction of contact between the sash or panel and the frame, to ensure the retention of the latter at any desired position, and also to keep it from rattling in the grooves of the frame. *Patent completed.*

2267. M. STOW. *Prevention or securing the detection of alterations or erasures in bankers' cheques and other similar instruments, and the crossings thereof.* Dated October 11, 1858.

This consists in making a series of perforations which shall form an essential part of the crossing or other part of the cheque or instrument which is important to guard against alteration or erasure. *Patent abandoned.*

2268. W. E. NEWTON. *Improved apparatus for facilitating submarine explorations.* (A communication.) Dated October 11, 1858.

This consists in combining with the working chamber in which the explorers are to be placed a reservoir containing air compressed, so that the explorers may draw the required supply from the said reservoir, and to control the buoyant power of the apparatus. It also consists in combining with the working chamber one or more ballast chambers. It also consists in purifying the air inside the working chamber whenever it has become vitiated by the respiration of the explorers inside, by a shower of water. It also consists in combining with the working chamber, a pump, which communicates by its eduction pipe with the reservoir of compressed air, and by means of a flexible induction pipe with the atmosphere above the surface. *Patent completed.*

2269. J. F. SWINBURN. *Improvements in fire-arms.* Dated October 12, 1858.

This relates to double-barrelled small arms, and consists in employing a band of clip for connecting the barrels to the stock, whereby the necessity of heating the barrels for fixing on the loops is obviated. *Patent completed.*

2270. L. WRAY. *New and improved compounds for the coating or insulating of submarine electric telegraph wires, and which are also applicable to the coating or insulating of electric telegraph wires laid underground.* Dated October 12, 1858.

The substances which the patentee proposes to employ are, 1, vegetable caoutchouc (comprised under which designation are all those gum elastics produced by numerous South American, Oriental, and African plants, such as the

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"Hevæa caoutchouc," the "jatropha elastica," the "ficus indica," the "ficus elastica," the "artocarpus integrifolia," and others), mineral caoutchouc (bitumen), or gutta-percha (under which designation are comprised the gummy or gum resinous products obtained from all the plants of the natural order Sapotads or Sapotea), or other gum elastic or gum resinous substances, or one or more of them together. 2, powdered flint, flour of glass, or other siliceous or aluminous matter, such as kaolin. 3, lac, or shell-lac, or other resinous substances, either one or more together. The inventor mixes these different substances in such varied proportions as he finds best adapted for the particular case to which he wishes to apply the compound. *Patent completed.*

2271. T. C. SHAW and F. H. COOPER. *A new or improved construction and mode of working engines by the agency of air or gases in conjunction with electricity for obtaining or producing motive power.* Dated October 12, 1858.

Here a reservoir is filled with condensed air, the condensation of the said air and its maintenance in a condensed state being effected by condensing pumps worked by the engine itself. The condensed air passes from the reservoir in an intermittent stream to a reaction or other engine, which is put into operation by the expansion and escape of the condensed air. On its passage from the reservoir to the engine, the air is exposed to an electrical discharge, whereby the elastic force of the air is much increased. *Patent completed.*

2272. W. JOHNSTON and W. ROSS. *Improvements in water-closets and taps or valves.* Dated October 12, 1858.

This comprises various improvements in the valvular mechanism of water-closets and in taps or valves, the whole having reference to improved modes or means of controlling or regulating the passage or flow of fluids. The invention is not described apart from the drawings. *Patent completed.*

2273. W. SMITH. *Improvements in transferring drawings or delineations in lithographic and zincographic processes.* Dated October 12, 1858.

Here the operator proceeds by primarily preparing a sheet of tracing or translucent paper, cloth, &c., with the transfer medium or materials ordinarily used in the preparation of transfer paper by lithographers and zincographers. The sheet thus prepared forms what may be termed a composite tracing and transfer paper, as it serves both purposes. This prepared sheet then answers as the medium for obtaining the first and only tracing used in the operation from the original drawing which is to be printed, the prepared sheet being fastened down upon the original drawing with its prepared face upwards. The drawing is then traced through, and on the prepared sheet with transfer ink, and it is then removed and applied to the stone or plate, the traced delineation being pressed down upon the face of the stone or plate. The removal of the sheet from the stone is effected by heating the back of it with hot water, and then taking up the sheet at one end and slowly pulling it off backwards. This process leaves the drawing upon the stone or plate ready for being inked up and prepared for printing in the ordinary manner. *Patent completed.*

2274. G. BEADON. *Improvements in the construction of ships, boats, rafts, and vessels for passing through water or through the atmosphere, or partly through the water and partly through the atmosphere.* Dated October 12, 1858.

It consists, 1, in constructing ships, boats, rafts, &c., with an outer jacket and open at the extremities, or with double sides, and with space between large enough to admit the wave or flow of the water or air displaced by the progressing end of a body in motion. 2, In forming the lower parts of vessels, including the patentee's conical bow-propeller, patented 21st Dec., 1852, in sections, in moulds, and putting the same together by tap-joints, bolts, and nuts. 3, In a boom or tail propeller for steering and propelling, and by its action keeping back the wake-water from following the vessel. 4, In constructing vessels with turntables for receiving masts with fixed yards, and working the same by gear-work, and hauling the sails out laterally. 5, In constructing the tubular bottomed vessels patented by the present patentee 21st Dec., 1852, with a moveable crane or Derrick, which the patentee raises or lowers between the sides or tubular bottom so as to project below the vessel to prevent the cables from injuring the conical bows or spiral propellers thereon when the vessel is at anchor. 6, In constructing tubular vessels with conical bows according to the patent aforesaid. 7, In constructing tubular bottomed vessels with openings at the sides above or upon pillars standing upon the tubular bottomed vessels, so that the waves may break through laterally. *Patent completed.*

2275. J. A. GASSE. *Improvements in railway brakes, and in apparatus for working the same.* Dated October 12, 1858.

This consists in constructing railway brakes, and apparatus for working the same, so that the brakes may be applied to every carriage throughout the train by means of rods, worked from either or both ends of a train, and connected between the adjacent carriages by means of two X levers, which cross each other, and are united at the centre by a pin or stud, around which, as a centre, they are free to move. These levers permit of the distances between the carriages being increased or diminished within reasonable limits without interfering with the action of the brakes. *Patent completed.*

2276. H. W. and G. CUTHBERTSON. *Improvements in lever purchases for ships' windlasses, pumps, and other similar purposes.* Dated October 12, 1858.

The inventors employ two short horizontal shafts, one above the other, the ends whereof work in bearings mounted on the top of the "pall-bit." On and about the centre of these shafts are placed two pinions working one in the other, and by the side of these pinions are fixed (also on the shafts) two cross heads; that on the upper shaft is hollow for the insertion of the lower handles, the lower one being solid and jointed or pinned at each end on to two vertical connecting rods by the side of the pall-bit. Thus as the power is applied to the handle and raised at one end, the reverse end of the lower cross head is also raised, and *vice versâ*. By this means they are enabled to increase the power four or five times more than by lever purchases. *Patent abandoned*

2277. M. SAUTIER. *Improvements in air engines.* (A communication.) Dated October 12, 1858.

The inventor uses moist air as the motive fluid, and employs an injection of steam to heat and at the same time saturate it with moisture, and an injection of cold water to absorb and remove such portions of the heat as the regenerator may not recover. *Patent completed.*

2278. J. PARKINS. *Improvements in securing envelopes, and in fastenings to be used therein.* Dated Oct. 13, 1858.

This consists in cutting and forming the envelope so that the ends of the side lappets may fold over each other upon the top of the lower lappet, and in cutting or piercing a hole through each end of the side and lower lappets, so that when folded together the holes may lie over and correspond with each other; also in cutting or piercing holes in the upper or seal lappet to enable it to receive the legs or pins of a plate or shield fastening, to be fixed thereto. *Patent abandoned.*

2279. H. PARKER. *An improved apparatus for the cultivation of land and other agricultural operations.* Dated October 13, 1858.

The peculiarity of this apparatus consists in the use of a portable steam-engine supported by two cylinders or sets of rollers, composed by preference of any number of short rollers revolving separately on circular axes. The one set of rollers is placed at or near to the front part of the machine for guiding, and the other set towards or near the aft part of the machine behind the centre of gravity, and perform the several functions of supporting the greater part of the weight of the apparatus, propelling it forward, and of simultaneously forking, breaking, and pulverising the soil as it passes over the surface of the land to be operated upon. *Patent completed.*

2280. R. RIDLEY. *Improvements in safety cages for mine shafts.* Dated October 13, 1858.

This consists of a peculiar combination of coiled or barrel springs and gripping eccentrics. The cage is fitted at its upper end with a pair of transverse parallel shafts, which carry at each extremity an eccentric. These eccentrics are disposed on each side of the conducting bars, and when brought into action or patially rotated by the coiled springs, they grip or lay hold of the conducting rods, and so prevent the descent of the cage should the rope accidentally break. *Patent completed.*

2281. W. H. TREACHER. *Improvements in respirators.* Dated October 13, 1858.

This respirator is constructed with an outer shell or plate, which may be covered with velvet or silk; at a small distance behind this outer shield the inventor places a similar plate, and brings both plates together at their ends; along the centre of, and between, the plates he fixes a partition which shuts off all communication between the top and bottom of the plates. In the back plate he cuts two slots, one above and the other below the partition, and over these slots he fixes, upon slight springs or blades, thin pieces of metal, one to each slot. These pieces of metal carried on the blades form valves, and he makes one to open inwards and the other outwards; he covers the space between the outer and inner plates with perforated metal both at top and bottom; and for convenience of wear, he applies a perforated metal screen at the back of the inner plate, and pads the screen to make it fit over the mouth. Where desired, he places powdered charcoal or sponge, moistened with any purifying agent, in that chamber to which the valve opening inwards is fitted. Thus air is inhaled through one chamber and exhaled through another, consequently the air exhaled is not again drawn into the lungs. *Patent abandoned.*

2282. A. G. BRADBY. *Improvements in connection with collars, ties, or other like articles of dress.* Dated Oct. 13, 1858.

This consists in combining a collar with a tie, scarf, ribbon, bow, or other like article of dress, so that the two together shall form one article of dress complete in itself. *Patent abandoned.*

2283. A. BENDA. *Improvements in the manufacture of models of the human and other figures, to be used as toys, for tuition, and for other purposes.* (A communication.) Dated October 13, 1858.

This consists in constructing models of the human and other figures, by forming the limbs and other parts of the same separately, and combining them by india-rubber or other elastic strips or cords. Models made in this manner are susceptible of being placed in various attitudes and positions, and may be used for toys, for tuition, for artistic composition, and for other purposes. *Patent completed.*

2284. J. BRADY, sen., and J. BRADY, jun. *Improvements in wheels and wheeled carriages to be propelled by steam, horse, or other power, and in apparatus for retarding the same.* Dated October 13, 1858.

This relates, 1, to a mode of constructing wheels of solid blocks of wood so connected together as to be of great strength; 2, to a construction of cast iron naves for wheels. It consists in constructing the wheel in sections composed of blocks of wood, so that when the blocks are brought together the grain will be from the centre to the circumference. It relates, 3, to a mode of mounting wheel-carriages, and of adapting thereto a portable railway. It also consists in coating the springs of carriages with gutta-percha, india-rubber, &c. Also, to means of retarding the progress of carriages, by adapting to some part of the axle-tree a drop-lever or bar with a kind of shoe or solid bent-up end or crank piece, which will act on the periphery of the wheel. *Patent completed.*

2285. J. C. OLLERENSHAW. *An improvement in cotton-gins.* (A communication.) Dated October 14, 1858.

The object here is to increase the capacity of the "roller gin," and the improvement consists in the use of a feeder bearing and working on centres below, and extending upward nearly to the line of contact of the two rollers, the upper end of the plate having a small curved ledge upon it armed at its front edge with teeth, and having a vibrating motion towards and from the bite of the roller, for detaching the seeds from the cotton and also assisting or feeding the cotton to the bite of the rollers. It further consists in using in connection with the feeder-plate a plate or comb provided with teeth, and having an endwise or lateral motion outside of and just below the bite of the rollers, together with the motion forward and back in common with the feed-plate by which the reeds are rippled, cut, and thrown off from the cotton as fast as the cotton is stripped from them by the action of the rollers and ledge on the feeder-plate. *Patent completed.*

2286. H. LIDDLE and J. BOOTH. *Certain improvements in machinery or apparatus for polishing and finishing yarns or threads.* Dated October 13, 1858.

This apparatus consists of a cylinder secured upon a shaft mounted in the centre of a framing, having its periphery clothed with fibre, and segments or tubes of india-rubber forming a series of "beaters." Upon each side of this composite cylinder, the "hanks" of yarn are distended in a vertical position, between two pairs of rollers which have a suitable arrangement of screw and bevel gearing for stretching the yarn; the cylinder is driven by a band and pulley upon its shaft, and motion is transmitted to the yarn pulleys by a worm and worm-wheel in connection with a train of spur and bevel gearing, which is so arranged that either one side of the machine or the other may be thrown out of gear by a lever and catch to remove the finished yarn without stopping the machine. The cylinder is to be driven at about 400 revolutions per minute, the high speed causing the cylinder to act as a fan and to dry the yarn, and the rapid action of the bearers upon the yarn effects the object of polishing and finishing. *Patent abandoned.*

2287. L. COWELL. *Improvements in apparel affording the means for preserving life at sea, and to prevent accidents to persons casually immersed in water.* Dated Oct. 13, 1858.

Here the garment is made of double or doubled or folded waterproof material, or the ordinary material lined with such manufactured waterproof material, so that the same may be inflated by the wearer, by blowing through an aperture having a spring valve therein. *Patent completed.*

2288. C. COWPER. *Improvements in the manufacture of articles of hard vulcanised india-rubber and gutta-percha, and similar gums.* (A communication.) Dated October 14, 1858.

In the first place the india-rubber, &c., is prepared for hardening in the usual manner, and is placed in the mould made of cast tin. It is then subjected to the action of steam or hot air. It is then removed from the heat, and the mould is removed from the india-rubber, &c. Any blisters or holes on the surface are now moistened by a liquid compound of india-rubber or gutta-percha, and are filled up and smoothed with the original compound, and pressed again in the mould. The parts of the mould are then pressed firmly together by screws, and again replaced in the heat. It is then again removed from the mould, and if the shape be perfect the article is placed loosely in a box without the mould. The box containing the shaped articles is then closed hermetically, and exposed to the heat until the articles are completely hardened. *Patent completed.*

2289. A. GORDON. *Improvements for manufacturing cast iron, steel, and wrought iron.* (A communication.) Dated Oct. 14, 1858.

This invention comprises, 1, a method of purifying and gradually decarbonizing pig or cast iron, or the iron as it runs from the blast or smelting furnace, so as to convert it at pleasure into malleable cast iron, steel, or wrought iron; 2, a method of obtaining steel or iron directly in a furnace or cupola charged with alternate layers of ore or mineral suitably prepared, and charcoal; 3, a method of substituting for the combustion of the coke usually employed, or charcoal, the combustion of coal or wood in the manufacture of iron and steel. This specification is very voluminous. *Patent completed.*

2290. J. R. SMITH. *Improvements in apparatus for propelling boats and vessels.* Dated October 14, 1858.

According to one modification of the invention a horizontal transverse paddle-shaft is fitted up in bearings near the boat's bow. This shaft has a paddle-wheel at each end, working in the usual manner, and it has upon it a toothed pinion, by which it is geared through a train of spur-wheels and pinions, with the shaft of a ratchet wheel, which shaft works in bearings a little abaft the paddle-shaft. The train of gearing is so arranged that one turn of the ratchet-shaft gives a considerable number of turns to the paddle-wheel shaft. The ratchet-wheel is actuated by a pawl and detent arrangement in connection with one end of a long working lever disposed lengthways and horizontally in the boat, the length being as great as the boat will conveniently allow. The party working or propelling the boat is seated in the stern, so as to be within convenient reach of the after end of the great lever, and by working this lever up and down in a vertical direction he actuates the ratchet movement, and through it and the gearing the paddle-wheels. *Patent abandoned.*

2291. T. INGRAM. *Improvements in means or apparatus for signalling between the parts of a train of carriages.* Dated Oct. 14, 1858.

The indicator used as a signal may be a bell or other means and is operated by a suitable cord, wire, rope, &c., continued from the part or parts of the train carrying the signal to the part or parts where it may be desired to operate such signal. *Patent completed.*

2292. W. CLARK. *Improvements in tanning hides, and in apparatus employed therein.* (A communication.) Dated October 14, 1858.

This consists in causing the tanning liquid to penetrate through the fibres of the skin, 1, by applying the pressure of a column of tanning liquid; 2, by a vacuum, which two processes can be employed either jointly or separately. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, MAY 27, 1859.

THE ENGINES OF HER MAJESTY'S SHIPS OF WAR.

In adverting once more, and for the last time, to the Report of Admiral Ramsay and Messrs. Nasmyth and Ward on the engines of Her Majesty's ships of war, we have next to notice the discussion which they introduce upon the amount of steam power that can with most advantage be placed on board such ships. In order to place the matter fully and conveniently before our readers, we have printed upon another page the whole of the committee's remarks and of the Surveyor of the Navy's reply.

This very important subject, which the most experienced naval architects and engineers feel unable to grapple with satisfactorily, is very flippantly entered upon by this steam committee,—"many mistakes appear to have arisen "in making the calculations for ascertaining "the exact amount of steam power required "for any particular ship, &c." We may say at the outset what the Surveyor of the Navy says in another place, viz., that the inferences which the committee have drawn from a certain table of resistances (supplied, as he intimates, by Mr. J. Scott Russell), are altogether vague and useless. This is saying nothing, of course, against the table itself, which, if properly used, would be valuable, although it is found difficult to reconcile it in some respects with other recorded facts; but it was never intended to settle of itself the important question to the solution of which it is here applied. This table was deduced, we may say in passing, by Mr. Scott Russell from experiments made in an entirely novel manner, and with very great care, and from both these causes they might well be expected to differ from many of the data before in our possession. Premising this we may add that with the whole of the practical replies given by the Surveyor we fully agree, and we recommend them to the careful consideration of our readers. We would, however, proceed a little farther, and observe, that of the amount and variation of the resistance which ships meet with from the water but little is known; and to obtain it from trials of ships in the Royal Navy nothing, that we are aware of, has been done for many years. At present matters stand thus:—Engines of a certain horse power are given to a ship in accordance with the principle mentioned by the Surveyor in his reply, and when completed, the ship is tried at the measured knot. During the trial, indicator diagrams are frequently taken, and the mean speed of the ship, from several runs, is carefully registered. If the speed is considered low, the ship is set down as a faulty piece of mechanism; there can be nothing wrong with the engines, for the indicator diagram settles that question, and all screws are assumed to be equally efficient. Now, supposing the work of the engines to be correctly measured by means of the diagram, this work (when there is uniform motion) has to overcome the work done by the friction of the engines, shaft, &c., and the work done on the screw in its revolutions on its axis. The motion of the screw on its axis causes a thrust on its after part in the direction of the axis towards the fore part of the ship. This thrust is always equal in amount and opposite in direction to the resistance which the ship meets with in moving through the water. The thrust of the shaft on the ship is then the exact measure of the resistance. As to its amount for any ship at any speed, or its variation for the same ship at different speeds, we know nothing very definitely at present; and until we have suitable means by which this thrust may be measured, we shall be unable to decide with any certainty in any given case in which the speed attained was less than expected, whether the screw did its work well, and the resistance of the ship was great; or whether the thrust on the screw to push the ship was small; or, in other words, how much of the evil was due to the mal-formation forward, how much to that abaft, and how much to the screw. All the dynamometers which we have seen fail to give an accurate register of the mean thrust of the screw shaft on the ship; and until a simple and efficient dynamometer has been extensively fitted on board screw ships, we believe that we shall be unable to predict, with any certainty, the speed which a given ship will attain with a given amount of indicated horse power. We are, therefore, entirely at a loss to conceive why the committee should have introduced the table into their report, and drawn practical conclusions therefrom, unless it is that they have yet to learn the real position which the resistance occupies in the matter, and which we have above explained. All that has yet been attempted by practical men is to connect the primary cause with the effect;—the indicated horse power with the speed of the vessel. Referring to the tables of the results of the trials of H.M. ships, which we published on 18th February, 1859, there does not appear to be any very simple law connecting the indicated horse power with the speed attained; nor do we think it possible to "make a most accurate estimate of the dif-"ferences of resistance consequent upon dif-"ferent formations;" for, from those tables we find that many ships which would be called sharp, give bad results, and others which would be pronounced full, or even very full, give good results. The subject is beset with difficulties, and our present mode of gaining experience therein is very slow, and not at all sure; for the speeds of new ships often fall short of what might have been reasonably expected from them. It seems to us, therefore, to be very important to narrow our reasonings as far as practicable, by obtaining facts relating to the amount of the thrust of the screw shaft on the ship, so as to gain an additional step between the engine power and the speed. Could these be furnished to us, we believe that our advance in screw propulsion would be rapid, and our ground sure.

The next subject which engaged the attention of the committee is the use of the screw as a propeller. Various forms of screw propellers have at different times been proposed, they say, and various experiments made as to their respective utility; but from all these it does not appear that any form that has ever been applied to our men-of-war is superior, for the purposes of propulsion, to that of the common two-bladed screw, supposing, of course, that the proper pitch and diameter applicable to the vessel has been arranged. It has also the advantage of being more easily hoisted up than the three-bladed screw. The attention of the committee was directed to the consideration of the qualities of Griffith's screw, and as its pitch is capable of being altered, they recommend its use for determining the most suitable pitch, where a common screw is to be fitted for any particular ship. There is one detail which the committee recommend, more particularly as in the greater number of our screw ships the plan has been adopted, and found to answer well; it is, that the screw shaft should not draw in, but be fitted with a T-head. Proposals have been made also for increasing the convenience of stowage, and facility of moving, that very large screws should be made in parts; "but all these details are matters suited," say they, "for the consid-"eration of the engineers of the Admiralty, "rather than by this committee;" and there they are perfectly right. It is a pity that idea did not occur to them before. There is, however, one other point to which, as bearing upon the subject, they draw attention. All the evidence received shows that where a ship has very fine lines a coarse-pitched screw, with comparatively small diameter, gives the greatest speed; "and "as this result is evidently a great benefit, it fur-"nishes another example of the advantages that "ships with fine lines have over others." The committee cannot, they say, close their brief remarks upon this subject without strongly urging that the purchase of screw propellers should be at once abandoned, and that they should be all made at the Government factories. The brass screw, on Griffith's plan, intended for the Doris, cost £637 more than it could have been furnished for at one of our own factories. And taking a general average, it will be found that upon this article of steam machinery a saving may be effected by Government being their own constructors to the amount of at least 30 per cent. upon the price at present paid, besides the certainty of having the best articles that the country can produce. As the committee entered as far as we have shown into this question of screw propellers, we must say it would have been agreeable to us to have found that they had examined, and represented the merits of, the admirable feathering screw of Mr. Joseph Maudslay. In the same connection we may mention a fact which escaped our memory while penning our last week's article—viz., that a remark of the committee, on page 40 of their Report, in which they mention the "oscillating" and "double cylinder" engines together, is apt to mislead; for they incidentally state that the latter engine (and, by implication, that only) was patented by Messrs. Maudslay and Field; whereas it is well-known that the oscillating engine also was first successfully applied to marine purposes by Mr. Joseph Maudslay, who patented the arrangement, and employed it in numerous steam vessels before Mr. Penn or any other person used it as a marine engine. It is only fair that this fact should be borne in mind. A few trifling, not to say trivial, remarks on what they pompously call "economy of labour" (but which really treat of nothing more or less than a donkey engine or two), and on the "classification of engines," bring the committee to the "Summary," with which they conclude.

Before we finish with these gentlemen, however, we must repeat some of the very just observations of the Surveyor of the Navy, and say that it is greatly to be regretted that the committee, before making several of their recommendations and suggestions, had not obtained such information as would have been afforded them by the Surveyor and his department at the least intimation of their wish, and such as in some cases would necessarily have led them to conclusions the very reverse of those at which they arrived, and it is confidently believed in other cases to conclusions considerably modified. Why the committee did not follow this obvious and only course for obtaining authentic information to enable them to draw just conclusions, more especially since the Board's instructions required them to do so, and to have "frequent intercourse with the Surveyor," they alone can explain: it is sufficient to state the fact that they did not do so. If no instructions at all had been given, the Surveyor, who might be supposed from his position cabable of giving evidence of some

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value on several of the matters which were investigated by the committee, should have been invited to do so; but he was not, although he more than once expressed his readiness to be examined. His minute which they insert in their proceedings, and which looks like a communication to them, was, he says, a copy of a minute which he had previously addressed to the Board, and which the chairman requested to have. The same remark applies substantially to the principal officers of his department. In selecting their witnesses, also, in many instances the committee did not take that course which is generally observed by committees appointed for similar purposes, and it is presumed never intentionally departed from. For instance, in their inquiries in regard to the forms of ships, the only persons whom the committee examined, with the exception of Mr. Scott Russell, were one master shipwright and two assistants, who, says the Surveyor, from their not having received a regular training in those branches of physical sicences which are necessary for the successful investigation of a subject far more complex than it appears at first sight, cannot be expected to be capable of giving so sound an opinion as those officers in the service who have had the advantages of a course of scientific instruction. In addition to what the Surveyor states, as we have seen, respecting the table of resistances, he adds that another striking instance of their over-hasty conclusions occurs in the case of the Diadem. "They record some person's opinions which cannot be entitled to much weight, while the opinion of Captain Cracroft, who had commanded the ship on a trial cruise, and who expressed that opinion to the chairman—a favourable one—is entirely omitted; his name does not even appear. On the other hand, the evidence of Captain Moorsom, who before he had tried the ship, recommended her stern to be cut off, high-pressure engines to be put in with a smaller screw, and other changes to be made, is duly recorded. Whether Captain Moorsom's opinion is right or wrong, it appears to have been formed and expressed so early as in a great degree to lessen its value. A somewhat similar course was pursued on another subject. A question to ascertain the readiness of manufacturers to construct engines on a plan different from their own, appears to have been put to all who were examined, with the exception of two, Messrs. Maudslay and Messrs. Penn. Possibly the committee thought it unnecessary to put the question to them, as they knew perfectly well what their answer would be. But such a mode of collecting evidence gives a one-sided appearance to their proceedings.

We think it right to expose these unjustifiable short-comings of the committee, lest any heedless and hapless reader, overawed by the authority which such a Report as that before us ought to possess, should mistake their blundering assertions for orthodox science. In conclusion, we will only say that while we have heard much, very much, spoken in condemnation of this silly production, we have heard no word pronounced in commendation of it.

THE CULTIVATION OF FLAX.

In a recent number we noticed the Prospectus of the National Flax Company, and, believing the extension of flax culture to be of great importance to the country, we again take up the subject.

The deficient supply of the raw material for our linen and canvas manufactures has for many years occupied much attention, and various projects have been devised with the view of increasing the quantity of home-grown flax, and improving its quality. The Royal Flax Society of Ireland has, ever since the year 1841, laboured zealously for the promotion and improvement of the growth of flax in Ireland. We have had Schenite's, Claussen's, Donlan's, Watt's, and other patent processes for the preparation of the fibre; yet for the last ten years the breadth of land under flax in the United Kingdom has been gradually decreasing, the entire quantity produced at home last year being only 26,599 tons, while 90,794 were imported. Our linen trade would at present absorb upwards of 150,000 tons of flax annually, and there is no adequate reason why the entire supply should not be produced from our own soil. We believe that most of the patented systems hitherto proposed have not been found successful when practically tested, and thus an amount of apathy and distrust has been created, which is much against the carrying out of any really sound and well-considered plan for promoting the culture and improving the management of flax. The National Flax Company intend to establish *Rettories* in suitable localities throughout the United Kingdom, purchase the flax from the farmers when grown, and make the preparation for the spinner a separate business. This we consider the right system to go upon, as flax will never be generally cultivated so long as the grower has to undertake the trouble of steeping, drying, &c., for the proper performance of which he has neither the requisite time nor knowledge. It seems to us that the drying machine (the patent right of which has been secured to the Company) renders the plan proposed to be carried out easy, simple, and certainly profitable. The apparatus to which we refer is thus described in the pamphlet issued by the Company:—"By the patent machinery, the flax, after being lifted out of the water, is passed at once in a continuous course through pressing rollers, and round cylinders heated by steam (being pressed against these cylinders by small carrying rollers) into fluted rollers, whence it is conveyed by hand all ready dried and broken, to be scutched. Thus the operation between the water and scutching is performed in less than a quarter of an hour. One machine is capable of drying sufficient flax to produce half a ton of fibre, and a quarter of a ton of tow, in ten hours." The processes of steeping and drying flax on the old system require from four to five weeks, and can only be done during the summer months; but by the patent process the whole can be accomplished in three days, while a superior article is produced, and the work can be carried on at all seasons, independently of the vicissitudes of the weather.

In the present aspect of European affairs the flax question assumes great additional importance, as complications may unfortunately arise which would shut up the markets of Russia, and thus leave us almost entirely dependent on our own resources, which in this respect are certainly ample, if properly utilised. We should, therefore, be up and doing while there is yet time. In every view of the case this is a truly national matter, the canvas used so extensively in our navy, and also in the manufacture of tents for our army, is made from flax of English growth. No one can say how soon the efficiency of both branches of the service may be put to the test, so that we should not neglect any of the necessary appliances, but, by developing the capabilities of the country for the production of flax, render our manufacturers, as far as possible, independent of foreign supply. The best argument, however, in favour of the National Flax Company is, the certainty of its paying a good dividend on the capital invested, as the calculations, based on sound data, show that a handsome return may be safely relied on. As we are in the habit of devoting a large portion of our space to the consideration of naval matters, we feel it our duty thus to bring forward the claims of this Company to general support.

GUNPOWDER EXPLOSIONS.

VERILY, gunpowder remindeth us of those old haradans who are brought before the magisterial bench, and who, after receiving just sentence for their deeds, incontinently hurl a shoe at the judge, or attempt to tear the jailor limb from limb. Scarcely had this Hecate of science received her well-merited verdict from the Hounslow jury, who pronounced her conduct "loose and dangerous," than she bursts out in a fury of revenge, blows up four mills, and flies at the poor fellow who would control her fury, and pursues him to the death.

This in sober earnestness is very sad! The verdict of the jury, which appeared at length in our columns of last week, is, although severe, only just, and we cannot see how anything less could have been arrived at. Those who read our former articles upon this subject may have been prepared for it; but with all our prophetic assumption, we confess we held on to a lingering hope that some one circumstance or other would crop out of the inquiry to mitigate or extenuate the fearful accusation of wilful neglect under which the proprietors and managers of these mills now labour.

Upon the subject of Government *surveillance*, the jury and the public appear to be somewhat in the dark. There already exist, to the best of our belief, official Inspectors of Powder Mills. We found this belief, in the absence of reference, upon the fact that a gentleman assuming to be a Government Inspector presented himself at the principal gates of the Hounslow Powder Mills upon the morning succeeding the late great "blow," and demanded admittance. This he was at first denied, but upon his threatening to send for a picket of soldiers from the neighbouring barracks and force an entry, the gates were thrown open to him. If we are not incorrect in this what a farce is here—a farce succeeding so deep a tragedy! A Government Inspector presenting himself at the door of the stable after the steed is stolen!—a Government Inspector whose face and person are totally unknown to the porter at the gate, although the latter has held that post for many years!

Professor Taylor's report is not yet printed. When this is done we shall return to the general subject of explosions of powder mills. With reference to the last accident we purpose maintaining a like reserve until after the coroner's inquest, feeling satisfied, as must our readers, that "Polvora" has been sufficiently answered by the events which have occurred since his letter was written without any further remarks from us.

GREAT GUN-MAKING AT WOOLWICH ARSENAL.

In completing our notice of the Royal Gun Factories at Woolwich, it is necessary to mention more particularly the arrangements for drying the moulds, the manner of preparing which it is hoped we have explained with sufficient clearness in previous papers. The drying stoves, as has been stated, are as nearly as possible 20 feet long, by 9 feet broad, and 8 feet high. They are covered with arches springing from cast iron girders, supported by the side walls. The stoves stand isolated, as it were, in the middle of the room or shop in which they are placed, and are built of 9-inch stock-brick work, bound together by bolts of iron—passing through external plates of cast iron—and nuts. The internal lining is composed of 4½-inch fire-brick work. The fire-places for heating the stoves are constructed on the insides of them, and at one end. They are sunk to about 18 inches

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below the floor line of the stoves, and rise 6 inches above it. This prevents the fire, or rather cinders and ashes from it, reaching the floor. The fire-grate in each case is 3 feet 6 inches, by 2 feet 6 inches, and gets its supply of cold air through the ash-pit, which communicates with the external atmosphere. Draught is obtained by means of an outlet through the roof of the stove, the dimensions of this being 18 inches by 6 inches. The smoke from the stoves is carried away, not by a chimney, or chimneys, which would have disfigured in this particular instance the building, but through square wrought-iron pipes connected with the roof outlets of the stoves, and then passing down to underground flues which lead to vertical pipes running up the outer walls of the foundry. There are many practical mechanics who doubt the satisfactory action of downcast flues under any circumstances, and especially where combustion is slow, but at the Woolwich Factory, we can assure the sceptics, no difficulty is experienced with them. Well, then, the moulds are prepared, and the stoves are ready to receive them. Skeleton trucks, with four wheels each, so arranged with regard to guage, as to run freely in grooves commencing in the cast-iron floors of the stoves and extending into the shop beyond them, for a considerable distance—skeleton trucks of three or four *stories* in height, are now advanced to receive the several instalments of the great gun mould. Those parts of the mould which contain the greatest thickness of sand occupy the upper storey of each truck, because the temperature at the upper part of the stove will be the highest. In the 68-lb. gun, for example, the thickness of sand at the base ring is about 5¼ inches, and at the upper part of the "dead head," 4 inches, and, as may be supposed, the operation of drying so much material occupies a considerable time. It has been found by experience, indeed, that nothing less than 36 hours' submission to the properly-heated stove, will suffice to produce perfectly dry moulds. On one occasion, an attempt was made to expedite the drying of the moulds for a 68-lb. gun. Greater heat and shorter time was the theory of the Woolwich experimenters in these their "green and salad days." In the particular case to which we allude—and the lesson may profit others engaged in producing sound heavy castings—18 hours' drying was tried. The consequence was, that when the metal was run into the mould, steam was generated, and gases evolved to such an extent that, although there was a vertical column of fluid iron 17 feet in length within it, a terrible commotion ensued. The fluid iron surged and bubbled, and seemed to boil up for fully half an hour after pouring, and there is no doubt that, had not the mould been open at the top, and vent holes in the boxes very numerous, the combined explosive force of steam and gas would have rent the mould asunder, and scattered its contents with death-dealing force among the experimenters. In spite of the phenomena observed at the casting of this gun, it was turned; and presenting then to the eye no defect, bored and finished. In the proving operation, however, it went to pieces at the first round; and the short drying process has not, we believe, been repeated.

Supposing that the mould, of which we have been previously speaking, is sufficiently baked, it is next drawn from the stove, and by means of the crane removed also from the truck. Three or four corresponding portions of the mould are now bolted together, and lowered into the casting-pit, this being formed of wrought-iron plate ½ an inch in thickness, and being 20-ft. deep, 20-ft. long, and 8 ft. broad; and the remaining parts of the mould also bolted together quickly follow, and united make the whole complete for the reception of metal. The kinds of iron most suitable for great-gun making, the furnaces for melting that iron, the means of pouring it, and the method of preparing the patterns and moulds for the purpose, have now been given, and it only remains to be said that castings of the size in question are allowed to remain undisturbed for three days; that from the excellent character of the "blacking" used at the Arsenal, and described in our last, the castings then present as smooth a surface as that of a Paris kid glove, that scarcely any trimming is required even opposite the joints of the moulding-box, and that the loss in weight of iron used in the furnaces as compared with iron produced in the shape of guns, is 5 per cent. So much as to the production of heavy guns; the boring and turning operations have not been described, because similar manipulations are familar to our practical readers. The war pressure has increased the addition of further means and appliances to the Royal Gun Factories, and it is certain that the rate of production from them cannot be too much increased at this "rugged and awful crisis."

MARINE ENGINE-ROOM TELEGRAPHS FOR HER MAJESTY'S NAVY.

WE are much pleased to know that a series of experiments with these valuable instruments, and very important acquisitions to steam-ships, more especially to ships of war, has lately been going on at Sheerness for some time, under the direction of Captain Halsted and the steam-reserve. The operations and trials have been severe, in order to test the accuracy and working of each of several competitor's inventions, and to afford grounds for a report to the Lords of the Admiralty upon their relative efficiency; when we take into consideration the number of lives and valuable property dependent upon the efficient and accurate working of such telegraphs, especially in cases of emergency, it is of vital importance that every means should be taken to secure the most simple, substantial, and reliable instrument. The arrangement for proof was a day set apart for a trial of each inventor's apparatus, when reported ready for proof by themselves to Captain Halsted. The mode adopted to prove them consisted of the engine-room dial being divided into eleven segments of the circle, each segment graduated into seven divisions similar to the "minute" marks of a clock dial, thus making 77 divisions. The centre of each segment is accurately found, marked with a spear head, or arrow, intended for the index hand to stand at, when the motion of the needle to the point is "perfect" on being worked by the captain or pilot on deck, by the deck dials. The next graduated mark to the right is termed "good to the right;" the third mark is termed "indifferent;" and the fourth mark "bad." The same description applies to the left of the *arrow*.

The trials of each telegraph consisted of some hundreds of moves, as previously arranged on a tabulated form for this particular test, and were carried out by Captain Halsted on deck with each deck dial, two deck dials being necessary in a ship of war, one in each hammock netting, at the gangway or bridge. The officials below in the engine-room marked the working of each move of the hand on the dial. It may be interesting to some of our readers to give, as near as we could ascertain, the result of each inventor's telegraph on the days of trial. Without troubling ourselves with intermediate degrees of merit, we may say that the greatest number of "perfect" marks was attained by Mr. Thomas Suffield's (of Bermondsey-wall, and Fenchurch-street) instrument, which registered no less than 600 such marks. Mr. A. P. How's (London) came next, with from 350 to 400. Mr. Hornsey's (Southampton) followed with considerably less than 200, and Mr. J. Allen's (London) last with about 150. Of "indifferent" or "bad" Suffield's, and that alone, registered none at all.

It will thus be seen that the Suffield's telegraph had a very decided and great advantage. Having obtained the above information we waited upon Mr. Suffield in order to obtain particulars of his invention, when he in the most candid manner exhibited to us the whole apparatus in a full-sized working model; and in justice to the inventor, we must say it is an exceedingly simple and reliable working piece of mechanism. The arrangement of it throughout has evidently been made by a person of great practical experience, and we do not in the least wonder at its marked superiority. Mr. Suffield, as we learn, has recently opened extensive stock premises at 116 Fenchurch-street, for the convenience of shipowners, captains, engineers, and others, and the engine-room telegraph will, we presume, speedily be placed on view there.

THE EFFECT OF THE INTRODUCTION OF THE ARMSTRONG GUN ON NAVAL ARCHITECTURE.

BY CAPTAIN J. GARDINER FISHBOURNE, R.N.

(*Continued from p. 334.*)

THE above is fully confirmed by experience, as may be perceived by reference to the following table,* which shows that the widest ships with the least proportionate mean draught are the most uneasy—that is, roll quickest and deepest.

No. of Guns.	Name.	Length.	Half Breadth.	Mean Depth.	Diff. of 4 and 5 Col.	Character.
		ft.	ft. in.	ft. in.	ft. in.	
116	Queen	204	30 0	25 3	4 8	Uneasy.
120	St. Vincent	205	26 9	25 3	1 6	Very easy.
121	Trafalgar	205	27 6	25 3	2 2	Easy.
90	Albion	204	30 0	24 4	5 8	*Very uneasy*
90	Rodney	205	27 0	24 8	2 4	Easy.
80	Superb	180	28 6	24 7	3 11	Uneasy.
84	Canopus	183	25 6	23 10	1 9	Very easy.
80	Vanguard	180	28 6	24 0	4 6	Very uneasy
131	Marlborough (Sc.)	245	30 6	25 6	5 0	
91	Agamemnon (Sc.)	234	27 6	23 6	4 0	
	Birkenhead (Pad.)	210	18 6	17 0	1 6	Very easy.

The old French ships are in marked contrast and show the recognition of a principle in designing.

No. of Guns.	Name.	Length.	Half Breadth.	Mean Depth.	Diff. of 4 and 5 Col.	Character.
		ft. in.	ft. in.	ft. in.	ft. in.	
120	.....	209 0	26 9	25 11	0 11	Very easy.
86	.....	193 6	25 5	23 9	1 8	"
50	.....	173 0	22 5	20 2	2 3	"

The Albion rolled through 49° to one side, and somewhat less to the other side, and thirteen times in the same time and under the same circumstances that the Rodney rolled only *eight* times and 27° one way, somewhat less the other.

On a different occasion from the above, the Queen was observed to roll 20° and 7° and *seven* times in the same time and under the same circumstances that the St. Vincent rolled only *five* times and 13° and 5°; usually the St. Vincent was only shutting her first lower deck ports when the Queen had shut all hers and was commencing to shut her skuttles, which were 18 inches to 24 inches higher than her ports.

The Queen has also been observed to roll four times while the Trafalgar rolled but once.

Nor can these motions be said to have been due to the inequalities of the solids near the load water-lines, as has been asserted, for the Agamemnon, Hecate, and the Queen, very nearly so, have their sides perpendicular at that part; indeed, the Queen was originally laid down as a Trafalgar.

If, on the supposition that moving the centre of gravity would mitigate the evil of quick rolling, weights were raised in the Queen, Albion, or Superb, as a consequence they would roll deeper, but that fault is already too great; and if weights were lowered quicker rolling would ensue, but this is already too quick.

It must be observed also, contrary to what might have been expected from considering the effect of weights alone, notwithstanding their third deck, which, with its guns, must have amounted to 350 tons, situated say 25 feet above the centre of gravity, the Queen and St. Vincent were easier, and rolled less deep than vessels of

* *Limited as this table is, it shows the value of statistics*, which are dangerous only in ignorant hands. The contrast drawn above is between sailing ships, simply so, and screw vessels; yet, without controversy, the latter kind should be proportionably deeper.

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their own type and nearly similar dimensions, viz., the Albion and Rodney respectively, principally because of their greater immersion, the Queen, partly because of her fuller body below. This view is endorsed by the reports of their Captains. Captain Lockyer wrote: "Albion rolls quicker perhaps for want of ballast, and her rolling has *increased* since the ballast and shot have been removed, and the ship *lighter from want of water and provisions.*" And Captain Corry wrote of the Superb: "Her rolling is quick, and in proportion to Canopus as 3 to 2, which in light airs, with any swell whatever, renders her very unsteady, and makes it *difficult to take accurate aim with her guns.*"

More recently the Agamemnon, when she had the Atlantic cable on board, with a swell abeam, and very little wind, rolled 20° to starboard, and 12 to port in 9·4 seconds. It must be added, that this was stated to have been due to the fact of the cable having been stowed too low; a sufficient contradiction to this, however, is, that the obvious consequence of raising the weight would have been to have increased the extent of the roll, just in proportion as it reduced the rapidity; on the subsequent cruize, but during bad weather, the vessel having been lightened 5 inches, and having had 200 tons of cable placed on the upper deck, lurched to upwards of 40°, and completed her roll in 10·3 seconds. The American frigate Niagara, on the first occasion, was said "scarcely to roll at all," while the Agamemnon was rolling both deeper and faster, and yet she had the greater portion of her moity of the cable stowed very high; consequently, if the effects described were due to the position of the weight alone, she would have rolled deeper but not so fast. This ship, however, as she discharged the cable, rolled more, and considerably by the time she arrived near Newfoundland, when she had discharged the greater part of the cable. Admitting some small portion of the difference between the rolling motions of these two ships to have been due to the difference in their dimensions, yet the principal cause was the large mean breadth of the Agamemnon, and the comparatively small mean breadth of the Niagara, as compared with their respective draughts of water, which in the first cruize was equal; the difference of mean breadth being due to their difference of form. If dimensions necessarily make a vessel easier, it may be asked why the Albion was so much less so than the Canopus. The owner of a yacht, and one of the best informed on the subject that I have met, says, "The rolling of my vessel has been strikingly diminished by lengthening her by the bow 8 feet," which he justly observed must have been in a great measure because her mean breadth was reduced.

It cannot be, as has been said, that the uneasiness of H.M.S. Agamemnon was due to the abstract fact of her being deep, for it is no uncommon thing for merchant ships to be much more so; thus, for instance, a ship of Mr. Green's brought a heavy cargo from Calcutta not long since, and was very easy.

The following dimensions will put this in a clearer light:—

	Length between Perpendiculars.	Half breadth.	Mean Draught.
	feet.	ft. in.	ft. in.
H.M.S. Agamemnon. . .	234	27 6	26 0
Mr. Green's Agamemnon .	244	18 0	19 6
White Star	285	22 6	24 4½

That is, the merchant vessels Agamemnon and White Star were proportionally deeper, the first by 3 feet, the second by 3 feet 4 inches, than the man-of-war, which was said to have been under extraordinary circumstances.*

Easiness is so important that its value should be further illustrated and enforced.

It is stated by Sir Howard Douglas that a second may elapse between the time of pulling the trigger and the time the shot leaves the muzzle of the gun. The arcs of roll of the Queen and St. Vincent being respectively 3° and 1½° in a second, we have but to suppose equally expert gunners, each to aim at the water-line of the other, and each to fire with a rising motion, the ships being 30 feet high and 400 yards apart, and the second alluded to to elapse, the result would be, assuming that there is no other cause of deviation, that the Queen's fire would pass over the hull of the St. Vincent, while every shot of the St. Vincent would hit the hull of the Queen; and yet the Albion, Superb, and Vanguard, rolled three times as fast as the Queen; how, then, could it be expected otherwise than that sister ships to these, as the Colossus, Exmouth, and others, should be otherwise than failures?

There is no reason to doubt but that the motions of the Marlborough, though less than those just named, would be faster than those of such ships as the St. Vincent or Trafalgar, as from the table the difference between her half-breadth and her mean draught is as 5 to 1·6, and 2·2 respectively.

As the deviation increases with the range, it were absurd to expect efficiency from ships that are so uneasy under not unusual conditions of weather; and if unfitted for smooth-bore guns, how much more unsuited to rifle guns, when, in addition to their great range, their shot take longer before they leave the gun.

The following is a more pointed illustration of the necessity for steady platforms. The Hecate and Antelope were anchored off the coast of Africa under very similar conditions; that is to say, they had about an equal proportion of provisions and water, &c., on board; the former was rolling 11° each way, and eight times in a minute—her commander states that her guns could not have been cast adrift and worked without danger.

He visited the Antelope officially, and found she was rolling but 5° each way, and about four times in a minute; her guns were cast adrift, exercised, and satisfactorily pointed at a target. The commanders of both vessels agreed that the Antelope could have destroyed the Hecate with ease, as the latter, at a moderate distance, could not have hit the former much oftener perhaps than once in fifty times.

In this case we have a vessel carrying only three guns, admitted to be superior to one a sixth larger, and carrying six guns.

It is evident that had the Hecate had 100 guns, and had rolled with equal rapidity, supposing only that the Antelope should have, as in the case in question she had, greater speed, her 100 guns would not have saved her from the fate predicted of the 6-gun Hecate; and if this case can occur with smooth-bore and comparatively short-range guns, how much more certainly would it do so were the Antelope's guns accurate and long-ranging rifles.

Rapid as was the motion of the Hecate, it was less than that of H. M. S. Agamemnon under favourable circumstances of weather, and only one-fifth that of the Albion; still it was at the rate of 3° in a second.

The form of the Hecate and Antelope, near the load water-line, was similar, so far as having equally vertical sides; consequently, the difference in their motions could not have been due to any inequality there.

I stated in a pamphlet last year that the Diadem would roll considerably; it is now reported that she and the Cæsar, 90, were lying at Greytown together, and that the former rolled twenty-five times, while the latter rolled only fifteen times. If these ships were under equal conditions as to the swell, and equal as to the proportion of coals, water, and provisions they had on board, then are we receding in our practice of shipbuilding, as the Cæsar is a much older ship, and a much shorter ship; whatever was the cause of the difference, it should be inquired into, and if possible removed, if not avoided, in any future ship.

In a paper of this sort, it were impossible to do more than clearly recapitulate the principles already enunciated.

The depth of water in which any projected ship is to be navigated should be taken as the limiting principle of the design; from that the immersed depth should be determined, and the vessel designed on that as a basis, and upon definite principles.

If a maximum fitness as a floating battery or effective sea-going ship, there must be a definite ratio preserved between the breadth and the mean immersed depth. If the horse-power is to be kept within satisfactory limits and a sufficient immersion obtained for an effective screw, the half-breadth should not exceed the mean immersed depth, and the centre of gravity should be kept proportionably low; if a maximum result as to efficiency and economy, so far as form will effect it, a fine bow and suitable midship section should be added—slightly convex at the load water-line is the best form.

[The concluding portion of this paper, together with some remarks by Sir W. Armstrong with which it was followed, will be given in our next.]

* It has been objected that in a pamphlet which I printed last year I understated the draught of water of the Agamemnon, and to that extent undervalued her as compared with the Napoleon; this implies that the defects of the former were confined to deficient draught, and that those who objected to my view would have been content had hers been equal to that of the Napoleon. Now I, on the contrary, contend that her form also is defective in principle, just where the French have borrowed from us, viz., in giving undue breadth; and while, as I believe, she is superior to the Agamemnon, her breadth is still too great by several feet for her depth. I was contending for a principle, and took the most correct information at my disposal; the incorrectness of this, however, even if it had been greater, would not have affected the *principle*, and in the case in point the only thing that was grounded on the fact was the propriety of inquiry before any ships similar should be built—a course not without value whatever the facts may have been. I could have no wish to misrepresent, inasmuch as the fact, whatever it may be, "cuts both ways;" thus in the same pamphlet I argued that it was not an undue weight of cable that caused her to roll so deep and so rapidly: this argument gains considerable force by the admission that she was only 2 feet or 2 feet 6 inches more than her proper draught, instead of 4 feet, more or less a few inches.

Literature.

The Story of the Life of George Stephenson, Railway Engineer. Abridged by the Author from the Original and Larger Work. By SAMUEL SMILES. With Portrait and Illustrated Woodcuts. London: John Murray, Albemarle-street. 1859.

WHETHER the remarkable character of George Stephenson, or the work which he accomplished, or the manner in which the story of both is here told, be considered, there is but one judgment to be pronounced upon this book, and that is an unqualified approval. There is not a youth in the kingdom, whether high-born or low-born, who would not find in its perusal a healthy and elevating stimulus. The demand for the larger work, from which this has been condensed, has been so great that we are encouraged to believe that in this its cheaper form it will have an enormous circulation. We earnestly hope it may. Let no youth or young man who may read these lines omit to procure it; as a possession, if possible; if not, for perusal.

Things not Generally Known, Familiarly Explained. Second Series. A Book for Old and Young. By JOHN TIMBS, F.S.A. Author of "Curiosities of London," &c. London: Kent and Co. (late Bogue), Fleet-street, 1859.

THE merit of Mr. Timbs' first series of these popular explanations is well sustained in the present series. He is an unrivalled compiler, and this, his last book, is inferior to none that has gone before it. It contains authoritative expositions of old English manners and customs, old plays and pageants, English laws, privileges, &c., money, weights and measures, olden herbs and fruit, phenomena of life, funeral ceremonies, home proverbs, sayings, &c., weather-wisdom, pictures, and the care of them, inventions and discoveries, &c.

Recent Practice in the Locomotive Engine. By D. K. CLARK, C.E., and Z. COLBURN, C.E. Parts 5 and 6. Blackie and Son; Glasgow, Edinburgh, London, and New York. 1859.

IN the first of the parts before us Mr. Clark continues his discussion of coal-burning locomotives, and of recent practice with them, and then, in

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pursuing the subject of the physiology of the boiler, treats of "heat-traps," such as Gooch's Venetian damper, Barran's cup-surfaces, &c. In the sixth Part he concludes this part of his subject by a few pages on safety-valves, feed-water, and steam. He next gives two chapters on "The Engine"—respectively headed "Details," and "Working dimensions and arrangement of engines"—and then makes way for Mr. Colburn, who commences his part of the work with an account of the historical progress of the locomotive in America. The plates in Part 5 illustrate a passenger locomotive, by Danforth, Cooke, and Co, Paterson, New Jersey, and a goods locomotive, by Alexander Allan, of Perth. Part 6 presents us with several locomotives, by Beyer, Peacock, and Co., Manchester. These plates are got up with that excellence of style from which Messrs. Blackie and Son never depart.

Lecture IV. *(with Appendices) of a Course on the Principles and Practice of Civil Engineering: delivered at the Royal Engineer Establishment for Field Instruction at Chatham.* By HENRY CONYBEARE, F.G.S., M.I.C.E. London: Office of the *Civil Engineer and Architects' Journal*, 13 Warwick Court, Holborn. 1859.

MR. CONYBEARE is known to the profession as an able and zealous man; but it is only by perusing these lectures of his that a just estimate of his industry and research is to be formed. Here, for example, we have a discourse embracing an elaborate discussion of the various sources of resistance offered to motion on railways, the proportion of the load insistent on the driving wheels that is available in traction, and the general conditions of maximum useful effect in the locomotive, and in steam engineering generally, these subjects being illustrated by copious references to all kinds of authorities, and to inventions of the most recent date.

The Carpenter and Joiner's Assistant. Parts 17 and 18. Blackie and Son: Glasgow, Edinburgh, London, and New York. 1859.

WE have only space just now to say that the high degree of merit which has characterized this publication from the beginning, is in no way abated now that the work is approaching its completion.

Instructions for the Management of Open Boats in Heavy Surfs and Broken Water; with Practical Hints for the consideration of Merchant Seamen, or others having charge of Ships' Boats; to which is appended Instructions for Rescuing Drowning Persons, and for Restoration of the Apparently Drowned. Issued by the Royal National Life-Boat Institution. Charles Knight and Co., Fleet-street. 1859.

HAVING given the title page of this little pamphlet (published at 3d.) in full, it only remains to say that it has been deemed so reliable and useful that the Lords of the Admiralty have authorized its circulation in large numbers throughout the Royal Navy. This is, we presume, a stronger recommendation of it than anything else we could say in its favour.

LIST OF NEW BOOKS.

Althan's Treatise on Medical Electricity, 8vo.
Busk's Rifle, and How to Use It, 4th ed., fc. 8vo.
Foster's Commercial Code of Signals, by Larkins, second edition.
Hoppus's Table for Measuring, new ed., oblong.
Stantial's Test Book for Students, Pt. 4, Physical Science.
Stephenson (George), Life of, by Smiles, post 8vo.
Tate's Key to Elements of Commercial Arithmetic, new edition.
Timbs's Things not Generally Known, 2nd series, 8vo.

The National Botanic Gardens, containing the great palm house, the old and new museums, the tropical aquarium, &c., and the royal palace pleasure grounds, flower gardens, and new arboretum, having been greatly improved and adorned, are now open for the season, every week-day from one o'clock till dusk. On Sundays, from two o'clock till six. Free admission to the whole.

Proceedings of Societies.

ROYAL AGRICULTURAL OF ENGLAND.

May 18.—A Weekly Council was held.—The names of candidates proposed for election were read. The Secretary of the Belgian Legation transmitted copies of the programme of the International Exhibition of Reaping Machines to be held at Brussels, under the auspices of the Central Agricultural Society of Belgium. The Hon. Leslie Melville laid before the Council copies of the prospectus of a gas apparatus adapted to lighting farm buildings and stables and private houses. Having had one in operation himself for a year he was enabled from personal observation to detail its success. He stated that an intelligent labourer could manage it, and that the cost of gas varied from 2s. 9½d. to 3s. 6d. per 1,000 feet, but of course subject to variation according to the price of coal used. Mr. Fisher Hobbs expressed his willingness to detail to the Council the result of his practical experience relative to the Turnip fly, and his success in lessening the ravages made by it. The Council expressed their hope that Mr. Fisher Hobbs would favour the Society with this statement at the Weekly Council to be held on Wednesday next, the 25th inst. Adjourned to Weekly Council, on 25th inst.

UNITED SERVICE INSTITUTION.

May 20.—A lecture was delivered in the Theatre of this Institution, Col. the Hon. Jas. Lindsay in the chair, by the Rev. Baden Powell, M.A., F.R.S., Savile Professor of Geometry, Oxford, on "Rotatory motion, and its application to obtain stability for astronomical observations at sea." The object of the lecture was to explain the principles, on which, recently, plans have been proposed and successfully tried, for obtaining a stable platform for an artificial horizon, and a support for a telescope on board ship. The principles of contrivances hitherto adopted were shown to be defective on mechanical grounds, as mere suspension generates pendulum motion. The rotatory principle applied in the "top" of Terson and of Troughton, as the centre of gravity is below, involve the same defect. This defect is obviated by suspending a revolving desk in gymbals accurately balanced on its centre of gravity on the principle of the gyroscope. Such a machine has been constructed and actually used by Professor C. P. Smyth, on his voyage to Teneriffe. It affords a support either for his artificial horizon (constructed by means of a spirit level), and when on a larger scale for a telescope, which may be applied to the observation of the eclipse of Jupiter's satelites, so valuable for determining the longitude, but without it incapable of being observed. A working model of the machine was exhibited.

SOCIETY OF ARTS.

May 18.—Sir John Rennie, F.R.S., in the chair. The following candidates were balloted for and duly elected members:—T. Battam, jun., S. B. Edenborough, W. Hancock, T. Harman, J. Hollingshead, H. A. Silver, Vice-Chancellor Sir W. Page Wood. The paper read was, "On the Relative Values of Coke and Coal in the Locomotive Engines," by B. Fothergill. The paper consisted of a statement of the results of a series of experiments which the author had made, and was designed to show, first, that coal was decidedly superior to coke in respect of heating power, and consequently more economical; second, that a plentiful supply of steam could be generated by the use of coal for working engines at high velocities, and for drawing heavy trains; third, that coal-burning engines could consume their own smoke; and, fourthly, that fire-boxes and tubes were more durable with coal than with coke.

MEETINGS FOR THE ENSUING WEEK.

MON.—*United Service Inst.*, Evening Lecture, at 8 p.m.
TUES.—*Royal Inst.*, "General facts and leading principles of Geological Science," by John Morris, F.G.S., at 3 p.m.
Inst. Civil Engineers, Conversazione.
WED.—*Geological Society*, I. "On the sinking for coal at the Shirecoaks Colliery," by J. Lancaster, Esq.; II., "Notes on the Geology of Southern Australia," by A. Selwyn, Esq., in a letter to Sir R. Murchison, F.G.S.; III., "Notes on Spitzbergen," by James Lemont, Esq., communicated by Sir C. Lyell, V.P.G.S., at 8 p.m.
THUR.—*Linnæan*, at 8 p.m.
Society of Antiquaries, at 8 p.m.
Zoological, General Business, at 3 p.m.
Chemical, at 8 p.m.
FRID.—*Royal Inst.*, Thomas Henry Huxley, Esq., F.R.S.
SAT.—*Royal Inst.*, "On Modern Italian Literature," by J. P. Lacaita, Esq., at 3 p.m.

REEVE'S PATENT REVOLVER.

THE utmost thought amongst military mechanicians is at present being exercised to improve upon the revolver—a weapon of vital importance to the soldier. Such attempts, while they sometimes display considerable ingenuity, give us, for the most part, merely novelty as their result. Mr. Charles Reeves, the eminent contractor for arms of the Toledo Works, Birmingham, has, however, patented a revolver which may not be passed over without comment. It provides greater strength where the recoil of the chambers take place, and thus fracture is prevented at that part. The action of the rod is likewise *direct*, but that which will insure the greatest amount of interest is to be found in the arrangement which permits its owner getting immediately at the whole of the interior of the lock's machinery for examination, cleaning, and oiling. This is certainly a feature of improvement, as the user may be assured from time to time that all is right without waiting for the disturbing cause, which may alone present itself at the moment which may determine life or death. Reeve's pistol can likewise be half-cocked for safety in loading, and secured in that position by an excellent bolt, thus preventing accidental explosion. It can be wholly cocked with the thumb in taking a deliberate aim, or the contents of all the chambers can be discharged instantaneously by the trigger; either of which operations can be performed without withdrawing the hand. The chamber revolves upon an axis which is removable at pleasure, but which cannot become displaced, as is too often the case in other arms of a like nature. Having thus briefly alluded to the peculiar merits of this revolver, we need not add that in the choice of a weapon of this character too much discrimination cannot be used; and every opportunity ought to be afforded by the seller for comparison, and, if it be possible, for a practical course of trial.

THE DEANE-HARDING REVOLVER.

ANOTHER revolver which has excited some attention recently is the "Deane-Harding Revolver." The engraving (next page) illustrates this weapon. The manufacturers (Messrs. Deane and Son) tell us that previous revolvers cannot be taken to pieces and put together again without difficulty. As a result of this, it not unfrequently happens that the owner, having taken his pistol to piecse for the purpose of cleaning, and having wearied himself with almost every variety of misplacement of the several parts in his attempt to put it together again, is compelled to resort to the gunmaker to make his weapon useful again. It was desirable that this objection should be removed. they say, and naively add, "but the difficulty of producing an entirely new arrangement without interfering with, or touching upon, one or other of the numerous patents already granted, was very great, independently of the natural obstacles which 'simplification' *per se* generally presents." The attempt, however, was made, and the present pistol is the result. The construction of it is so simple, in the judgment of the manufacturers, that it is almost impossible for any one having taken it to pieces to fail in putting it together again, in consequence of the whole of the functions being performed by the cock and the trigger; while from its simplicity and strength of parts, it is also not liable to get out of order. Another peculiarity in the new revolver is, that the barrel is removable for the purpose of being cleaned. "The readiness with which it can be detached, and its firmness and solidity when fixed to the body of the pistol, render the barrel and the frame, as it were, one piece—yet separable."

"In order to remove the barrel, it is necessary to turn the pendant part, forming the bolt to the cylinder, from right to left, until it stands upright above the top of the barrel, when the pin which joins the fastening between the barrel and the body may be withdrawn, and the two parts be separated by pressing them downwards in opposite directions (as if breaking a stick), the stock being in the left hand, and the barrel in the right. To replace the barrel,

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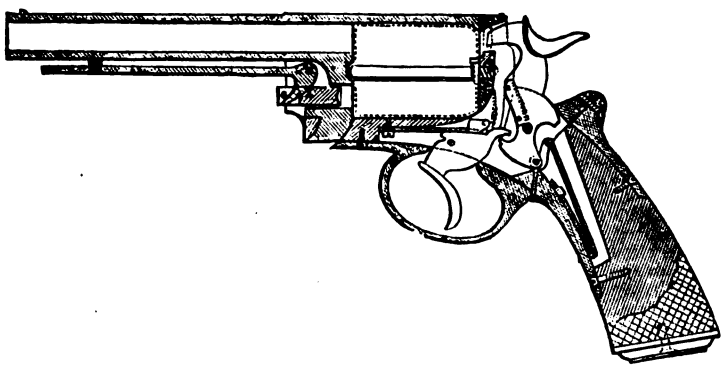
THE DEANE-HARDING REVOLVER.



insert the hook upon its lower limb in the slot in the body intended to receive it, and the projection on the top of the body in the slot of the top strap of the barrel, when the bolt-pin can be returned to its place. To take the action (or lock) to pieces, take out the screws by which the stock is affixed. Remove the mainspring by placing the edge of a screw-driver under its lower extremity and pressing it upward. Take out the screws which hold the guard in its place. Unscrew and remove the trigger-spring with the lifter. Then the cock and trigger may be taken out by unscrewing their respective pins. When cleaned, return each part to its place in reverse order."

The facility with which this pistol may be loaded, by the use of the new Lever Ram Rod, which is at once simple and powerful, acting vertically upon the bullet, is also another new feature.

THE STEAM POWER OF MEN-OF-WAR.

By ADMIRAL RAMSAY, C.B., Mr. NASMYTH, and Mr. WARD.

[The following paper on "the Amount of Steam Power that can, with most Advantage, be placed on board of Men-of-War," and the reply of the Surveyor of the Navy to it, are taken from the Report made to the Admiralty on Marine Engines. Our remarks upon these papers will be found in our leading article.]

MANY mistakes appear to have arisen in making the calculations for ascertaining the exact amount of steam power required for any particular ship. The source of these mistakes has often been sufficiently obvious, and the greatest uncertainty will always prevail as to results, where there has not been the most accurate estimate of the differences of resistance consequent upon different formations of vessels, as well as taking into account the capability of the ship when fitted with an engine for carrying weight.

1st. Of these mistakes, some no doubt had their origin in the attempt to obtain great speed from ships where there has not been the proper formation for obtaining that speed. The ships may, from their capacity, have been quite competent to carry the weight of steam machinery put on board, but were not constructed for the speed.

Before determining the amount of steam power suitable for any particular vessel, a reference should be made to the conditions indicated by the following table:—

Suppose four vessels of the same size and displacement, but of different formation, the results of the resistance at two different rates of speed will be as follows:—

VESSELS.	RESISTANCE.	
	At 3 knots.	At 7 knots.
A. With as fine lines as a man-of-war can have.....	12·0	52
B. Lines not quite so fine.....	12·2	84
C. Still coarser.....	12·5	96
D. With lines the same as our old 44-gun frigates.....	12·7	129.

Now, assuming that the above table is correct, and there seems no reason to doubt its accuracy, it must be obvious that the error has been sometimes committed of putting too great power on board of our steam ships as at present planned.

The Diadem, with 800 nominal horse-power, although a noble ship, is quite a case in point. By reference to a table kindly furnished to this committee by Captain Moorsom, it will be found that in perfectly smooth water and little wind (force 3) it required an indicated horse-power of 2390, or in other words, nearly three times the nominal horse-power, together with a consumption of 60 tons per day, to obtain 9·9 knots from the Diadem.

But it has been urged, although the committee do not admit the objection to be relevant, that although the Diadem, and vessels with similar lines, cannot be expected to attain to great velocity under steam alone, yet that, in the case of strong head winds, when slow speed can only be expected, they then are placed more upon an equality with ships which have finer lines than they have, and thus the great power placed on board of them becomes of essential use. The committee conceive that there must be a fallacy in the argument, as it would lead directly to the conclusion, that to have fine lines is a disadvantage to a man-of-war.

There is, however, another error into which the professional advisers of the Admiralty have sometimes fallen, and which the committe are desirous of noticing. In order to obtain great speed, engines of such large power, and therefore of such great weight, have been put on board that the vessels have been quite unfit to carry the weights allotted to them. In some cases also, from the small size of the ship, the steam machinery has occupied so much space that the vessel has lost much of its utility.

The projectors of such vessels seem to have forgotton that the length of a screw-ship may, under certain circumstances, be considerably increased without diminishing the speed; and in some cases, where the weight put on board is less in proportion to the increased length, and the immersed midship section being lessened, the velocity may be increased.

The following is an important example, to show that the length of a ship may be increased, that 300 tons more weight may be placed on board, the immersed midship section being unalterd, and yet that the speed may remain the same, with the same engines and boilers.

The Peninsular and Oriental Company's ship Canada, before being lengthened, was 280 feet long, and her trial at the measured mile in Stoke's Bay gave 12·5 knots. This vessel was lengthened 35 feet before the midship section, and on her second trial had 300 tons more weight on board than on the first trial. Her second trial took place on the 12th August, 1857, also at Stoke's Bay, and the speed of the Canada was then 12·45 knots.

It must not, however, be supposed, from anything that has been said upon the subject of placing great power on board unsuitable ships, that the committee are not desirous of guarding against the opposite extreme, namely, that of placing only very small steam power in ships, merely because they have not good lines of construction. A certain degree of speed for a man-of-war has now become essential; and in converting old sailing ships into screw steam-ships, the nominal horse-power that ought to be placed on board each ship must be carefully considered in reference to the size and lines of the particular case. For instance, from the size and formation of the Queen, it would probably be advantageous to place 100 nominal horse power more than should be placed on board some of the other line-of-battle ships that are being converted.

REPLY.—BY THE SURVEYOR OF THE NAVY.

It appears from the tenor of the remarks of the committee on the forms of ships, that they suppose there are some persons holding office in the Government service, and who, having made this subject their especial study, and being well acquainted with the dimensions, forms, and other elements of Her Majesty's ships, and of many others, as well as with a vast number of authentic facts relating to their actual performances, are not yet aware that fineness of lines is conducive to velocity, and essential to high velocity. Such an opinion, however, it may be confidently stated, is altogether erroneous.

The effect of fineness of form on velocity is universally admitted, and it has never been disputed.

All theoretical considerations show that this might be expected, and all experience proves it beyond the possibility of a doubt.

Then it may be said, why not carry the principle into practice? How far it has been carried is strikingly seen by a glance at the models of ships constructed during the last 10 years, and the propriety of going so fast in this direction has been questioned by more than one Board of Admiralty. At first sight it appears a simple question: it may be thought that to effect the object in view, it is only necessary to add a finer piece of structure to each end of a ship; but a moment's reflection will dispel this error; the displacement of the pieces supposed to be so added will not give buoyancy to support a tenth part of this weight; the necessary displacement must therefore be provided elsewhere; this can be found only in the middle of the ship, so that the ship must be also lengthened amidships sufficiently to displace a quantity of water equal in weight to the entire weight of this midship piece, in addition to 9-10ths of that of the other two: but this is not all, the temptation to put into a ship of such dimensions a heavier armament is irresistible, rendering necessary more men and more stores; displacement must be provided for all; in fact, a ship of the old form to be made like one of our recent designs, must have her length increased by one-half; her cost of construction would in consequence be half as much again, and her handiness under sail somewhat impaired.

It is no wonder, therefore, that propositions to build a frigate 50 feet longer than former frigates should be considered, debated, and reluctantly consented to, more especially as no honest man could say with certainty what would be the precise effect in point of speed, and in other respects, of such additional dimensions and alterations of form.

After a few good experiments have been made, which are now in progress, and a few great points, as it were, fixed for future guidance, it becomes an easy matter to predicate with some certainty the results of any subsequent and comparatively subordinate changes that may be required if they do not constitute a very peculiar combination.

A kind of law is thus established, which may be relied upon with certainty within its own limits, and even for some distance beyond them. This is the extent, whatever some may pretend to, of the means of extending our knowledge of this branch of naval architecture, and it is deeply to be regretted there is not much chance of our

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getting any other help. Our proceedings must be based on experiments, and on experiments alone; hence the vast importance of those trials to ascertain the exact speed of our ships and of the power developed at the time—trials which some persons consider as matters of mere curiosity, not worth the time they occupy, and others as calculated, if not intended, to mislead persons into the belief that the speed thus realised is to be regarded as the ordinary sea-going speed of the ship.

This subject being of high importance, it may not be out of place to point out shortly how our ships have been lengthened, step by step, in order to give them finer lines.

	GUNS.	BUILT.	LENGTH. ft.	in.
Agamemnon	90	1852	230	0
Renown	90	1857	244	9
Bulwark	90	Building. 1858	252	0
Imperieuse	50	1852	212	0
Shannon	50	1855	235	0
Diadem	32	1856	240	0
Newcastle	50	Building. 1858	250	0
Ister	50	Building. 1858	270	0
Mersey	40	Built. 1858	300	0

It will thus be seen that our frigates have now reached the length of 300 feet.

In designing screw-ships for the navy, it has always been considered as essential that they should be capable of sailing well, of being readily manœuvred, and of steaming well.

Speed under steam may be obtained by means of length and fine lines; but until it shall have been satisfactorily ascertained that the great length which is necessary to obtain high speed under steam alone does not materially interfere with the ready performance of the evolutions which may be required of men-of-war under any circumstances, it would not be prudent to depart otherwise than gradually, and after sufficient experience, from the dimensions and forms of the ships which have been found to possess every good property.

Almost the first of the large ships designed especially for the screw were the Duke of Wellington, Agamemnon, and Imperieuse, when a considerable step was taken; the Agamemnon having been made 230 feet in length; the longest sailing two-decker being only 205 feet.

It being found that these ships sailed and worked quite as well as the ordinary sailing ships of the same classes, it was decided to make a further step in this direction; and, in consequence, the Renown was built of the still greater length of 245 feet, to enable her to receive larger and more powerful engines than the Agamemnon, and to give her finer lines with a view to increase speed under steam.

The trial of the Renown having proved so far satisfactory, it has been decided to take a yet further step by building the Bulwark, and other ships of this class, of the still greater length of 252 feet, for the purpose solely of making them of still finer forms for greater speed.

High speed under steam is, in the present day, considered of such paramount importance that no reasonable expense should be spared, nor means left unresorted to, which are likely to accomplish it, provided the sailing and other essential properties of ships are left intact.

But in still further increasing the length of ships there is another and very important consideration, whether, looking at the fineness of their extremities, and weight of their machinery, it will be possible to make ships built of wood of sufficient strength to retain their forms for any length of time.

It has always been felt that it is by means of experiment at sea chiefly that any reasonable expectations can be entertained of advancing the art of designing ships and their machinery; and, with this view, experimental trials of ships have been made from time to time when their services could be spared; but the absolute necessity for such experiments has been still more felt since the introduction of the screw, for this has rendered necessary an entire change in the size, proportion, and form of ships, in consequence of the enormous bulk and weight of their machinery and coals, and of their being required to sail well, to steam well, and also to behave well under sail and steam combined.

Far more complex and difficult considerations are thus introduced, and almost incompatible conditions required; in fact, so complete a change has been made in Her Majesty's navy within the last few years, that the former accumulated experience derived from the behaviour of sailing ships becomes comparatively useless as a guide for the construction of modern steam-ships.

Data, however, founded on the actual performance of these ships at sea are now fast accumulating, and it may be expected that the conclusions drawn from them, and from an elaborate comparison of the lines, and calculated elements of ships of different classes, will gradually but surely point out the nature of the improvements which are still needed, and the best mode of effecting them.

Immediately connected with this subject is that of the engine power which ought to be used. This is also an important question, and one involving difficult considerations, which experience and observation will alone help us to deal with satisfactorily. It by no means follows, that because a vessel carries a wave before her when urged to the utmost at the measured mile, she has more power than can generally be used advantageously. This is an exceptional case, and should not of itself be taken as a criterion of the proper amount of power required for general use.

A certain speed for every particular class of vessel may be regarded as essential, at which speed the power placed in her should be capable of propelling her under ordinary circumstances without difficulty.

The rule generally has been to place in ships of war as much power as the displacement and general arrangements connected with the necessary stowage of the ships admit of being placed in them, and in no instance has the amount of power so determined been reported too great by the officers who have commanded such vessels; but, on the contrary, complaints have been sometimes made of its being insufficient.

The committee, however, adduce as one instance of too great power being, in their opinion, placed in a vessel, the case of the Intrepid, which was taken out for trial by them at Devonport. Against this opinion may be placed that of Captain R. Drew, who commanded the Nimrod, a sister vessel, with the high boilers taken out to afford greater coal stowage, to adapt her better for making the passage to China. He says in his report, "In steaming head to wind in smooth water the ship behaves well, but against a swell her performance, from want of power, is very bad; she will only move two or three knots when a full-powered steamer would be making six and seven knots. Auxiliaries have at least their sails to depend on, but this ship is both auxiliary in steam and sail. I would recommend the high boilers being replaced, and the ship full rigged, which would make her perfect in both respects."

All ships of this class have since been more fully rigged.

The next case of too great power, in reference to form, is that of the Diadem. Her speed, when last tested at the measured knot, was 12 knots, which the committee regard as less than is due to the power, and that with a less amount of power, and finer lines, an equal speed would have been obtained. This may be true with greater length; but under the same length it would not be practicable, it is believed, to fine the ends of the vessel sufficiently to effect this object At the time when the design was made for this ship, a strong feeling was entertained against increasing the length of ships, both on account of the additional cost of their construction, and of the difficulty which might attend the working of them under sail, together with the greater dock and basin room they would require. These considerations have prevailed up to within a short period, to prevent the lengthening of ships sufficiently to enable suitable forms to be given them for attaining high speed, except with some sacrifice of power.

The Diadem it may, however, be observed, was designed originally for 600-horse power engines, and 800-horse power engines were subsequently ordered to be placed in her, because the French were then placing engines of this power in their 50-gun frigates of about the same length.

In order to form a better judgment of the capabilities of the Diadem, it might be well to compare her with the Euryalus, a frigate carrying a greater number of guns, but of about the same aggregate weight.

This ship has only 400-horse power, and the Diadem, in consequence, has a superiority in point of speed of nearly two knots, an advantage which, coupled with the longer range of her guns, gives her a superiority which cannot be questioned.

It may be almost unnecessary to observe that the disadvantage of expending a larger quantity of coals is only incurred when high speed is necessary to effect some important object beyond the range of the smaller-powered ship; at speeds within this range, the Diadem would expend no more coals than her rival.

In fact, the only important question is, is the Diadem a better ship with 800-horse power than she would be with 600, or any less amount of power?

It is assumed that few practical men would hesitate in answering this question in the affirmative.

The question raised in the last paragraph of the committee is not one of opinion, but of fact, namely, the internal capacities of the several ships referred to.

This was of course ascertained in the first instance, before any suggestion was made to the Board respecting their conversion into screw ships, and if the committee had communicated their intention of expressing their opinion on this subject, the necessary information would have been freely furnished to them, and they would thus have been prevented from making loose statements, so calculated at first to convey erroneous and unjust impressions, but afterwards to lessen the confidence which the statements and opinions of a committee generally command.

Instead of the Queen being capable of carrying larger engines than the other three ships, she is, in fact, the least capable; she has actually less available displacement than any of them, and less internal space.

The cubic contents of her hold below the orlop deck is upwards of 1,300 feet less than that of the Trafalgar.

"DELTA'S" PATENT CHEESE PRESS.*

IN the new press, which is here arranged for a cheese press, but is applicable for any purpose where a press of moderate power is used, the simple mechanical arrangement and the absence of screws and appliances where an uncertain amount of power is obtained, is the chief argument for its recommendation. The precise force exerted may at all times be known and regulated, and after that it is entirely self-acting.

Fig. 1 is a side elevation, Fig. 2 a front elevation, Fig. 3 a plan, and Fig. 4 a diagram of its working. *A* is the table of the press on which is placed *B*, the hoop containing the cheese, and *C*, the cover fitting loosely within the hoop *B*; *D* is a crossbar which is screwed down upon *C* by means of the nuts *E E* on the screws *F F*, which are attached to the lower crossbar *G*. *H* is the framing of the machine, or upright fixed in *I*, which is kept in position by the feet or stretching pieces *J J*. Fixed to the upright *H*, by the pins *M* and *P*, are the two pair of arms *K K* and *L L*, the latter of which act merely as guides, while *K K*

* The inventor and patentee of this apparatus wishes his name to be kept back.

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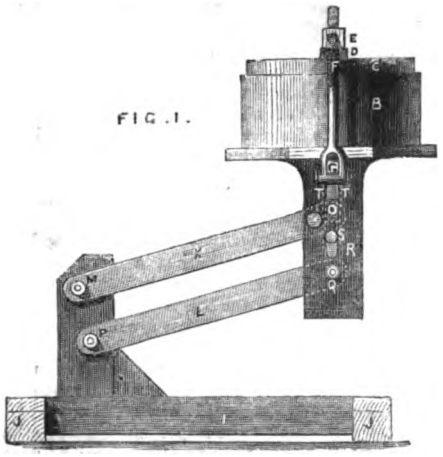
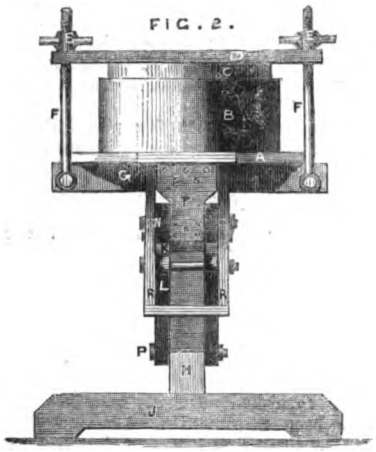
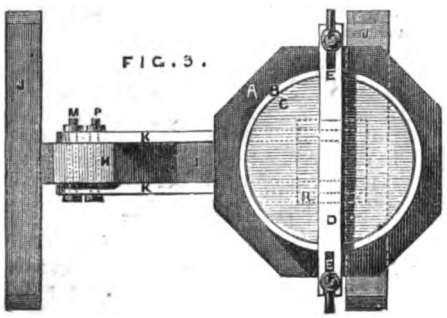
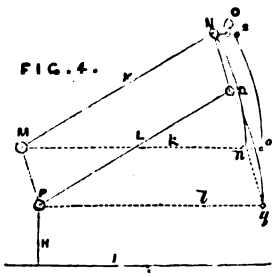
are double levers attached to the sides of the table brackets *E E* by the pin *N*. The slide piece *S* is joined to the crossbar *G* by the plates *T T*, and is acted upon by the pin *O* in the levers *K K*. Then, as the table *A* is depressed, the pin *O* forces the









slide piece *S* down, drawing with it the crossbars *G* and *D*, and therefore pressing the cheese.

In the diagram the levers or arms *K* and *L* are shown at an angle of 30°, and it will be seen that the length of *K* from *M* to *N* is the same as that of *L* from *P* to *Q*. *N* and *Q* being the pins by which they are attached to the table brackets *R*, and they thus form a parallel motion for the table *A*.

If a horizontal line be drawn from the point *N* while elevated, it will show the distance between *O* and O^2 to be one inch; then if the levers are placed in a horizontal position the short arm *n o* will have recovered the inch, which will consequently have been communicated to the cheese.

In the arrangement shown, the levers bear a proportion of 12 to 1, and in practice it is found that the weight is transmitted to the cheese in this ratio, added to the constant weight of the levers, table, &c., which is found to be equal to from four to six cwt.; then if the cheese, hoop, and cover weighs 30 pounds, the force exerted will be 3¼ cwt. nearly—the constant say 5 cwt.

Should this not be found to be sufficient a weight placed upon the table will readily make up the deficiency, as a seven pounds weight will give out a force of three-quarters cwt., and the weigh of the cheese determines the pressure to be given out by the levers. These may be made any length and proportion, but that here given has been adopted as giving the best range of the point *O*, being about 1¼ to 1⅝ inch.

The press is readily loosed, and when lowered the table serves as such to turn and trim the cheese upon; to obtain a fresh purchase it is only necessary to raise the table and screw down the nuts *E E*, when the range is again renewed. The weight of the whole is from 40 to 60 pounds.

A silver medal was awarded to this press a few days since, on the only occasion when it has been exhibited. Mr. R. Law, of Shettleston, by Glasgow, was the maker.

HALE'S IMPROVED WAR-ROCKETS.

FIG. 1.

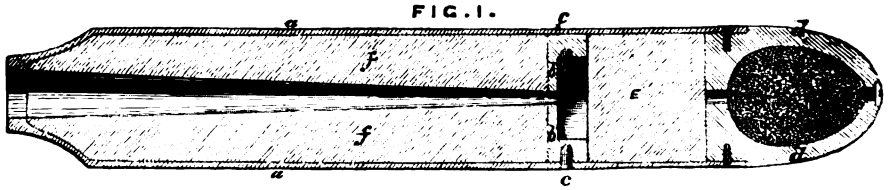
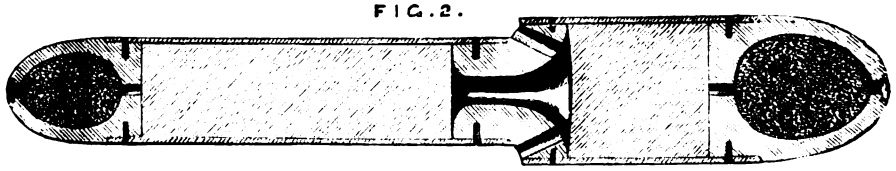


FIG. 2.



MR. HALE, the inventor of the well-known war rockets, is not idle in these days of preparation. He has just completed a patent for further improvements, the object of which is to ensure a more certain direction of the flight of rockets than can be obtained by any other arrangement hitherto made use of, and also for sustaining the case against the extra pressure which is produced in rockets constructed according to a former patent, dated January 11, 1844, wherein the bored composition has not only to be sufficiently long for supplying the gas to give the onward motion, but likewise for giving the rotatory motion, and a weight or plug was placed at the back for the purpose of bringing the centre of gravity towards the after end. But he has since discovered, as he tells us, that the application of the weight with the oblique tangential apertures at the after end causes the rocket to describe an orbit which more or less produces uncertainty in the direction of its flight; and to obviate this is one important object sought in these improvements. It is effected by dispensing with the weight at the after part, and instead of placing the tangential apertures at one end, he now arranges them in a plane as near as possible to the centre of gravity, between the bored part of the composition and that part toward the head, which is left solid, this being in the position of about the centre of gravity; and in order to give greater stability to the case he rivets in a cast iron piece in which the tangential apertures are formed. whereby solid composition supplies the tangential apertures with gas for giving rotatory motion about the rocket's axis. The bored composition is devoted only to giving the onward motion. Fig. 1 of the accompanying engravings is a longitudinal section of this improved rocket; *a a* is the cast iron case forming the body with the after end contracted to nearly the size of the main central hole; or a light cast iron end may be riveted into the tube in lieu thereof. This aperture is intended for the egress of the gas in the direction of the rocket's axis, producing the onward motion; *b* is a cast iron plate with a thick rim on one side which is riveted inside the case in such position that when tangential holes are drilled through the case, and through the rim of the plate, they shall all range in the plane of the rocket's centre of gravity, when the rocket is complete with the shell or shot in the head. The dotted lines *c c* indicate the centre of gravity; *d* is the shell showing the hole for the fuze; *E* is the solid composition between the shell and the plate *b*, which is intended by its construction to supply the tangential holes with gas for giving the rotatory motion, while the bored composition *f* supplies the central hole with gas for giving the onward or rectilinear motion. A small hole is drilled through the centre of the plate whereby a communication is obtained between the gas generated by the combustion of the solid composition and that of the bored part, so that the rotatory and rectilinear motion shall take place at one and the same time, the rotation being produced by holes formed in the direction of tangents to a circle described in the plane of the rocket's centre of gravity, to insure a steady motion during its flight. Fig. 2 shows a section of another form of rocket, with a shell at either end for ground firing at short ranges, and for which no rotatory motion is required.

An issue of tickets for the Crystal Palace Handel Festival at five shillings each has been announced. Seats for these will be provided in the north and south naves, and from the fact that the present orchestra projects considerably beyond that of 1857, and brings the principal singers and the band and chorus much more into view, there is no doubt but that the issue of these tickets will be appreciated. Concurrently with this arrangement, additional galleries have been planned, and raised stalls have been decided upon, on the site now occupied by the Italian orchestra From these seats the entire frontage of the orchestra (216 feet wide) is comprised within one glance. Considerable additions, principally unison stops, are being made to the Festival organ erected, and some gigantic steel kettle drums, far exceeding in size any yet in use, and some deep-toned brass instruments, are being built for the occasion.

Mr. J. Le Cheminant, of 39 Queen Ann-street, writes under date of May 19, 1859, as follows:—"To the Editors of the MECHANICS' MAGAZINE." Gentlemen,—Having noticed in your interesting and valuable paper of the 13th instant an advertisement of Mr. W. Gosling relative to a newly-invented gun and projectiles, I beg to inform you that the projectiles, as well as the hinged platform for the gun to slide upon, were patented by Mr. Wm. Hobbs, of 196 Piccadilly, on the 1st of September, 1858. This being the case, I felt it advisable to apprise you of the same."

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LAYING-OFF; OR, THE GEOMETRY OF SHIP-BUILDING.

FIG. 23.

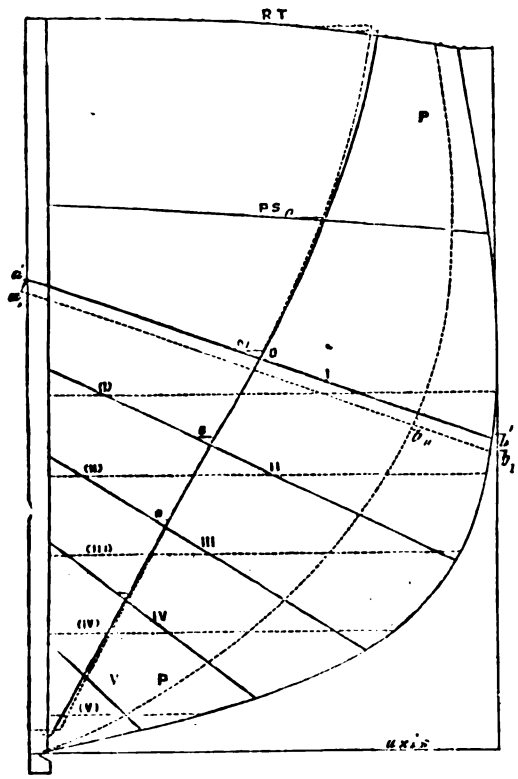
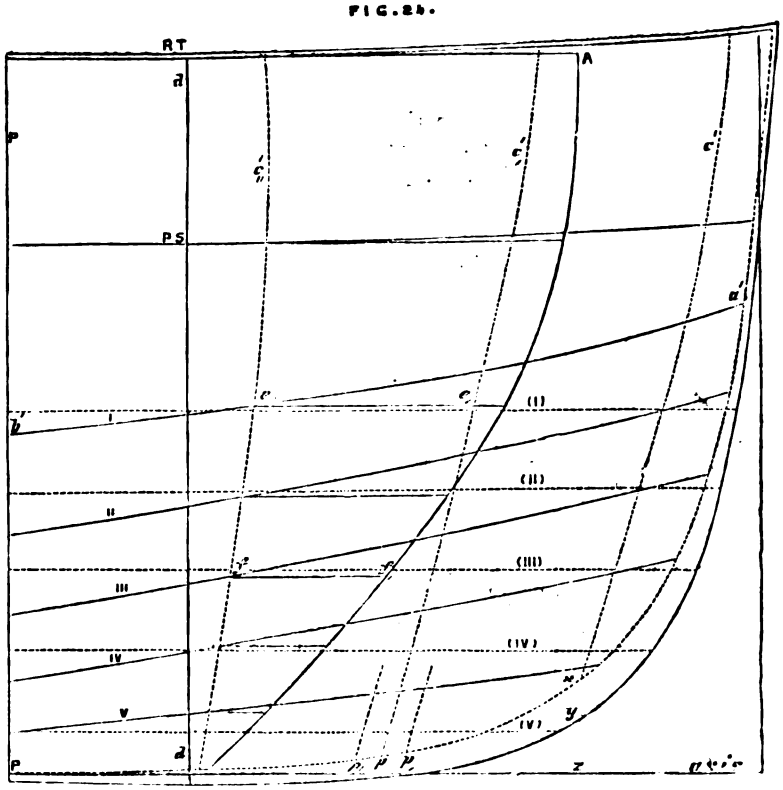


FIG. 24.



LAYING-OFF;
OR,
THE GEOMETRY OF SHIP-BUILDING.

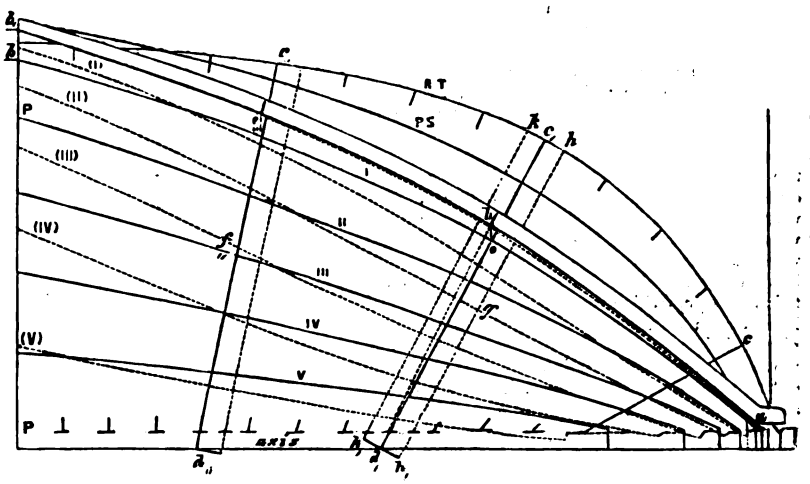
No. VI.

THE diagrams given above show on a small scale the various sections which have to be drawn on the floor for the purpose of laying-off the harpins and cant timbers in the fore body of a corvette. The sections marked (*I.*), (*II.*), (*III*), (*IV.*), (*V.*), in the three plans are level lines; and those marked *I.*, *II.*, *III.*, *IV.*, *V.*, are the projections of diagonals; these latter lines in Fig. 25 are called *level* diagonals, or horizontal ribbands. The line *P P* in the three plans is a vertical transverse section. *R T* is the rough-tree or upper boundary of the ship, and *P S* is another sheer line at the height of the portsills. The lines *x*, *y*, and *z*, in Fig. 24, are respectively the bearding line; the fore edge of rabbet of stem; and a continuation of the upper edge of rabbet of keel, forming the axis. The straight lines *c*, c_{I}, and c_{II}, in Fig. 25, are the horizontal projections of the joints of cant frames; *c'*, c_{I}', and c_{II}',* are the vertical projections of these joints in the sheer plan. The positions of all the joints of the cants in the fore-body are indicated in Fig. 25, but to avoid confusion, only three have been drawn. It may be necessary to repeat here what we have already said in describing the square frames, viz., the adjacent sides of the lower pieces in each *cant* frame touch each other, but between those of the upper pieces there is an interval of some inches. There is, however, an imaginary surface of contact from the bottom to the top of the frame in continuation of that formed by the lower pieces; this imaginary surface is called the *joint* of the frame.

To lay-off a harpin.—The line *I* is, as we have said, the horizontal projection of a diagonal line, and does not give the real shape of any section of the vessel. To obtain the shape of the section made by the diagonal plane *I*, or *a'b'*, the plane must be swung up about its trace upon the vertical plane through *a'* until it becomes parallel to the horizontal plane, the true form of the line

* Read *c*-dash, *c*-one-dash, and *c*-two-dash.

FIG. 25.



will then be found to be ab_1; to which the harpin mould may be made, as shown in Fig. 25. In order that the workmen may be able to trim the harpin, so that it may fay against the bottom, it is necessary to give them not only the mould to one of its edges, but also a number of bevellings; for which purpose the shape of the bevelling edge of the harpin must be obtained. The projection of the bevelling edge in the body is a straight line parallel to the moulding (upper) edge, and at a distance from it equal to the thickness of the harpin, as shown by the dotted line a_1b_1. Let us now suppose that the half of the ship is cut through by the planes $a'b'$ and a_1b_1, so that $a'b'\ b_1a_1$ may be a slice of the ship. Let this slice be supposed to be hinged in the horizontal line through a', and swung upwards: then when $a'b'$ becomes horizontal, a_1b_1 will also be horizontal, and if both the curves, viz., that of the moulding edge, and that of the bevelling edge be projected upon the horizontal plane from this position we shall be able to discover where the bevelling edge projects beyond the upper edge, or where the bevelling of the inside of the harpin is *under*; and also where the converse of this is the case, and the bevelling is *standing*. The dotted line in fig. 25, nearly coincident with $a\,b_1$ is the bevelling edge for that harpin. It will be seen that the distance from the *axis* of any point in the line $a_1\,b_1$ (fig. 23), after the planes have been swung up, is the same as its distance from the point a_1, because, after the revolution, the point a_1 lies in the axis. For example, the position of the point in which the bevelling edge intersects the vertical transverse section *P P*, is found by setting off on *P P* in the half-breadth, the distance $a_1\,b_{11}$ measured in the body. Having obtained the moulding and bevelling edges of any harpin, it is very easy to take the bevellings. If it is desired to get the bevelling at the joint c_1, measure square to the curve (fig. 25), the distance between the two edges, this will be the distance

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(in this case) outside a "square" or right angle in the siding or thickness of the harpin.

It is sometimes convenient to "pitch" the *lower* side of the harpin at a definite height at the ship; to make this the moulding side, and the upper side the bevelling edge. In such a case the measurements for obtaining the bevelling edge in the half-breadth for the diagonal a' b' would be made on a line drawn the thickness of the harpin above it, and from the point in which a_1 a' produced upwards would meet this new line.

It is necessary to mark on the harpins—and, therefore, on the harpin moulds—the positions of the joints of the cants, to direct the workman in fixing the timbers in their places. To do this it must be observed that the *horizontal* projection of the point in which the harpin crosses the joint of a cant timber is the point in which the horizontal projections of the diagonal and of the joint cross each other. For example, o is the horizontal projection of this intersection in the case of the joint c_1 and the diagonal I, and is, therefore, the horizontal projection of the point we wish to mark; from which we know that, were the harpin in place, the point itself would lie *vertically* over the projection o. It must therefore be evident that when the diagonal plane with the harpin is swung up into the position a b_1 the point sought would describe a circle in a plane at right angles to the axis; and would be found after the revolution in a line o o', drawn through o at right angles to the axis; and, of course, also in the expanded diagonal a b_1; the point o' is, therefore, that which should be marked on the mould. We conclude, from this, that the proper positions of the joints on the harpin mould, may be found by squaring up from the level to the expanded diagonal the points in which the level diagonal crosses the joints of the cants. The line c_1 d_1 gives us, as we shall see more clearly presently, the direction of the sides of all the timbers composing the frame $c_1 d_1$; this *direction* also it is necessary to mark on the harpin mould as a further guide to the workman. It will be seen that if the harpin mould were down in its proper place instead of being rabatted upon a horizontal plane, it would appear to be coincident with the line I; and the direction of the line c_1 d_1 across it would be the direction required. Suppose, now, that while the harpin mould is thus inclined downwards, a batten were laid on the diagonal plane coinciding with the line c_1 d_1, and therefore indicating the required direction upon the harpin mould. Then when the diagonal plane with the harpin mould were swung up to the horizontal the batten would appear to lie no longer in the direction d_1 c_1 but in the direction do', for the extremity d_1 of this line d_1 c_1 (which may be considered to be the intersection of the cant plane with the diagonal plane) being in the axis of motion would not move, but every other point in d_1 c_1 would move out at right angles to the axis. The point o would, as we have before seen, move to o', and the batten which would rise with the plane, being compelled to pass through this point whatever position it may occupy, must lie in the direction d_1 o', which would therefore be the direction sought, and which it is necessary to rase upon the mould. *Practically—to mark off the joints of the cants*, square up from the level diagonal to the expanded diagonal the points in which the former cuts the joints; then stretch a batten from the points so obtained to those in which the respective joints cut the axis, and rase them across the mould. The moulds for the harpins at the *sheer lines* are made to the horizontal projections of these lines, although there is a slight error in doing so, because of the double curvature of the lines; they should properly be expanded lengthwise. Frequently, however, the harpins at these heights are not made to the sheer lines but to level lines got in for that purpose. The bevelling edge for either a sheer or level harpin is obtained in exactly the same way as the moulding edge; and the position and direction of the cants upon the mould may be marked at once from the half breadth.

To lay off a cant timber. Let us now endeavour to obtain the true shape, and the bevellings of the timbers on each side of the joint c_1 d_1. These operations are always performed in the body plan, but for the sake of illustrating the principle adopted, we shall first show how the true shape may be obtained in the sheer. The curve c_{11} is, as we have said, the vertical projection of the curve in which the surface of the ship, on the timbers, is cut by the joint plane of the cant frame c_{11} d_{11}. This projection is obtained by considering that the points in which the *vertical* projections of two lines cut each other are immediately over the points in which the *horizontal* projections of the same lines cut each other, by which consideration we are able to obtain points in the vertical projection of c_{11} d_{11} on the lines *I, II, III, IV, V,* (*I,*) (*II,*) (*III,*) (*IV,*) (*V,*) and on *PS* and *RT*. Let it be observed now, that c_{11} d_{11} is at the same time the projection of the curve of which we have to find the true shape, and the horizontal trace of the cutting or sectional plane. We may imagine that this sectional plane is a door hinged in a vertical line through d_{11} on the vertical longitudinal plane, and that the true shape of the section is drawn upon it. If we swing this door upon its hinges until it coincides with the vertical longitudinal plane, or, in other words, if we rabat it upon the sheer plane, the true shape will be seen upon that plane. The supposed hinge will be, in the sheer plan, a line d d, found by erecting a perpendicular upon the axis from d_{11}. When the revolution takes place every point in the curve of the section will remain at the same height as its projection in c_{11}', but its apparent distance from d d will increase. Thus the point, of which e is the vertical projection, *i.e.*, the point in which the required curve cuts the diagonal a' b', will in the revolution move along a horizontal line e e_1, until its apparent distance from the axis is the same as its real distance, which we know to be d_{11} e_{11}, fig. 25. Again, the point in which the required curve cuts the level line *III*, the vertical projection of which is f, would be found, after the revolution at f_1, in the same line, but at a distance d_{11} f_{11} from the axis. Similarly the new positions of all the intersections in the projected line may be discovered; and the curve A e f_1, found by joining these points, will be the true shape required, to which a mould may be made. A bevelling edge could be obtained in a similar manner, and the bevellings found for the timbers, but as the section is always in practice laid off in the body and not in the sheer we shall proceed to show how that may be done. Imagine that the door c_1 d_1 is turned about the vertical hinge through d_1 until it is parallel to the plane of the body, and at right angles to the axis, then the projection on the body plan of the required curve will give its true shape. It will be seen that during the revolution the height above the axis of any point in this curve will remain the same as the height of its projection; while its distance from the axis will increase until it becomes equal to that of its horizontal projection (fig. 25) from d_1. For example, the point in which the cant section cuts the level line (*II*), and of which g is the horizontal projection, will be found in the line *II* (fig. 23) and at a distance from the axis equal to d_1 g. We might thus, by means of a number of level lines, obtain as many points in the true or rabatted curve as would be needed for describing the curve on the floor. This would be, indeed, the more simple mode of operation, but another consideration comes in, which is, that we need to know the positions of the diagonals on this curve for the purpose of giving bevellings at them, and that we may know, with regard to the harpins, the heights of the several portions of the cant frame; so that on the whole it is less trouble to obtain the points in the curve from the diagonals at once than from the level lines.

Observe how this is done. The point o is the *horizontal* projection of the intersection of the required curve with the diagonal (Fig. 25); the *vertical* projection of this intersection in the body must lie in the vertical projection of the diagonal, and at the same distance from the axis as the horizontal projection. Measure therefore the perpendicular distance of o from the axis (Fig. 25), and set it off "square" from the axis in (Fig. 23) to intersect the diagonal I; the point o_1 so found, is the vertical projection of that point in the curve of the cant, of which o is the horizontal projection. Similar points, o o, being found on the other diagonals, and on the sheer lines, the curve joining them would be the vertical projection of the joint edge of the cant. But this curve is not got in upon the floor, as it is only necessary to know the points o' o, &c., which we have already obtained. From these points short straight lines, called *liftings*, are drawn out horizontally, and it will be clear that the points in the true curve of which these points are the projections, will be found after the revolution in the horizontal lines so obtained. The distance from the axis of the points in the rabatted curve will evidently be the distance of their horizontal projections from d_1, so that if we measure d_1 o, and set it off from the axis in (Fig. 23) along the *lifting* o_1, we shall obtain the point O in the true curve. Finding points in this way at the sheer lines and diagonals, we are able to get in the required curve, which is shown by the drawn line in (Fig. 23). Its ending at the bearding line is obtained as follows: measure in Fig. 24 the height p of this ending above the axis, and draw a *lifting* at this height in the body; then measure along d_1 c_1, Fig. 25, the distance out from d_1, at which the joint of the cant meets the side of the deadwood as indicated by the dotted line. Set off this distance from the axis in the body, on the lifting just obtained; the point thus found is the ending of the joint of the cant at the bearding, and as the cant timbers cut off at, and butt against the side of the deadwood, it is also a point in the heels of the timbers composing the cant frame. When the distance between the timbers on each side the joint is not great, the shape of their moulding or joint edges is assumed to be the same as that of the joint, but when the opening is large there would be too much error in such an assumption, and the shape of the section of the vessel is obtained at the joint side of each of the ranges of timber composing the frame instead of at the joint—in this case the range of timbers are said to be laid off as single timbers. Having obtained the line at which the mould is to be made, it is necessary to get in a bevelling edge. For this purpose another section of the ship is taken parallel to that already obtained, and at a distance from it equal to the siding of the timbers. Thus, pursuing the case we have chosen, in which they are laid off from the joint; h h_1 is the horizontal trace of the plane taken for bevelling the timbers *before* the joint, and k k_1 that of the plane for bevelling the timbers *abaft* it. The points in the vertical projections on the body plan, of the sections made by these bevelling planes, are found in just the same way as those of the section c_1 d_1, and liftings are drawn out therefrom in the same manner. Now imagine the slice of the ship contained between the planes h h_1, k k_1 to be turned round with the plane of the joint about the hinge through d_1. Then, when this slice becomes parallel to the body plan, the points k_1 and h_1 will lie in the axis, so that the real distances of the points in the bevelling edges to be set off on the liftings from the axis in Fig. 23, will be the distances, measured before the revolution, from h_1 and k_1, and not from the *axis* in Fig. 25. We have shown in the body, by a dotted line, the form of the bevelling edge in the section h h_1, obtained in this way. The practical mode of operation is to take off on a batten the shortest distances from the axis of the intersection of h h_1, with the level diagonals and the sheer lines in Fig. 25; set these off horizontally from the axis in Fig. 23, so as to discover the corresponding points in the diagonals and sheer lines, and draw the liftings. Then measure along h h_1 the distances of these same points from h_1, and set them off from the axis, in Fig. 23, on the liftings. The endings of these bevelling edges on the bearding line are obtained by drawing liftings in

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Fig. 23 at the heights of p_1, *i.e.*, of the points in which the projections of the bevelling edges meet the bearding line. Then, for the distance to be set off along these liftings, measure the distance to the side of the deadwood in Fig. 25 from k_1 for the *foremost* edge, and from k_1 for the *after* edge.

ON TIMBER FOR SHIP-BUILDING.

(Concluded from p. 319.)

AUSTRALIA is the next country to which I shall ask your attention, and which already furnishes us with "iron bark," one of Lloyd's first-class woods—a distinction we all thoroughly understand. This vast island is unfortunately extremely deficient in navigable river and in water communication generally, and whether this deficiency can in any manner be remedied by the formation of railroads or tramways intersecting the enormous forests of valuable timber that exist (not far inland), is an important question, now occupying the serious attention of very eminent and influential men in our metropolis, and which I shall have occasion to refer to again, although very briefly. Besides iron bark the only Australian woods that have any classification at Lloyd's are the stringy bark and the blue gum, and these are in the fifth-class. For a variety of reasons, however, I propose confining myself entirely to the woods of Western Australia in its more southern parts. Those especially interesting to the ship-builder are the tuart, the jarrah, the blue gum, and the morrell. The "tuart" is a noble timber tree, growing in tolerable abundance on the coast, peculiarly in the limestone districts. Planks are sometimes obtained ten feet wide, and it is said to be peculiarly adapted to the building of ships of war, as it is most difficult to split, and is not liable to splinter. It is of a very pale yellow or white, and is sometimes called the white *Eucalyptus*. Its timber is curiously cross-grained, and it is hard, tough, and very strong and durable; from which known qualities it will no doubt attain a high rank a Lloyd's, and will be very extensively employed in ship-building, provided it can be obtained in sufficient quantities.

The morrell is a large fine tree, yielding timbers three feet in width, which has been used as treenails, and may probably become more generally esteemed.

The blue gum (*Eucalyptus globulus*) is an enormous tree, sometimes yielding planks 14 feet wide and more than 120 feet long. It is beginning to be used pretty freely in ship-building, and will, I believe, when better known in England, obtain at Lloyd's a much higher classification than is at present accorded to it.

But it is the jarrah (another of the *Eucalyptus* tribe) that forces itself so prominently and so urgently upon our attention. It has been very generally called mahogany, because one or two of its varieties bear a resemblance to that wood when polished; but when spoken of in relation to ship-building, I should advise its own name being adhered to.

It is very certain that there are many varieties of the jarrah, just as there are of the teak and other woods; and, by bearing this in mind, we can easily reconcile all the apparently conflicting statements in regard to its colour, disposition of fibre, hardness, density, and specific gravity.

Mr. Reveley, an engineer to the Government, speaking on this point, says:—"First, in colour, there is every variety of shade, from almost crimson to reddish brown, and pale brown inclining to white. In the second place, as to grain, there is almost every variety, from the perfectly straight fibre to every species of curl, including the zebra and satin specimens. The length of the stem of this tree, taking the average, may be 65 feet (many being much longer), without a branch or a knot in all that length, and very nearly equal in size all the way up; being veritable ornaments of nature. It is not attacked by insects of any kind, nor has it any tendency to dry-rot, and is scarcely affected in any way by damp or moisture." The truthfulness of this description will be clear to those who will inspect the specimens on the table this evening.

There are forests of this wood (almost wholly) in Western Australia, of more than four miles in depth, which are known to extend for a length of 150 miles, covering an area of more than 364,000 acres, containing timber sufficient to build 20,000 line-of-battle ships!

A knowledge of these facts is enough to stimulate enterprising capitalists, especially as this wood is known to be a beautiful and a valuable furniture-wood. Our merchant ships go out with emigrants and cargoes, but for a *return* cargo, they frequently wait and wait, and wait in vain; it would not be so if these vast forests could be opened up.

No wonder, then, that our enterprising merchants are turning their thoughts to this promising field of operations, and are seriously contemplating the construction of a short railroad (of eight to ten miles), to bring the timber to the shipping port. My own opinion is, that a company should be formed to carry out this important measure, and that Government should aid the undertaking by allotting to that company a sufficient number of selected "convicts" to work as labourers. It has often struck me that half the question as to the commercial success of the Great Eastern would be answered if she could always be sure of 10,000 to 15,000 tons of timber as freight on her passage from Australia.

THE PRESERVATION OF TIMBER-BUILT SHIPS.

But, after all, even the best of woods when made into a ship will exhibit decay much sooner than they should do. And why? In my humble opinion, it is because shipbuilders and shipowners will not adopt the simple but efficacious means which chemical science, confirmed by ample experience, offers them. Long years of practical experiment has shown that timber, however prone to dry-rot, or to wet-rot, may be effectually preserved from both by the use of certain metallic solutions or other suitable protective matters. One of the very best solutions for this purpose is that of sulphate of copper, which many years ago was patented by a Mr. Margary. Now this substance is sold, in quantities, at 4d. per lb. So that £100 would buy 6,000 lbs., and each lb. weight is sufficient for six to eight gallons of water. The process of saturation is a very simple one; the timber being placed in a closed iron vessel of great strength, is made to imbibe the solution by exhaustion and pressure, the operation occupying but a few minutes. Timber so treated is rendered perfectly exempt from all liability to dry-rot; whilst other injections, such as paraffine oil, the commonest and cheapest naphtha and oil, with a little resinous matter dissolved and mixed with oil, will effectually prevent the decay from wet-rot, &c. These are all such simple, well-known remedies, that almost everybody has heard of them; and yet it is positively true that neither the Admiralty nor the merchant shipowner has yet built one single ship in which these principles have been intelligently and thoroughly carried out. A reasoning and an undoubtedly shrewd man of business will have a fine ship built at a cost, perhaps, of £5,000; and yet he will not spend another £200 in rendering her timbers exempt from the attacks of insects and from rot. But if this indifference be astounding in the merchant shipowner, how shall we characterise such recklessness when exhibited in the construction of our men-of-war? Whilst on this subject I must call attention to some fine specimens (now on the table) of the gigantic pine, which has recently been imported from Vancouver Island, and to the following letter, which I received from the gentlemen who politely furnished me with those specimens. In this letter you will find that Messrs. Bilbe dwell upon the important circumstance of the gum or resin in these pines being "more uniformly diffused through the wood," thus tending to its impermeability and consequent preservation from decay. This is the chief object we should always strive to attain in treating timbers, with a view to their preservation:—

"Nelson Dock, Rotherhite, London, April 30, 1859.

"SIR,—We have been informed that a specimen or two of the wood recently imported by us for mast-making purposes would be acceptable to you; we therefore beg to forward you a slice cut off the side, and a cube of six inches cut out of the heart of one of the masts made by us. From the slice you will find some of the gum exuding, which appears to us to be of a different nature and more uniformly diffused through the wood than in any other variety of pine known to us. It seems to render the tree almost impervious to water, as in dressing the masts they feel quite dry while being planed up, although floating a few hours before. In its growth this pine is remarkable for its straightness and the absence of knots and defects, and for its very gradual taper. In fact the trees grow *masts*, maintaining by nature that taper which experience has proved the best for masts. While all the pieces imported by us are remarkable, some few are extraordinary; one tree is 129 feet long, and nearly 40 inches at one-third from its butt, without a blemish in it, and contains over 26 loads of timber. There was another, extraordinary in another way, its length being 118 feet 9 inches, whilst its diameter at the butt was only 15 inches and that at the top 6 inches. This was made into a flag-pole for Kew Gardens, but was unfortunately cut in two by a steamer, while it was entangled with Putney-bridge. . . . . This pine grows in the Oregon and Washington territories, and in Vancouver Island and British Columbia, where some of them acquire the height of 350 feet. It is, as you may suppose, a serious business to get them out of the woods to the water-side. Their importation into this country is a great boon to the Navy and Mercantile Marine. All those ship-owners who have had experience in the China trade, and in that to the north-west coast of America, can appreciate these mast-trees on account of their durability, which is scarcely inferior to that of teak. Those who have not that experience will, we hope, soon ascertain what is for their interest. Yellow pine, out of which masts of any size are usually made, is very perishable, its average durability being under five years, and when to the expense of renewing masts at short intervals, is added the expense of unrigging, taking out and in, and rigging again, besides the confusion and delay incurred therefrom, you will at once appreciate the value of these trees, if their average durability be only twice that of yellow pine. The writer has known them over ten years in a ship himself, and not a symptom of decay; and has been informed, among other instancesof durability, that in one of the dockyards a single bowsprit had worn out two frigates.

We, are, Sir, your obedient servants,

"THOS. BILBE AND CO."

"Leonard Wray, Esq."

Time will not permit me to enter more fully into this comprehensive subject of wood-preserving; but I must emphatically and respectfully warn our Admiralty to have every one of the sailing ships which are now being converted into screw steamers, as thoroughly saturated with the sulphate of copper solution as possible; especially in all those parts near the engines, boilers, and bunks. Let it be remembered that those ships were not intended for steamers when built, but that in opening them out for the purpose of lengthening them, opportunities will be afforded for using the preservative solution, which, as far as they are concerned, will never again occur. If this measure be not adopted I feel convinced that dry-rot will speedily destroy these ships, and many hundred thousands of pounds sterling will be lost to this country.

In conclusion, I beg leave very respectfully to suggest that the Council of this Society, in the interest of our naval and commercial marine, do address to her Majesty's Government a request that the Colonial Secretary shall order the several engineer officers residing in Honduras, Guiana, Assam, Tenasserim, Malacca, and Western Australia, to make a careful selection of the best and most durable timber woods of their respective localities, being not less than one or two tons of each timber, to season these lots in the most careful manner in the colony, and when fairly seasoned to send them home to the Government dockyards, where they may be examined and tested by a commission composed of duly-qualified men.

HALL AND WELL'S TELEGRAPH CABLES.

GENTLEMEN,—In your issue of the 6th inst. I observe in your description of Messrs. Hall and Well's mode of insulation of submarine telegraph conductors by india-rubber, that previously to coating with that material the conductor is covered with cotton. I also find in the specification of Messrs. H. and W.'s patent the following sentence:—"Our invention consists, first, in perfectly insulating the conducting wire or wires as follows: we commence by covering the conducting wire or wires with a spiral layer of cotton, and we prefer to use grey or unbleached cotton, as being the most pure." I do not profess to know enough about electricity to judge of the merits or demerits of the many new plans lately proposed. We poor shareholders have to take for granted, I fear, a great deal too much in a scientific way, and to pin our faith pretty much upon the sleeves of telegraphic engineers, patentees, and cable makers. I had always understood that cotton was a conductor; and it appears rather anomalous to me that the first step in what professes to be a perfect insulation should be the use of a conducting substance. As, however, great stress is laid upon the purity, perhaps cotton in this condition possesses superior virtues. I am glad to see attempts made to introduce india-rubber. We have had a considerable amount of expensive experience with gutta-percha; but before I would venture to trust myself again either in bands of gutta-percha or india-rubber, I should like to see my way, if possible, a little more clearly. Messrs. H. and W. would confer a great favour, I believe, upon many in the same category with myself, if they would in plain and simple language, and I do not care how briefly, explain how cotton assists in the insulation of their conductors, or what its office is. The removal of this difficulty, which at present I feel to be in the way of the full appreciation of the value of their contrivance, will be esteemed by, gentlemen, yours, &c., AN ENQUIRER.

THE CREMERIAN BOOT.—Mr. Cremer, of Regent-street, near the Polytechnic, has brought out an improved boot, in which a false sole is introduced *within* the boot itself, from half an inch to an inch in thickness, with which, by an ingenious elastic arrangement of the waist of the boot, the wearer feels no other alteration than that he is by so much raised above his fellows. The appearance of the foot in these boots is likewise very much improved, as the improvement has the effect of giving to the instep a much more elevated character, and causes the foot to look smaller.

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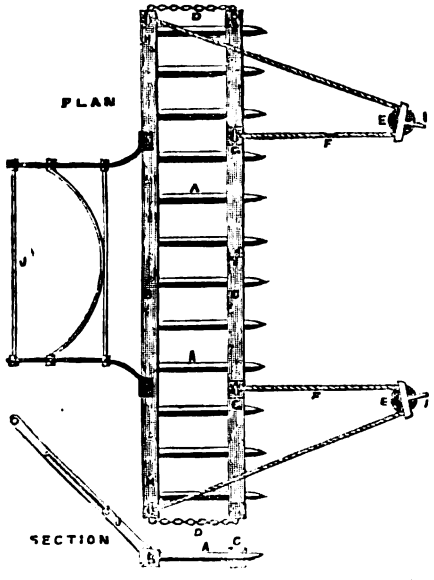
"DELTA'S" PATENT HORSE-RAKE.

THE teeth *A A* are fixed into the head *B* of the rake, and on the teeth is a slide *C* formed of two plain pieces of wood with distance blocks between, so as to allow it to slide freely upon the teeth *A A*. The slide *C* is attached at either end to the end *B* by a small chain *D D*, and over a pulley *E* (on each side of the rake) is passed a rope *F*, one end of which is fastened to an eye *G* in the slide *C* and the other end to the eye *H* in the head *B*. The horse is attached by trace chains to the loops *I* of the pulley blocks. *J* is the handle. The width of the rake is 9½ feet. When the horse draws the rake into the hay or stubble to be collected, the resistance of the head *B* and the slide *C* are equal; but as the hay accumulates the slide is pressed back until it is filled. To deliver the rakings it is only necessary to detain



the head of the rake by a slight pressure upon the handle, when the slide is drawn forward and the load discharged without altering the speed of the horse, the chains *D D* preventing the slide from going too far. Again the pressure upon the handle raises the teeth of the rake, causing it to pass over the winrow or discharged rakings, and falling upon the other side it again enters the spread hay.

If the teeth should be caught in the turf, or in any projecting piece of earth, the resistance is communicated to the head, which is thus detained, while the slide is drawn forward and frees them at once. It is necessary that the rope should run freely over the pullies.

Mr. R. Law, of Shettleston, by Glasgow, is making a large number of these very simple and efficient rakes for the coming harvest.

NOTICES.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of insertions less than 13; for 13 insertions, 4d. per line; and or 52 insertions, 3d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

THE demand for Mr. E. J. REED'S paper—

ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY, IN RESPECT OF DIMENSIONS, FORM, MEANS OF PROPULSION, AND POWER OF ATTACK AND DEFENCE,"

has been so great that the Journal of the Society of Arts, the MECHANICS' MAGAZINE, and all other Scientific Journals in which it appeared in December last, are now out of print. The demand still continuing, it has been deemed desirable to reprint it in a separate form. An 8vo. edition of it, in large type, and on fine paper, has, therefore, been prepared, and may now be had at the Office of this Magazine, price 1s.

Our Weekly Gossip.

A NUMBER of a curious publication called *The Balloon; or, Aerostatic Magazine*, has this week been sent to us. It appears to be under the management of Mr. Henry Coxwell, of Tottenham, and to have been first projected by him in the year 1845. It does not appear, so far as we can ascertain, that it is issued at regular intervals. It is proposed that another number shall be published in the autumn, with the view of taking a retrospective glance at the aeronautic exploits of the season. The number before us contains, first, a sketch of the rise and progress of the drag and sail plan for directing balloons. This is followed by an article upon the question, "Is aerostation progressing?" In this Mr. Coxwell tells us that after twenty years devoted study of aerial navigation, he finds no reason why this question should be replied to in a tone of despondency, but at the same time he has no hesitation in affirming "that the advantages likely to accrue from unrestrained intercourse through the atmosphere are so great and exalting, that the world is not yet prepared for such a consummation, nor will it be until despots shall have been hurled aside; for the air-borne car is the emblem of liberty, peace, and good-will; a messenger that will wing her way probably when humanity shall have been further ameliorated, and the passion for war gives way to lasting repose. . . . . Ballooning as an art is, I am convinced, steadily advancing; and although the uninitiated may not observe much progress, because the machine does not strikingly deviate from the wind, yet the various appurtenances gradually undergo improvement, and in a short time I have no doubt that balloons, like the old men of war, will be cast aside for new models; and then, just as the application of steam requires a reconstruction of our war vessels, so will some new power demand a similar alteration for vessels in the air; so that if balloons cannot be managed, elongated aerostats may; and the difficulties which appear insurmountable at the beginning of the nineteenth century may be at last dispelled, and the great high-road to all the nations of the earth (the atmosphere) may be travelled triumphantly." The next paper is upon war balloons for reconnoitring. In this Mr. Coxwell says: "I assert with no small degree of conviction, if not of assurance, that by no other medium could so much information be acquired as from the car of a balloon, elevated kite fashion, and subject to control by ropes regulating its altitude. The idea owes its origin to French ingenuity, and a Frenchman acquitted himself valiantly at the battle of Fleurus. Guyton Morveau proposed balloons as a means of observation for the French armies, and they were repeatedly used with advantage at places too numerous to particularize. But as the aeronautic art was not, mechanically speaking, in anything like the state of advancement it is now, I am of opinion that under expert management balloons may be made the vehicles, not only for acquiring information instantaneously, but also, on some occasions, for destructive and incendiary objects. This may be pronounced an abuse of such a philosophical instrument, but the reply of a matter-of-fact man would be the old adage, 'All is fair in war.'" Further on in the same paper the writer suggests that as we are about to cover the channel with our wooden walls, we should proceed further, "and station on the most approachable parts of our coasts a few aerial observatories, in order not only to command a view of our fleet, but also of portions of foreign soil within telescopic range of England. Half-a-dozen balloons judiciously located would afford the means of observation, and the aerostatic telegraph would be ready to facilitate the movements of the coast-guard, and to render other service of importance." The exploration of Australia by balloons, is the next subject treated of; and then we have in succession "Meteorological hints to Aeronauts," "Reporting in Cloud-land," &c. We have thus glanced at this curious publication because many of our readers are interested in the subject of which it treats. The work bears no publishers' name or price, but we dare say it can be obtained for a few postage stamps from Mr. Coxwell himself at Tottenham.

An old correspondent sends the following, under date of May 9:—"There appears to be some difference of opinion between electricians and telegraphic engineers with respect to the utility of having a second wire for the return current in so long a cable as the Atlantic, and those gentlemen who are opposed to the idea seem not exactly to comprehend the real object and necessity for it. It has been surmised that the object in view was to get rid of what is certainly a great difficulty, namely, the effects of induction in the principal cable; but, in reality, no such object was ever calculated, at least by me, and I believe I was the first person who suggested the second wire; a few words, therefore, on the subject may not be thought unnecessary. There appears in your last publication an interesting paper, copied from a communication made to the Society of Arts lately, and I have taken the liberty of copying a passage therein for the purpose of making some observations on it. The writer says, 'That it is a well-established fact that when a telegraphic circuit is composed of a loop of wire, it will oppose the same resistance to the electricity as a circuit of double the length when the earth is made use of in the place of a return wire, and he says this proves the earth offers no apparent resistance, and he continues, if this be the case, can it make any difference whether the battery pole be carried to the ends of the wire itself, or through the medium of any perfect conductor, which the earth has been proved to be.' In the first place, I have to observe all the statements in this paragraph require to be proved; they contain the substance of the matter in dispute, and if they were true, it would be a most important discovery, and would go the length to upset and contradict some of the elementary and most important principles in electricity. In my last communication to you, published 11th December, 1858, No. 1844, I described some experiments which went to prove that in every circuit traversed by the electric current, that portion of the circuit composed of the most imperfect conducting material, governed and controls the quantity of electricity put in motion, I shall not again, therefore, trouble you with a repetition of these experiments, but I will describe an additional one taken from the late Sir Humphrey Davy's work, Davy's 'Chemical Philosophy,' page 151, and apply the experiment in such a way as to put the matter beyond dispute, and prove that there exists more difficulties in the way of a perfect Atlantic cable than that caused by the induced electricity in the gutta-percha covering of the wire. Davy, in describing Mr. Children's powerful battery, which consisted of twenty double plates four feet by two feet—this great battery, he says, when in full action had no more effect on water or on the human body than a battery containing an equal number of small plates, but when the circuit was made through metallic wires, the phenomena were of the most brilliant kind; a platina wire of one-thirtieth of an inch in thickness, and eighteen inches long, placed on the circuit between copper bars, instantly became red hot, then white hot, the brilliancy of the light was soon insupportable to the eye, and in a few seconds the metal fell fused into globules. The other metals were easily fused or dispersed in vapour by this power, points of charcoal ignited produced a light so vivid that even the sunbeams compared with it appeared feeble. Now, let us in imagination take this battery to the telegraphic station house at Valentia, and, in the first instance, perform all those brilliant experiments here described; we will afterwards try the shock on ourselves; we need not fear any danger as we have Sir Humphrey Davy's word that it is not dangerous, but we will note down in our book this important fact, the enormous disproportion between the large quantity of electricity required to pass through the circuit when eighteen inches of platina wire was used, with the very small quantity which circulated when our hands joined the poles of the battery in taking the shock. Let us now attach an insulated cable to one end of the battery—I mean a properly constructed cable—and let it terminate at the station-house at St. John's, Newfoundland, and let a strong copper wire be attached to the other pole of the same battery and be continued likewise to the same station. We will now proceed ourselves across the Atlantic and visit the station. I should have mentioned that it is essential that this latter wire should not be insulated with gutta percha; we have quite enough of that mischievous material in one of the wires, and we don't want a repetition of the difficulties attending it when necessitated to make use of it. Being now at St. John's station, and repeating the experiments with the ends of the two wires which we have now to experiment with, it is not very likely that if we connect the two wires with a platina wire eighteen inches long, as we did at Valentia, that the same brilliant results would follow. The electricity has by this time travelled 1,600 miles; the most we can expect from it would be that by attaching the wires to the ends of an ordinary indicator that we would get some deflection of the needle; indeed, we do not require more for telegraphic purposes. But if the powerful instrument at Valentia, and with a metallic circuit throughout, is not able to deliver more electricity with such a length of cable than what will deflect the needle of a galvanometer, and taking into consideration the note we took and entered in our note book at Valentia, how can it, I say, be expected that if we make the connection with these two wires and

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the indication by passing the electricity through the human body—how can it, I say, be expected that with such an arrangement the needle could be affected? much more, how could it be expected that if the second wire had been altogether removed and the circuit be completed by 1,600 miles of moist earth and salt-water, that it would be more successful. The idea seems preposterous? Having several wires in the principal insulated cable is very good, but in the present cable, in consequence of its construction, was productive of mischief. The gutta-percha is pressed closely round and in close connection with each wire, whereas the wires should touch each other and be bound firmly round together with linen, or hemp, or some other imperfect conducting substance before the gutta-percha is applied; and the suggestion of Mr. Hearder is a great improvement,—layers of gutta-percha with an intermediate covering of linen again.—I am, Sir, P. M. May 9th, 1859."

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated April 1, 1859.

818. W. E. Newton, of Chancery-lane. Improvements in cricket bats. A communication from M. Doherty.

Dated April 8, 1859.

881. W. E. Newton, of Chancery-lane. Improvements in telegraphing and in telegraphic apparatus. A communication from A. Wilson.

Dated April 11, 1859.

902. W. Boaler, of Manchester, Merchant. Certain improvements in the manufacture of soap. Partly a communication from A. Hay.

Dated April 18, 1859.

976. W. E. Gedge, of Wellington-street, Strand. An improved safety apparatus for clearing off condensed steam from steam-engines. A communication from A. Morel.

Dated April 19, 1859.

984. W. Gosling, Architect, of Woolwich. Improving rifle cannon and projectiles.

Dated April 20, 1859.

998. J. Apperly, Cloth Manufacturer, and W. Clissold, Engineer, of Dudbridge. Improved apparatus for oiling wool.

Dated April 26, 1859.

1044. W. Mackenzie, Publisher, of Glasgow. An improved method of printing impressions upon an enlarged or reduced scale, either from engraved plates, electrotypes, blocks, drawings, or other surfaces.

Dated April 27, 1859.

1056. J. and W. Stuart, of Musselburgh, Mid-Lothian, Manufacturers. Improvements in machinery or apparatus for manufacturing nets for fishing, and for other purposes.

Dated April 28, 1859.

1065. C. Randolph and J. Elder, of Glasgow, Engineers. Improvements in steam-engines and boilers.

1067. R. Harrington, Watch Maker, of Camberwell. Improvements in umbrellas and parasols.

1069. N. J. Holmes, Gentleman, of Glasgow. Improvements in electric telegraphs, and apparatus connected therewith.

1070. E. Lardenois, of Brussels, Merchant. Improvements in the manufacture of pulp for paper, pasteboard, and other like articles. A communication from B. F. Brunel.

1071. T. Clarke, of Hackney, Engineer. Improvements in sheaves or pulleys for paying out and hauling in ropes, chains, and cables, for communicating motion to machinery, and for other useful purposes.

1073. W. A. Tompson, of Cecil-street, Strand, and W. Green, of Thames Ditton, Surgeon. Improvements in apparatus for applying liquids to the throat and air passages, for medical purposes.

Dated April 29, 1859.

1076. W. Corbett and W. Carmont, of Clayton, near Manchester, Iron and Steel Manufacturers. Certain improvements in the construction and arrangement of furnaces employed in the manufacture of iron and steel, and for other similar purposes.

1077. J. W. Welch, of Manchester, Warp Sizer. Improvements in sizing or dressing yarns or threads for weaving.

1079. E. A. Portens, of Warwick-sq., Engraver, and W. H. Burke, of Cannon-st. West, Manufacturer. Improvements in printing and other presses.

1081. T. Smith, of Bredfield, Suffolk. Improvements in cultivating implements.

Dated April 30, 1859.

1083. J. Tousaint, of Welbeck-street. A new process of modelling and moulding for galvano-plastic.

1084. J. Darlington, of Cannon-st., Mining Engineer. Improvements in zinc retort furnaces.

1085. E. Francis, of Wrexham, Grocer. Improved apparatus applicable to the treatment of tea and other useful purposes.

1086. J. Morison, sen., and J. Morison, jun., of Paisley, Machine Makers. Improvements in looms and in apparatus connected therewith.

1087. W. Clark, of Chancery-lane. Improvements in ventilating or supplying air to diving bells and divers, and in holding communication therewith from above. A communication from F. A. Laurent.

1089. J. Bull, of Manchester. Improvements in apparatus used for securing bales of cotton and other substances.

1090. C. H. G. Williams, of Regent-sq. Improvements in the manufacture of colouring matters, and in applying the same for dyeing and printing fabrics and materials.

1091. J. Souquière, of Paris, Civil Engineer. A new or improved process for distilling coal.

Dated May 2, 1859.

1092. T. H. Arrowsmith, of Bolton, Cotton Spinner. Improvements in carding engines.

1093. A. Jumelais, of Paris. An apparatus yielding illimited power, so called "French movement."

1094. J. Ferguson, of Kilmarnock, Tinsmith, and J. Mc Gaveny, of Glasgow, Yarn Dresser. Improvements in fasteners for shutters, and for similar uses.

1095. W. Baylis, Fencing Manufacturer, of Wolverhampton. Improvements in the manufacture of iron hurdles and fencing.

1096. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in, and in connection with, electro-magnetic engines. A communication from A. P. M. Darlu, of Paris.

1097. J. Basford, of Oundle. An improvement in the apparatus used when expressing clay or brick earth through dies.

1098. J. Childs, of Putney. Improvements in the manufacture of night-light cases.

1099. W. Gossage, of Widnes, Chemist. Improvements in the manufacture and useful application of certain alkaline silicates, and in the production of liquor silicis, or liquid flint.

1100. D. Moore, of Brooklyn. Improvements in machinery for rubbing or dressing types.

1101. W. Gossage, of Widnes, Chemist. Improvements in the manufacture of caustic soda and carbonate of soda, from certain alkaline liquors and salts.

1102. C. Nuttall, of Rochdale, Machinist. Improvements in machinery or apparatus for grinding wire cards.

1103. F. W. Emerson, of Fenchurch-st. Improvements in treating ores to obtain a new metallic substance and its salts, and in the application of such matters, and also certain products of tungsten in dyeing, printing, and painting.

Dated May 3, 1859.

1104. A. G. Franklin, of South-st., Finsbury, Merchant. Improvements in the manufacture of crayons. A communication from G. W. Sussner.

1105. W. Johnson, of Lincoln's-inn-fields. Improvements in the manufacture or production of mineral oil and grease. A communication from F. Schütze.

1107. W. Clark, of Chancery-lane. Improvements in obtaining or extracting quinine and the principal organic alkalies. A communication from L. de Sourdeval.

1109. W. Sellers, of Philadelphia, Engineer. Improved machinery for making screw bolts and nuts.

1112. H. Chapman, of Appleby. An improved military camp cooking apparatus.

1113. H. Chapman, of Appleby. Improvements in the construction of kettles.

1114. E. W. Scale, of Merthyr Tydfil, Gentleman. Improvements in railway signals.

1115. R. Mushet, of Coleford, Metallurgist. An improvement in the manufacture of cast steel.

Dated May 4, 1859.

1116. W. H. Kingston, of Bandon, Cork. Improved means of communication between the passengers and guards, and guards and engine drivers, of railway trains.

1117. C. F. Vasserot, of Essex-st., Strand. An improved form of tuyere for blast furnaces. A communication from F. C. Bierlein.

1118. J. Adolphus, of Serle-st. An improvement in locks, bolts, and latches.

1119. W. E. Newton, of Chancery-lane. Improvements in steam-boilers. A communication from S. Pierce.

1120. J. G. Willans, of Belfast. Improvements in utilizing bog stuff or peat, when applied for treating metals and certain mineral and alkaline substances.

1121. J. C. Wilson, of Manchester. Improvements in machinery for cleaning cotton.

Dated May 5, 1859.

1122. H. Turner, of Mile-end, Engineer. Improvements in steam-engines and apparatus connected therewith.

1123. J. F. Allender, of Brierley Hill, Stafford, Manager, and D. Rowley, of Brierley Hill, Iron Roller. Improvements in shears for cutting boiler plates and sheets, and for other like purposes.

1124. J. Scholfield, of Milnrow, near Rochdale, Cotton Spinner, and W. Cudworth, of the same place, Manager. Certain improvements in machinery or apparatus for spinning cotton and other fibrous materials.

1125. H. Chapman, of Appleby. Improved means or appliances for protecting ships against injury from shots, shells, or other warlike projectiles.

1126. H. Chapman, of Appleby. Improvements in the construction of fortifications.

1127. W. F. Batho and E. M. Bauer, of Salford, Engineers. Improvements in drills for recessing, cutting slots, keyways, and cotter holes.

1129. W. Clark, of Chancery-lane. Improvements in seed depositors or drills. A communication from L. A. Pruneau.

1130. A. Knox, of Kingsland, Engineer. Improvements in gas regulators.

1131. H. Reynolds, of Denmark-hill, Gentleman. Improvements in refining sugar and other saccharine substances.

1132. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in cannon and other fire-arms, and in projectiles, wads, and cartridges to be used therewith. A communication from J. W. Cochran.

1133. H. Fletcher, of Southampton-buildings. A machine for scutching and carding tow, oakum, or waste cordage. A communication from F. Maigron.

1134. W. E. Newton, of Chancery-lane. An improved steam-gauge. A communication from A. E. Dupas.

1135. W. E. Newton, of Chancery-lane. Certain improvements in fish-hooks. A communication from T. F. Weil.

1136. J. H. Johnson, of Lincoln's-inn-fields. Improvements in piano-fortes. A communication from G. Vogt.

Dated May 6, 1859.

1137. W. Kellingley, of New Cross, Carriage Builder. Improvements in the mode of lubricating the journals of the axles of locomotive engines, of carriages and machinery.

1138. F. Angerstein, of Kennington, Esq., Robert Clegg, of Islington, Gentleman, and G. Thorrington, of Egham, Lighterman. Improvements in apparatus for obtaining motive power.

1139. F. W. Hart, of Horncastle, Lincoln, Photographer. Improvements in photographic apparatus.

1140. S. Wright, of Sudbury, Suffolk, Gas Engineer. An improved gas governor or regulator.

1141. J. Dixon, jun., of Blackburn, Paper Stainer. Improvements in machinery or apparatus for staining paper.

1143. W. S. Booth, of Birmingham, Undertaker. A new or improved washing machine.

1144. J. Frearson, of Birmingham, Mechanical Engineer. New or improved fastenings for wearing apparel, and for such other purposes as the same are or may be applicable to.

1145. G. T. Bousfield, of Brixton. Improvements in apparatus for grinding grain and other substances. A communication from P. E. Brisson.

Dated May 7, 1859.

1146. J. Combe, of Paris, Gentleman. An improved plantoforme or apparatus for measuring the hoofs of horses for the purpose of forming their shoes.

1147. J. Bray and J. W. Harrison, of Staley Bridge. Improvements in machinery or apparatus for spinning fibrous materials.

1148. A. C. Bamlett, of Middleton Tyas, York, Farmer. Improvements in reaping machines, part of which improvements is applicable to other agricultural implements.

1149. M. Henry, of Fleet-st. Improvements in the manufacture and construction of locks and fastenings. A communication from J. N. Rebour.

1150. R. Mushet, of Coleford, Metallurgist. Improvements in puddling iron and steel.

1151. R. Mushet, of Coleford, Metallurgist. Improvements in the manufacture of iron.

1152. C. Frost, of St. George's-in-the-East. Improvements in the construction of electric telegraph cables.

1153. R. Pearsall, of Smethwick, Stafford, Glass Blower. Improvements in the manufacture of glass shades.

1154. W. E. Gedge, of Wellington-st., Strand. Improvements in the manufacture of steel. A communication from C. J. Perinel.

1155. R. D. Kay, of Accrington, Manufacturer. Improvements in the preparation of certain colouring matters. A communication from Dollfus Mieg and Co.

1156. W. Jeffery, of Gloucester. Rendering more convenient out-door manipulations in photography by means of an improved portable photographic tent and tent camera.

Dated May 9, 1859.

1157. J. Ramsbottom, of Crawshaw Booth, Lancaster, Machine Printer. Certain improvements in machinery for printing fabrics.

1159. C. A. H. Marcoux, of Montmartre, near Paris. A new impelling mover by the pressure of water.

1163. A. Morton, of Kilmarnock. Improvements in means or apparatus employed in the weaving of figured fabrics.

1165. T. Green, jun., of Old Broad-st. Improvements in apparatus applicable to steam boilers, to obtain greater security against explosion.

Dated May 10, 1859.

1167. W. F. Nuthall, Major, of Kilburn. Improvements in ordnance and fire-arms, and in projectiles to be used therewith.

1169. W. Wilkinson and C. Whitley, of Manchester. Improvements in buttons and fastenings for garments, harness, and other similar purposes, and in the method of securing the same.

1171. J. Norman, of Glasgow, Engineer. Improvements in furnaces.

1173. G. Bell, of Wandsworth, Manufacturer. Improvements in matches or fusees.

1175. W. Keiller, of Perth. Improvements in cartridges for guns or small fire-arms.

1177. J. Absterdam, of New York, Mechanical Engineer. Improvements in impregnating illuminating gas with hydro-carbon vapour.

Dated May 11, 1859.

1179. A. Manbré, of Rathbone-place, Oxford-st., Brewer. The manufacture of a colouring matter for colouring spirits, beers, vinegar, and other liquids, from sugar produced from rice, maize, carrots, maple, amanas, pompions, chestnuts, mangel-wurtzell, sorgho, turnips, and Jerusalem artichokes.

1181. J. Luis, of Welbeck-st. An improved burling and napping machine. A communication from J. B. Duval.

1183. M. Henry, of Fleet-st. A mode of protecting the mariner's compass against local attraction. A communication from S. C. Bishop.

1185. W. Spence, of Chancery-lane. Improvements in knapsacks and other military equipments. A communication from J. Rider.

1187. J. Leadbetter, of Leeds, Brazier, and J. Rhodes, of Armley, near Leeds, Water-rate Collector. Improvements in pumps.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(From the London Gazette, May 24, 1859.)

92. W. Oliver. Boats.
106. W. Bennetts. Raising or lowering skips, &c.
110. J. Picksley and R. Sims. Mowing machines.

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120. J. Barrans. Steam-engines.
122. S. Holt. Woven silk fabrics.
125. W. Davis. Sluice valves.
128. J. Eccles. Articles for building.
130. P. A. Viette. Inks.
143. E. G. Salter. Collecting letters, papers, &c.
145. R. Mushet. Cast steel.
146. J. Luis. Colouring paper. A communication.
149. G. Hamilton. Treating rosin.
150. H. Gallon, J. H. Bean, and S. Lumb. Slotting, &c.
151. C. D. Archibald. Generating force. A communication.
156. W. Trotter. Reaping machines.
162. E. T. Hughes. Sorting silk. A communication.
163. J. Whitehead. "Purled" wire.
164. E. Stevens. Cooking utensils.
168. J. H. Johnson. Cigarettes. A communication.
169. W. Clark. Boots and shoes. A communication.
173. W. Woofe. Ploughing.
181. J. L. Clark and J. Muirhead. Electric telegraphs.
190. C. O'Hara. Propellers.
192. A. Davenport. Gas burner. A communication.
193. J. Childs. Applying heat.
197. J. Newman. Chains.
203. E. Dorsett and J. B. Blythe. Distilling oil.
208. R. Barter. Heating and ventilating.
223. J. H. Johnson. Shaping wood. A communication.
252. G. F. Bradbury and J. J. King. Sewing machines.
258. C. E. Amos and J. Francis. Water-pressure engines.
278 J. P. Booth. Ventilating ships.
295. W. E. Newton. Blowing machine. A communication.
312. S. D. Davison. Locomotive engines.
314. M. Smith. Looms.
509. A. Reid. Weaving.
724. J. T. Pitman. Springs. A communication.
725. E. Maynard. Fire-arms.
868. R. Wardell. Reaping machines.
875. J. Bindley and J. L. Hinks. Steam-engines and pumps.
877. M. Wheeldon. Looking glasses.
884. W. E. Newton. Telegraphing. A communication.
885. E. R. Handcock. Motive power engines.
899. R. Wappenstein. Cop tubes.
948. J. Chapman. Angle iron.
962. H. H. Vivian. Smelting copper.
986. C. Batty. Railway signals.
1002. J. Napier. Producing figures on glass.
1056. J. and W. Stuart. Nets.
1065. C. Randolph and J. Elder. Steam engines and boilers.
1073. W. A. Tompson and W. Green. Applying liquids to the throat.
1096. R. A. Brooman. Electro-magnetic engines. A communication.
1116. W. H. Kingston. Railway signals.
1119. W. E. Newton. Steam boilers. A communication.
1136. J. H. Johnson. Pianofortes. A communication.
1144. J. Frearson. Fastenings.
1145 G. T. Bousfield. Grinding grain. A communication.
1148. A. C. Bamlett. Agricultural implements.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed May 20, 1859.

2632. J. Wadsworth.
2635. H. Ellis.
2636. C. Tomlinson.
2637. C. Cuit.
2638. W. Lea.
2640. H. Jordan.
2646. H. Gardiner.
2648. R. Nelson.
2650. S. W. Johnson and J. Varley.
2656. W. Gorman.
2662. R. H. Hughes.
2759. J. Baillie.
2761. M. Henry.
2771. J. Cameron.
2783. M. Henry.
2787. J. Jobson.
2813. M. Henry.
2872. A. V. Newton.
2972. W. Hayworth and W. Barker.
2977. T. Pickford.
526. J. Howden.
716. W. Warne, J. A. Fanshawe, J. A. Jaques, and T. Galpin.

Sealed May 24, 1859.

2663. R. A. Brooman.
2668. C. Peterson.
2671. C. E. Amos.
2678. F. H. Maberly.
2680. F. Loos.
2687. M. Meyers.
2691. J. B. Booth.
2693. P. Griffiths and J. Brennand.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1178. G. Carter.
1180. J. Brown.
1187. W. Maugham.
1194. A. V. Newton.
1219. J. C. Pearce.
1226. R. Bell.
1239. T. Herbert and E. Whitaker.
1250. B. N. de Buffon.
1267. W. E. Newton.
1291. R. Jobson.
1297. H. Cartwright.
1315. E. Heywood and T. O. Dixon.

LIST OF SPECIFICATIONS, &c.

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ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINES, &c. *None.*
BOILERS AND THEIR FURNACES, 2296, 2332, 2347, 2350.
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 2335.
SHIPS AND BOATS, including their fittings, 2298, 2315, 2337.
CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 2308.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 2318.
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 2297, 2299, 2300, 2331, 2344, 2348, 2355.
BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c., 2338.
LIGHTING, HEATING, AND VENTILATING, 2312, 2325, 2332, 2345.
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 2302, 2343, 2349, 2352, 2360.
METALS, including apparatus for their manufacture, 2361.
CHEMISTRY AND PHOTOGRAPHY, 2295, 2307, 2336, 2342.
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2293. S. PERKES. *Improvements in machinery for extracting oil from the cocoa nut and other vegetable matters.* Dated October 14, 1858.

Here the coprah is reduced into a pulp by a rotating rasp made up of circular saws, and such pulp is continuously fed on to an endless table or chain, which is reticulate, or made with suitable passages through for the passage of the oil. This endless chain or table is supported by several rollers on its under side, and the pulp of coprah is fed on to the same at the upper end of the machine, there being suitable mats or fabrics of cocoa-nut fibre, &c., on the under and upper surface of the vegetable matters so fed on to the endless table, which is arranged by preference in the form of an inclined plane from the upper to the lower end of the machine. The part of the endless chain or table for the time out of action passes under the supporting rollers, and there are trays under the supporting rollers to receive and conduct off the oil to suitable receivers. The endless chain or table in its movement over the supporting rollers passes under a number of pressing rollers, there being one such roller over each supporting roller. The first or uppermost pressing roller is at the greatest distance above the table or endless chain, so as to offer comparatively little pressure to the vegetable matters on the table, and the rollers in succession are set nearer and nearer to the endless table or chain, by which as the table or chain progresses the matters thereon become subjected to greater and greater pressure. The rollers are made hollow so as to be heated by any suitable hot fluid or otherwise, and in some cases the pressing surfaces of the rollers are of glass. In order to separate the fluid oils from foreign matters centrifugal machines are employed. *Patent completed.*

2294. H. MARTIN. *Improvements in separating starch from gluten, in apparatus used therein, and also in preparing cement from gluten.* Dated October 14, 1858.

Here a rectangular trough is used, having wire gauze let in at the ends and middle. In this trough a reciprocating frame is used carrying rollers, by preference four. The dough which is to have the starch separated from the gluten is placed between the two end pairs of rollers, the frame is made to reciprocate, and a constant flow of water is allowed to flow on the dough, which will wash out the starch from the gluten, the wash water continually flowing through the wire gauze into a suitable vessel to settle, and there to be treated in the ordinary manner of manufacturing starch. After the dough has been subjected for a time to the action of the frame of rollers the dough—now for the most part gluten— is placed between the ends of the frame and the ends of the trough, by which the dough or gluten is continually beaten by the ends of the frame whilst still subject to a constant flow of water. In order to convert gluten into cement it is combined with stale beer or fermented liquor and oil. *Patent completed.*

2295. G. BAXTER. *Improvements in colouring photographic pictures.* Dated October 14, 1858.

This consists in combining with photographic pictures the processes of intaglio plate and surface printing, and also the processes of lithographic and zincographic printing, as a means of colouring such photographic pictures. *Patent completed.*

2296. T. ARCHER, jun. *Improvements in apparatus for preventing explosions of steam boilers.* Dated Oct. 14, 1858.

Here the supply valve is enclosed in a case having an opening at the top, through which the rod of the safety-valve passes, and by which steam passes from the boiler when the safety-valve is somewhat raised. On the rod of the safety-valve there is another valve, which, when the safety-valve is raised beyond a certain point, closes the opening in the top of the case, and causes the steam to pass through a pipe which leads from the case to the interior of the furnace of the boiler, and so damps the fire and reduces the pressure on the boiler. Steam is also caused to pass on to the fuel in the furnace when the water in the boiler gets too low. This is accomplished by a float in the boiler having a rod attached to it, which passes through a stuffing-box in the top of the boiler. This rod also passes through a hole in a prolongation of the weighted roller, which keeps down the safety valve, and on the end of the rod there is an enlargement which cannot pass through the hole in the lever. Thus, when the water in the boiler gets too low, the weight of the float depresses the arm of the lever through which the rod passes, lifts the arm of the lever which keeps down the safety-valve, and allows the steam to pass on to the fuel in the furnace. *Patent completed.*

2297. S. DIGGLE. *Improvements in looms for weaving.* Dated October 14, 1858.

This relates, 1, to mechanism for moving the boxes of looms in which two or more shuttles are employed; but neither this nor the remaining portions of the invention are described apart from the drawings. *Patent completed.*

2298. W. E. NEWTON. *An improved construction of cabin or state room for steam-boats and other vessels.* (A communication.) Dated October 14, 1858.

The object here is the construction of air-tight cabins or state rooms, for steam-boats, &c., which are so arranged and adapted to the vessels that they shall, in the event of the hull of the boat or vessel sinking, be capable of automatically detaching themselves therefrom, and also of floating on the surface of the water, and under the control of the occupants. *Patent completed.*

2299. J. LOMAS. *Improvements in the production of ornamental fabrics for ladies' dresses.* Dated Oct. 14, 1858.

This applies to cotton, woollen, silk, or other piece goods upon which patterns are produced by processes of printing, weaving, or by other means, and consists in forming another pattern thereon by embossing, and so that the said embossed parts, when the piece is made up, may follow a leading outline of the dress. *Patent abandoned.*

2300. R. R. JACKSON. *Certain improvements in machinery or apparatus for sizeing yarn.* Dated Oct. 15, 1858.

This consists in the use of a ball or other float tap or valve for regulating the supply of size to sizeing machines, in which tap the escape of the liquid through the tap is prevented by a piece of india rubber, &c., which is pressed by the float against the seating of the tap, or is opened, and leaves the same to supply the cistern as the float rises or falls in the sizeing liquid. The float may be placed in a separate cistern, so as to feed a number of machines, or in a small cistern attached to the trough of each machine. *Patent abandoned.*

2301. W. BACON. *Improvements in the mode of constructing valves, valve cocks, gates, and stop cocks, which may be used in steam engineering, and for other purposes.* (A communication.) Dated October 15, 1858.

This consists in so constructing a peculiar form of oscillating valve that when it is in position to leave its ports uncovered, there will be a passage or passages from the induction port or ports in the valve chamber to the eduction port or ports in the same through the valve and the valve spindle, thereby causing less friction to the steam, water, air, gas, &c., passing through it, and thus obviating loss of pressure or head. It also consists in so constructing the valve that when it is in position to cover its parts, it will prevent the flow of a fluid from the valve chamber through either of the ports alternately, so long as the spindle remains unturned; and also in so constructing it that the springs which hold the separate parts of the valve against their seats shall not act on the spindle to force it from its centre of motion. *Patent completed.*

2302. G. DAVIES. *Improvements in the manufacture of gloves, and in the apparatus employed therein.* (A communication.) Dated October 15, 1858.

Here the cutter is formed with moveable pieces or blades, and is suitable for cutting from one to several dozens of gloves of four different sizes at one blow. The number of seams in the fingers of each glove is reduced to four. *Patent completed.*

2303. T. MOORE. *Improvements in refrigerators.* Dated October 15, 1858.

Here a polygonal vessel is formed of cast-iron, with fretted or interwoven channels, ascending with a slight gradient from the base or sides of the vessel to the centre. These channels commence at one angle of the polygon and run parallel to the sides, that in connection with the last side being the width of the first channel shorter than the others. All are returned at the same angle as the sides, and continued throughout, diminishing in regular succession. Partitions of galvanised iron separate the channels, which are formed of such depths as to contain a series of pipes. These pipes are placed between the partitions, they are continuous, and so connected at the angles that by removing a cap with a screw or telescope joint, one end of each pipe may be opened, the cap or accessible end throughout having the same relative position, that is, each

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being in the end of the pipe forming, when the vessel is other than square, a re-entrant angle with the pipe next in ascending progression. The pipes are connected with the inlet for the work at the bottom, and with the outlet at the top, and the whole bound together in position, so that they may be raised out of the containing vessel at pleasure. *Patent completed.*

2304. S. T. CLARKE. *A mode of crossing bankers' cheques and drafts.* Dated October 15, 1858.

Here the parallel lines, with the banker's name, or simply the words "and Co." appear in perforations. The apparatus consists of a tool fitted with a series of small punches fitted into any convenient form of press. *Patent abandoned.*

2305. J. WAINWRIGHT. *Improvements in respirators.* Dated October 15, 1858.

This consists, 1, in employing two valves for allowing the inhalation and exhalation to be conducted through separate media. 2, in employing a series of metal plates—by preference three in number—in place of wire gauze. *Patent abandoned.*

2306. G. T. BOUSFIELD. *Improvements in machinery for cutting the threads of wood screws.* (A communication.) Dated October 15, 1858.

This consists in producing wood screws tapering with a slope at the point, and tapering with a slope, also, where the core vanishes into the stem of the screw, so that the projections of the convolutions of the tapering portions shall slope towards the point, and be inclined to those of the core at the body of the screw between the tapering portions thereof. *Patent completed.*

2307. G. F. WILSON. *Improvements in preparing compounds containing sulphur for preventing and destroying blight, mildew, and insects.* Dated October 15, 1858.

This consists in preparing compounds of sulphur and soap, by combining sulphur in a state of solution with soap. *Patent completed.*

2308. L. MARCUS. *An improved reaping machine.* Dated October 16, 1858.

This consists chiefly in the use of a gathering rack actuated by the same movement as that of the other organs. This rack takes on the table, the cut grain, and by a travelling motion brings it back on the table, throwing it aside in small heaps for bundling. The cutter works in a space larger than that in which the other pieces of the machine are actuated by the action of the large wheel, which is caused to pass outside of the grain to be cut, that is to say, in the space which serves also for the passage of the horses. *Patent completed.*

2309. F. J. COULON and S. G. GIRAUD. *Improvements in the process of ornamenting skin and leather.* Dated October 16, 1858.

This consists mainly in the application of a calender disposed and combined in a peculiar manner. *Patent completed.*

2310. T. W. G. TREEBY. *An improvement in breech-loading fire-arms and cannon.* Dated October 16, 1858.

This invention is not described apart from the drawings. *Patent completed.*

2311. H. FRANCIS. *Machinery for making the springs of surgical trusses.* Dated October 16, 1858.

This consists in passing a strip of hot steel between rollers suitably arranged, instead of forging it. *Patent abandoned.*

2312. J. P. GILLARD. *Improvements in generating hydrogen, and in the means of and apparatus for applying the same to lighting and heating purposes.* Dated October 16, 1858.

In carrying out this invention (which relates to a previous patent, dated 22nd November, 1849) steam is obtained from a boiler heated by the last heat of the furnace, and that by introducing this steam at once into the retorts—the head of these latter should not be lowered too much—the patentee causes the steam, previously to entering the retorts, to pass through tubes situated in the interior of the piers or buttresses of the brickwork of the furnace, by which the steam will become sufficiently superheated, so as not to cause the charcoal to coal too quickly. The steam is introduced into the retorts by tubes having perforated roses, and situated in the interior of the retorts. These tubes extend over the entire length of the layer of charcoal. The steam is so distributed over the decomposing material that an equal degree of heat is kept up on the entire surface of the decomposing material, whereby an equal decomposition of the steam and evolving of hydrogen will be secured, and the generating of carbonic oxide in great measure prevented. *Patent completed.*

2313. J. HICK, W. HARGREAVES, and R. HARWOOD. *Improvements in governors or regulators for prime movers.* Dated October 16, 1858.

This relates to apparatus for regulating the supply of water to water-wheels, and consists in connecting the slow shuttle or valve, the position of which is to be adjusted for regulating the speed of the water wheel, &c., with a piston moveable in a cylinder. *Patent completed.*

2314. P. JENSEN. *An improved apparatus for governing or regulating the speed of marine engines.* Dated October 16, 1858.

Here the inventors employ a cylinder placed in communication with the water at one end, whilst the other end thereof is closed. It is fitted with a moveable piston, and the latter is connected with the throttle or other valve regulating the admission of the steam to the cylinders of the engine. The more deeply the stern of the ship becomes immersed the more the pressure of the water upon the piston in the regulating cylinder increases, the greater is the force wherewith the piston is thrust towards the closed end of the cylinder, and the more the air between the piston and cylinder cover becomes depressed, and *vice versâ*. *Patent abandoned.*

2315. A. ROBERTSON. *Improvements in applying starch and similar matters.* Dated October 16, 1858.

This consists, 1, in causing the fabric, &c., to be passed in contact with a roller or drum having a film of the starch or similar matter on its surface and moving in the same direction as the fabric, &c., but at a slower rate; 2, in rubbing the starch, &c., into the fabric by a second roller or drum, and moving in a direction opposite to that of the fabric, but not supplied with starch, &c. *Patent abandoned.*

2316. A. DUNN. *An improvement in preparing marking compounds to be used on linen and other fabrics.* Dated October 16, 1858.

This consists in making up materials, such as the compounds of silver, &c., and other materials used in the preparation of marking inks, in a solid state, in combination with any suitable material, such as black lead, &c. The compounds are made up in forms suitable to be used in ever-pointed pencils, &c. The materials to be marked should be written on while damp. *Patent completed.*

2317. B. NICKELS. *Improvements in electric telegraphs.* Dated October 16, 1858.

This consists in using wires not electrically insulated from the water, and in so constructing and arranging an electric telegraph between two places separated by water as to use the intervening water in forming the battery employed for working the telegraphs. *Patent completed.*

2318. W. CLAY. *Improvements in combined thrashing and dressing machines.* Dated October 18, 1858.

This relates to operating upon the corn after it has left the drum of the thrashing apparatus. On leaving the drum the straw is received upon shakers, to which motion is given by a crank shaft. The shakers are supported upon rocking bars which cause the shakers when acted upon by the cranks to have a tossing motion, which throws the straw out at the end of the machine. The grain and chaff is received upon an inclined vibrating trough the whole length of the machine, at the lowest end of which trough there is a riddle. A current of air from a fan-blower drives the chaff out at the hinder end of the machine, while the grain falling through the riddle passes into a box at the side of the machine from whence it is raised by an endless chain of buckets into a hummeller through which it is led to the opposite side of the machine where it falls into a vibrating riddle box attached to and moving with the vibrating trough. Within this riddle box there are two riddles, one above the other, and a screen beneath; while passing these riddles the grain is exposed to the action of a second blast to drive off chaff, &c., not before got rid of. The motion of the riddle box causes the small grain and seeds to pass through the screen to one spout, while the best corn is separated and delivered through another. *Patent completed.*

2319. J. A. MASON. *Improvements in washing machines and apparatus for wringing and mangling.* Dated Oct. 18, 1858.

This washing machine consists of a box in which the linen, &c., is placed in layers separated by corrugated plates or frames made of wicker work, wood, etc., every alternate frame being moved backwards and forwards by an eccentric spindle in a direction opposite to the motion of the intervening frames, and to the directions of the corrugations thereon. The frames are held down so that the pressure can be regulated. The wringing and mangling apparatus consists of two or more rollers affixed near one end of the box, and the necessary pressure is obtained by causing the box to act as a weight upon the axles of the rollers. *Patent abandoned.*

2320. W. A. F. POWELL. *Improvements in stopping or closing jars and bottles.* Dated October 18, 1858.

The inventor forms the stopper with a shoulder on its underside which fits on to a corresponding seat within the neck of the jar or bottle; an interposed washer of india-rubber, &c., making an air and water-tight joint when the stopper is pressed home. On the upper surface of the stopper there are two grooves at right angles to each other, for the reception of a string or wires, which being passed round the neck of the jar or bottle and tied over the stopper secures it tightly in its place. *Patent abandoned.*

2321. C. WEST. *Improvements in the mode of insulating and covering wire.* Dated October 18, 1858.

The patentee claims, 1, the mode of applying a solvent to the india-rubber covering of a wire as described for causing the folds of india-rubber to adhere together, and effecting a more perfect insulation of the wire. 2. The mode of subjecting the india-rubber covering of a wire to the action of a moist heat for causing the folds of india-rubber to adhere together, and effecting a perfect insulation of the wire. 3. The covering of insulated wires with yarns of fibrous material saturated with a composition for preserving such fibrous material, and causing it more effectually to protect the insulated wires. *Patent completed.*

2322. R. TIDMAN. *Improvements in machinery or apparatus for paying out and for raising electric telegraph cables.* Dated October 18, 1858.

This consists in the use of floating rafts or platforms for carrying and delivering the cables when paying them out, and for winding cables upon when it is desired to raise them. The cable passes over horizontal rollers on the lightest or aftermost raft to facilitate the delivery of the cable. The rafts are towed by a steamer. *Patent abandoned.*

2323. R. A. BROOMAN. *Improvements in the manufacture of small chains and links for the same.* (A communication.) Dated October 18, 1858.

Here a quantity of metal wire is wound upon a reel, and the end of it is led between tension rollers to a holding and cutting apparatus moved by a cam. Between the tension rollers and the cutting apparatus a nipping contrivance is placed to prevent the wire flying back when it is cut. The wire next passes through a guide hole, and then comes between the two parts of a forked mandril which is moved round by a pinion driven by a lever. The motion of the mandril gives the first bend to the wire by winding it partially round the said mandril. A kind of die is then advanced by another cam, shears off the bent piece of the wire, and, still advancing, gives the second bend to the same. A spring arm or presser is then moved against the first bend and forces the wire around a second mandril, completing the link. The second mandril is then pressed out of the link by a cam acting upon a lever attached to it or otherwise; the die is drawn back and all the parts return to their first positions, the finished link being at the same time passed out into a receiver. This is the complete process of making the single links; but if the links are to be formed continuously in the form of a chain, a kind of pincer or tool with one point barbed is interposed between the guide hole before mentioned and the first mandril, and is worked so as to place and keep each link within, or looped to, the adjacent one. *Patent abandoned.*

2324. K. H. CORNISH. *A new mode of advertising.* Dated October 18, 1858.

The inventor prints one address on a sheet of paper, or a number of different notices in squares or other divisions, and gives away this printed paper for use in the water-closets of Government offices, banks, railway stations, and other large establishments. *Patent abandoned.*

2325. W. E. NEWTON. *Improvements in apparatus for lighting gas and other lamps.* (A communication.) Dated October 18, 1858.

This consists in lighting lamps by electricity, or by the discharge from a galvanic battery. *Patent abandoned.*

2326. A. W. DRAYSON and C. R. BINNEY. *Improvements in submarine telegraphic cables.* Dated October 18, 1858.

The patentees use a much thicker wire than usual and cover it with silk, or other fibrous and non-conducting material. This silk, &c., is secured on the wire by a solution of india-rubber, &c., and the wire thus protected is enclosed in a tube of vulcanised india-rubber, so as to leave a vacant space around the enclosed wire, which thus will be enclosed in a kind of tunnel. To compensate for any undue strain on the cable, and to impart to it a certain amount of elasticity, they introduce lengths of cable from half-a-mile to a mile long, constructed upon such a principle as will admit of such lengths elongating to a certain extent when subjected to any undue strain. *Patent completed.*

2327. J. SMITH. *Improvements in rough-shoeing beasts of draught and burden.* Dated October 18, 1858.

This consists in the use of a plate or ring to which clips are attached to fit the outsides of the shoes of horses, and by causing these clips and the plate or ring to be drawn together, roughing pieces, or a snow-plate are fastened tightly upon the shoe, and thus the feet of the animal are prevented from slipping or being clogged by snow. *Patent completed.*

2328. E. WALKER. *An improved filter.* (A communication.) Dated October 19, 1858.

This invention is not described apart from the drawings. *Patent completed.*

2329. J. WHITWORTH. *Improvements in guns, gun-carriages, and ammunition.* Dated October 19, 1858.

This invention was described and illustrated at page 285, No. 18, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

2330. W. F. BATHO and E. M. BAUER. *Improvements in screws, worms, and wheels, and in machinery or apparatus for cutting the same.* Dated October 19, 1858.

This consists in constructing worms and worm-wheels, to work together so that their pitch lines will coincide, and that all the teeth of the worm will bear evenly on the teeth of the worm-wheel. *Patent abandoned.*

2331. J. OWEN and H. DUCKWORTH. *Improvements in looms.* Dated October 19, 1858.

This consists in placing the crank shaft as near the bottom of the loom as it can be conveniently worked, and the sword arm shaft much higher than is at present adopted. The picking motion is obtained by placing in each fly-wheel a bowl or tappet which acts as the wheel revolves on a lever connected by a rod or band to an arm in connection with the picking stick, the top of which is either at the side or passes through the slay bottom. Each lever is made to move out of the way of its corresponding bowl by a cam, and where several shuttles are used, pattern cards or lays are employed to govern the movement of the picking sticks. A damping apparatus is employed under the cloth and yarn beam. *Patent completed.*

2332. A. ALLAN, T. WHIMSTER, and R. GRAY. *Improvements in steam boilers, also applicable in part to gas meters, lamps, and lubricating and other apparatus requiring a constant liquid level, and in part to pressure-indicating apparatus.* Dated Oct. 19, 1858.

This invention is not described apart from the drawings. *Patent completed.*

2333. J. RICHMOND. *The construction of valves, applicable especially to water meters, and other instruments for measuring fluids, and all hydraulic purposes.* Dated October 19, 1858.

Here a quarter rotary valve is made of brass or iron. The chief object is to reduce friction. The valve is of the disc construction, and is so made that it can be eased off the face without loss of water or any other fluids that it may be applied to. The upper disc has a hollow box, and on being moved a quarter round will give either egress or ingress to the required passages, and at the same time will be quite tight on the faces. The spindle of the upper disc does not come through the valve, but is kept up in the lower box by a cylinder, and can be regulated as required. *Patent abandoned.*

2334. W. E. NEWTON. *Improvements in apparatus for washing clothes and other articles.* (A communication.) Dated October 19, 1858.

This consists in placing the clothes, suds, &c., in an air-tight vessel, and by a pump, or other equivalent contrivance connected with the upper part of the vessel, exhausting first the air and then the vapour from the upper part of the vessel, thereby removing the pressure from the surface of the heated water, which will be thrown into violent ebullition while considerably below the temperature of 212° Fahrenheit. *Patent completed.*

2335. W. E. NEWTON. *Improvements in the hanging and arranging of cylindrical, conical, or spiral steel railroad springs, for railway carriages.* (A communication.) Dated October 19, 1858.

This consists in arranging such springs in groups, or series of four or more springs placed in double lines vertically, so as to possess the length of elastic action whic

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two series of the springs would have if placed the one above the other, while the space which they occupy vertically is very much less than they would require if the springs were placed in pairs one above the other. *Patent completed.*

2336. W. GOSSAGE. *Improvements in the utilization of alkali-waste.* Dated Oct. 19, 1858.

This comprises, 1, the separation of sulphuretted hydrogen from such mixed gases (obtained from alkali waste) and thereby obtaining carbonic acid gas of sufficient purity to be usefully applicable. 2. Means whereby alkali waste can be caused to absorb oxygen from atmospheric air, and the use of such oxidized alkali waste for the production of sulphurous acid gas, and carbonic acid gas. 3. The extraction of sulphuretted hydrogen and carbonic acid gases, also sulphur, from alkali waste by causing such waste to be decomposed by the action thereupon of such acid liquors as are obtained by the use of muriatic acid in the manufacture of chlorine. 4. The production of sulphuret of iron and sulphuret of manganese by the action of alkali waste in the acid liquors obtained in the ordinary manufacture of chlorine, by the use of muriatic acid, and the application of metallic sulphuret so obtained for producing sulphurous acid gas. *Patent abandoned.*

2337. R. A. BROOMAN. *Improvements in propelling vessels.* (A communication.) Dated Oct. 19, 1858.

This relates to the propulsion of vessels for carrying burdens, such, for example, as are used in canals, and is designed mainly to combine means of adapting the propelling surface to the various draughts of water of the vessel, with other necessary qualities. It consists in employing propellers each composed of a float-board attached to vertical rods or arms, the upper ends of which are connected to cranks, and which are combined with other rods and crank so that throughout its motion the float-board always remains vertical. The motion of the vertical rods and of the float-boards is in fact the same as if they depended from a rotating crank pin and met with no resistance. The supplementary rods and cranks are added for enabling the propeller to move in this manner while encountering the resistance of the water. The float-board is adjustable and may be readily shifted up and down the vertical rods and arms to suit the varying draughts of water of the vessel. Any suitable number of such propellers may be employed in a vessel. *Patent completed.*

2338. J. GRANT. *Improvements in constructing and arranging ovens suitable for baking bread.* Dated Oct. 19, 1858.

Here two furnaces are constructed one opposite the other, and the heat from these furnaces passes into a chamber between the two furnaces, and in this chamber are placed ovens, arranged so as to leave spaces between the ovens and the end and top and bottom of the chamber, and also between the ovens themselves, so that the products of combustion from the furnaces in passing to the flue which leads from the top of the chamber comes in contact with three of the sides, and with the top and bottom of each of the ovens. The ovens are constructed of wrought iron plate. *Patent completed.*

2339. W. RIDDLE. *Improvements in packing or forming merchandize or goods into bales.* Dated Oct. 19, 1858.

This consists in packing goods into bales by compressing them as heretofore, and securing them when so compressed by bands of iron, each band covered with a textile material saturated with a solution of india-rubber. *Patent completed.*

2340. L. STIEBEL, and C. F. O. GLASSFORD. *Improvements in machinery for moulding washing blues, and other materials while in a plastic state.* Dated Oct. 20, 1858.

Here the inventors effect the moulding of the plastic material by dies formed of several pieces, the lower die having a central portion that rises after each stroke sufficient to relieve the material from the lower die worked by an eccentric or crank motion. The dies while in use are kept heated by jets of gas. The material is supplied to the dies by a cylinder having a lower aperture through which the material is caused to exude by the action of an archimedean screw. *Patent abandoned.*

2341. R. D. CLEGG. *Improvements in screws.* Dated Oct. 20, 1858.

This consists in making screws of such form that they can be fixed or screwed without a hole being first made for their reception. The patentee effects this by making a part of the screw similar to a gimlet. *Patent completed.*

2342. P. C. STORTZ. *Improvements in the materials of photographic plates.* Dated Oct. 20, 1858.

This consists in substituting prepared copper or other material, plates, panels of wood, millboard, canvas, or other materials having oiled or varnished surfaces, such as are usually used for painting upon in oil, for the ordinary materials upon which photographic images are deposited or printed. *Patent abandoned.*

2343. R. GRIFFITHS. *Improvements in baths.* Dated Oct. 20, 1858.

This invention was described and illustrated at page 281, No. 18, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

2344. T. TWELLS. *Improvements in machinery for embroidering or ornamenting woven, looped, or laced fabrics.* Dated Oct. 20, 1858.

This consists, 1, in the use and method of action of a needle with a single barb, which pierces the fabric to be ornamented; 2, in causing the needle to revolve, so that the back of the needle always stands in the same direction as the fabric is moving to form the required pattern; 3, in having a bobbin or spool with a hole through its centre to allow the spindle containing the needle to pass through; also in having a small head upon the bobbin or spool with two holes, one for the needle to pass through, and the other for the extra thread to pass through; 4, in placing one or more needles out of the centre of the needle spindle, so that in revolving stitch by stitch it will describe a greater or less circle, according to the required pattern. There are various modifications included. *Patent completed.*

2345. J. WAINWRIGHT. *Improvements in ventilating houses and other places.* Dated Oct. 20, 1858.

This consists, under one modification, in ventilating houses, cabins of ships, and other places, by forming holes in the sash frames, and placing over these holes metallic plates or screens. *Patent completed.*

2346. S. T. CLARKE. *Improvements in apparatus for crossing bankers' cheques and drafts.* Dated October 20, 1858.

This relates to crossing banker's cheques by punching out portions of the paper. The apparatus consists of a press body with a vertical slide which is steadied and guided in its movements by one or more guiding feathers formed upon it, such feathers fitting into corresponding grooves or slots made in the inside of the socket within which the slide works. At the bottom of the slide is fitted a metal block, to the under surface of which is secured a series of fine punches arranged in the form required for producing the parallel lines and words required. These punches are so secured to the block that any one of them may be removed if damaged and replaced by a new one without destroying the entire die. *Patent completed.*

2347. C. C. ALGER. *Improvements in cupola furnaces.* Dated October 21, 1858.

This invention is not described apart from the drawings. *Patent abandoned.*

2348. J. and S. MARLAND. *Certain improvements in power looms.* Dated October 21, 1858.

This consists, 1, in certain variations in the letting off motion. 2. In variations in the taking up motion. 3. In the application of a clutch-box or ratchet motion to the warp beam, to facilitate the tightening of the warp when required. 4. In the application of an improved easy motion to relieve the shuttle from the pressure of the swell at the moment it is being thrown through the shed. These several improvements are not described apart from the drawings. *Patent completed.*

2349. P. CLERC and A. PIAGET. *An improved method of winding watches, chronometers, and time-pieces without the use of a separate key.* Dated October 21, 1858.

Here a piece is cut round the wind-up hole, and a piece of the same metal and shape is introduced into the hole and fitted to the square or pipe. Then a handle forming part of the round plate is raised, and when held with the thumb and fore-finger will wind easily. The handle is then shut down level with the dome of the watch, so that it is not seen, and by that contrivance the watch is preserved from dust. *Patent abandoned.*

2350. C. W. WILLIAMS and G. EYTON. *Improvements in the construction of locomotive and other steam boilers.* Dated October 21, 1858.

This consists in giving the tubes or flues of tubular boilers an increased diameter with an increased run or passage along which the products of combustion pass to the chimney. The tubes or flues are furnished with heat conductors and heat agitators by which their absorbing surfaces are rendered more efficient and an increased amount of water vaporised. Provision is also made for the introduction of the required quantity of atmospheric air with an adequate space for the admixture and diffusion of the air and gases, and for which purpose a separate chamber will be provided. The chief feature of the invention is the combination of the several parts. *Patent abandoned.*

2351. J. M. NAPIER. *Improvements in printing presses, and printing machines.* Dated October 21, 1858.

In the common hand press used for letter press or raised surface printing, the patentee constructs the frame of the hand press all in one casting, including the feet upon which it stands to raise it to a convenient level from the floor. The table upon which the type is placed is not so deep, nor is it ribbed up so strongly as those usually employed, which sustain the whole of the pressure (when the impression is taken from the type) upon two bars which slide in the bed or guide rails, but it is provided with a number of bearing strips in addition to the usual guide bars. These bearing strips are correctly planed so as to rest upon opposing bearing strips upon the bed below, which are also planed true, and so arranged as to support the table against the pressure more generally over its surface, the bed thus taking its usual strain, while the table, being well supported by the bearing strips on the bed, may be made much lighter and will at the same time present a more rigid surface. He makes the platten in one casting with the guides which rise up from it for steadiment against the top of the press frame, instead of the plan at present adopted of bolting these guides to the platten. The invention also includes other modifications. *Patent completed.*

2352. E. B. HORN. *An improved compensation apparatus for a hair-spring balance for a watch or time piece.* Dated Oct. 21, 1858.

The purpose of what is termed the chronometer balance is to compensate for the stretching of the hair spring caused by different degrees of temperature. Instead of the chronometer balance, or any such contrivance making part of a balance wheel of a watch, the inventor employs what may be termed an expansible or compensating spiral cord, separate from the balance wheel, and formed of two strips of metal laid side by side, and united together where they touch one another, one of the strips being made of brass, while the other or outer one is constructed of steel. *Patent completed.*

2353. G. REDFORD. *A circular and self-acting cartridge pouch.* Dated Oct. 21, 1858.

These pouches are made in a true circular form with rounded ends and sides so as to fit the body. They are made self-acting by a flat or zig-zag wire spring placed inside of the pouch. They are composed either of leather or papier maché japanned or covered with leather; or when great strength is required of a combination of strong linen or cotton cloth, canvas, or thin metal. *Patent abandoned.*

2354. J. BALDWIN, Jun. *Improvements in files or holders for papers, letters, bags, and other similar articles.* Dated October 21, 1858.

The patentee attaches, by screws, a metal plate to a shelf or rail of wood. At the foot of this plate he affixes a long needle point to receive the papers or bags. At the top of the brass plate is attached a spring, tightened to the plate by a small set screw and collar; the opposite end of the spring may be forked, or it may be furnished with a padded shield or cap, or the end of the spring itself may be turned up to form a protection for the point upon which the papers or bags are pierced. The spring thus serves to keep such papers, &c., upon the needle until required for use. *Patent completed.*

2355. R. A. BROOMAN. *Improvements in knitting frames.* (A communication.) Dated October 21, 1858.

According to this invention, all the parts now forming knitting frames remain, but the motions thereof are produced mechanically, so as to make them self-acting. By a repetition of parts along a frame, a great number of similar fabrics may be produced at one and the same time. The drawing shaft runs along the front of the frame, and through bevel gearing and an inclined connecting shaft, motion is communicated to another shaft with eccentrics, which are arranged upon it in such manner as upon the revolution of the shaft to set in motion levers and arms, which in turn produce all the movements now effected by hand. *Patent abandoned.*

2356. R. A. BROOMAN. *Improvements in apparatuses for regulating the supply of fluids.* (A communication.) Dated October 21, 1858.

This relates to cocks or valves for supplying fluids to cylinders, gauges, pipes, and other vessels from which it is desirable to allow the contained fluid to escape when the supply is cut off; and the invention consists in employing an eccentric cock or valve with two or more faces, which bear alternately against vulcanised india-rubber seats, when the spindle of the eccentric is turned, in such manner that when the supply-port or passage is opened, an escape-port or passage is closed, and *vice versâ*. The spindle is packed with compressed vulcanised india-rubber, and the cock or valve seats, together with the packings of all other outlets and inlets to the body of the apparatus, consist of blocks of vulcanised india-rubber, compressed by bolts or screws. The spindle of the cock or valve may be turned by any suitable means. Apparatuses constructed as before described may be applied to gauges, water-pillars, hydraulic cranes, and to various other purposes. *Patent abandoned.*

2357. R. A. BROOMAN. *Improvements in cocks, taps, and other apparatuses for regulating the flow of fluids.* (A communication.) Dated October 21, 1858.

The object here is so to construct cocks, taps, &c., for regulating the flow of fluids that their flow may be instantaneously permitted or intercepted, that the joints may be always fluid tight, that contraction and expansion of the apparatuses from varying temperatures and other causes may be provided for, and that certain of the parts may incline themselves to each other without injuring the action of the apparatuses; and the invention consists in certain methods of applying india-rubber in the construction of such apparatuses. *Patent abandoned.*

2358. J. H. JOHNSON. *Improvements in apparatus for lubricating railway axles and other bearings.* (A communication.) Dated October 21, 1858.

This consist in employing a capillary pad composed of wool, cotton, &c., combined with a metallic conducting spout which is pressed by springs against the underside of the enlargement of the journal of the axle or shaft. The pad is placed above the level of the oil in the reservoir, so that it will remain in a comparatively dry state. *Patent completed.*

2359. J. BURRIDGE. *Improvements in fire-lighters.* Dated October 22, 1858.

This consists in making perforated fire-lighters from solid wood by the use of tubular saws, or by cutting, boring, or drilling. It also consists in a method of cutting bundle fire-wood by means of a cutting form, in connection or not with the tubular saws, cutting, boring, or drilling instruments. *Patent abandoned.*

2360. E. WHITEHALL. *Certain improvements in machinery for the manufacture of cap fronts.* Dated October 22, 1858.

This relates to certain improvements upon the details of a former patent, and is not described apart from the drawings. *Patent abandoned.*

2361. J. and W. BAGNALL. *An improvement in the manufacture of iron.* Dated October 22, 1858.

This consists in forming the piles by first passing the iron between rolls or cylinders with grooved surfaces, so that pieces of iron may be obtained with grooves on their surfaces; and these being superimposed or piled, their grooves will fit into each other, while by using one grooved and one smooth roll in conjunction, pieces grooved on one surface only will be produced to form the top and bottom of the pile, and present flat outside surfaces. On submitting the piles thus formed to the usual subsequent rolling operation, better distribution and superior texture and quality of iron will be obtained. *Patent completed.*

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Dates of Registration.	Nos. in Register.	Names and Addresses.	Subjects of Design.
April 29,	4169	Garton & Jarvis, Exeter	Lock.
May 4,	70	Cottam & Co., Oxford-st.	Drying Horse.
,, 7,	1	Bigg & Millikin, Boro'	Artificial Breast.
,, 13,	2	Elliott Bros., Strand ...	Levelling Staff.
,, 13,	3	Lambert & Son, Bristol	Fastener.
,, 14,	4	E. Parks, Fleet-street...	Kettle.
,, 17,	5	Walters & Co., Sheffield	Vice.
,, 21,	6	Permanent Advertising Company Gracechurch street	Post Advertiser.

PROVISIONAL REGISTRATIONS.

April 29,	1071	C.T.Gibson, Clerkenwell	Scrutoire.
,, 30,	2	G. B. Galloway, Newcastle	Omnibus.
May 6,	3	Lea & Brown Edgbaston	Aquarium Ring.
,, 7,	4	J. Ottignon, Bloomsbury	Fire Escape.
,, 9,	5	Horwood and Levy, Whitechapel.	Muff.
,, 11,	6	Shearer and Mundy, Lilypot-lane.....	Chess-board.

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, JUNE 3, 1859.

THE COINAGE OF THE REALM.

WE learn with much satisfaction that the articles on the state of the coinage which have been published in our columns during the last few months, and quoted in the *Times* and other journals, have met with the grave consideration of the Government, and that steps are being taken to remedy the inconvenience of which, with such good reason, the public have long complained. As regards the copper portion of the metallic currency, we have it on the best authority that an immediate improvement is contemplated, namely, the substitution of bronze pieces of the value of one halfpenny each for the old-fashioned and eccentric varieties of halfpence now in circulation.

This movement, we trust, is but the prelude to a complete and radical change in the inferior currency generally, and to a gradual reform of the superior currencies. We have pointed out the evils besetting the existing coinage, and in urging the application of remedial measures, have shown in what way to apply them with any chance of success. It is true that the English community are not gained over readily to new systems and plans, however clearly their value may be demonstrated, but in the matter of the coinage there must be few amongst us who are not anxious for a complete remodelling of it, or who would fail to applaud the Treasury and the Mint for commencing the good work. It will be our province to remind the authorities of both places should they falter in their onward movement that the public eye is upon them, and that with the means they have of effecting the reform desired, delay will not be regarded favourably.

ARMS FOR OUR VOLUNTEER RIFLEMEN.

As the gentlemen of England have made a sudden resolution to become riflemen, the Lord Lieutenants and Deputy-Lieutenants of counties have to perform a very important duty in making choice of the arms which shall be put into the hands of their respective corps; and as they run some risk of being misled in this matter, we will make reference to a fact or two for their guidance.

In the first place it is very evident that, notwithstanding the many and great improvements which breech-loading rifles have lately undergone, their immediate adoption cannot be recommended. Five or six years hence, or perhaps before, we shall doubtless have tested and modified them sufficiently, and have so far adapted the cartridge to them, as to enable us to substitute them on all desirable occasions for the muzzle-loading arm. But meanwhile we must content ourselves with the latter for general service. Turning, then, to the rifles already in use, from which alone we can prudently select a weapon for our volunteers, we find our choice limited to two—the Enfield and the Lancaster rifles—the comparative merits of which have been put beyond all question by actual service in the field of battle, as well as by the severest tests of target practice. Under many circumstances the Enfield arm fails utterly, often in the midst of the fight; under all circumstances it is liable to refuse the cartridge after a few rounds. The cause, or we may say the causes, of this are now well understood, and are known to be such as we have no present hope of remedying. On the other hand, the oval-bore Lancaster is entirely free from such defects. In the hands of our artillerymen it has repeatedly demonstrated its superiority to the Enfield in point of accuracy, and in late campaigns in India it has in no instance failed, although it has been put to the severest duties. We need not insist further upon this, because the oval-bore Lancaster is recognised as the one and only unfailing weapon with which the ordinary service ammunition can be used. This being the case, and it being manifestly desirable that the volunteer rifle corps should be so armed that they may use the service ammunition if called upon to act, it becomes evident that the Lancaster rifle is the best weapon which such corps can adopt.

With these facts before us, we have to account for the circumstance that in the Circulars on Volunteer Rifle Corps, issued from the War Department, the Enfield, and not the Lancaster, is the rifle recommended. Why is this? The reason appears to us to be sufficiently plain. It must be evident from what we have already said, that General Peel and his colleagues would gladly replace the Enfield by the Lancaster weapon throughout the regular service. But then they have an immense stock of Enfields in hand; so many that, notwithstanding the disparity between the number of our troops and those of France, we probably have eight or ten rifles for every one possessed by the French—a fact which has to a certain extent resulted from the incapacity of French manufacturers to compete with our own in the art and mystery of gun-making. Under these circumstances, what is to be expected but that an ingenious attempt should be made by the War Department to dispose of their present stock of Enfields to volunteer corps, whose mere establishment will be a guarantee against invasion, and therefore a security against their arms ever being brought to the test of battle?

In all this the officials of the War Department are doubtless acting wisely for their own interest. And if it should happen that the volunteer movement should be so far extended as to include those classes who cannot afford to buy their own arms, a legitimate means of disposing of the Enfield rifles will be provided. That it will be so extended, if the Government can manage the matter, we do not doubt. But those volunteer corps who are about to purchase their own arms may surely refuse to buy up the Enfield rifles, when the Lancaster arm, which is in reality the only model used in the Queen's Service with complete satisfaction, is equally accessible to them.

A word to the wise is enough!

THE NEW POLYTECHNIC INSTITUTION.

WHAT a happy thing it would be for England if by some blast of thaumaturgic art we could suddenly inspire all our populations with the fulness of the knowledge of science! The advantage of such an inspiration would spring, not only from the intrinsic value of the knowledge itself, but also from the banishment of those vain fancies and chimeras which now abound and predominate in the minds of the multitude. Notwithstanding all our boasted progress, for every one amongst us who is content to garnish his mind with the truths which heaven permits us to know, and with them only, there are hundreds who still retain their reverence for the idle conceits of speculation and tradition.

We have cause to be thankful, however, that the progress of knowledge, although less rapid than we could sometimes desire, is nevertheless certain and continuous. Of this there can be no doubt. We likewise know that its advance can be aided by our exertions. Every school, every educational class, every scientific institution in the kingdom, is daily spreading it abroad among the masses. In the metropolis, in particular, we have many agencies established with this express design. One of them—the Polytechnic Institution, of Regent-street—has been known for twenty years to thousands even of our country population. It has in its time done very much for the diffusion of scientific light and influence. But it has lately, we regret to say, been running a great risk of suffering extinction; and it is with the hope of averting this evil that we now address our readers.

In consequence of the lamentable accident which occurred on the premises of the Institution on the 3rd of January last, combined with other causes, it has unfortunately been found necessary by the proprietors to wind up its affairs, inasmuch as the system of management adopted ever since its establishment in 1838 has been on too lavish a scale to allow of the accumulation of any reserve fund for meeting extraordinary contingencies. The prospect of the discontinuance of an Institution which has, for many years, exercised so beneficial an influence has occasioned great regret; and a number of friends of intellectual and social improvement have agreed to join their efforts to prevent such a loss to the metropolis. They purpose forming a new society under the Acts of Parliament limiting the liability of shareholders; the society having for its object the acquisition of the whole of the property of the present Royal Polytechnic Institution, with a view of continuing the useful class of exhibitions and lectures which have heretofore been highly appreciated by the public, with such extensions and improvements as may be suggested by the experience of the past, and by an earnest desire, we believe, to uphold the high character of the original Institution.

Careful calculations lead to a confident belief that the new Polytechnic Institution will be satisfactorily remunerative to the shareholders, even supposing the receipts from the public under the new management not to exceed those of former years. This may be more readily understood when it is borne in mind that in the new Institution there will be a capital of only £16,000 (of which it is proposed to call up no more than £12,000), whereas the former company had expended a capital of £35,000. It is, of course, the duty of the directors to realize the utmost amount with the property entrusted to their charge; but a careful computation leads the promoters of the new institution to believe that the premises, machinery, and plant as they now stand will not, when offered to public competition, realize more than £4,500. It is proposed, therefore, 1st, to effect the purchase of these for the sum of £4,500; 2nd, to expend a sum not exceeding £3,000 in re-constructing the staircases, rendering the entrance-hall fire-proof, effecting certain alterations to enable the society to let off portions of the premises facing Regent-street at a rental of £300 per annum, and accomplishing other improvements which will materially tend to the success of the renovated Institution; 3rd, to apply the sum of £2,500 in reduction of the rent of £442 at present payable for the great theatre, to a ground-rent of £50 per annum; 4th, to reserve the sum of £2,000 for procuring a new charter, and for immediate working capital. On going over the estimated assets and expenditure, as stated in the society's

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schedule, which is based on the accounts of the late Institution and the experience of those best acquainted with its management, we find that the dividends anticipated to be secured to shareholders, exclusive of one per cent. for a sinking fund, amount to nearly six per cent. on the capital proposed to be called in. The projectors of the new Institution profess, however, that they have not so much in view the realisation of a highly profitable investment as the upholding in the metropolis of a class of scientific attractions and intellectual recreation, the loss of which would be lamented as a great public evil.

"The new establishment will combine," we are told, "with the most useful and interesting of the attractions which raised so high the reputation of the late Polytechnic Institution, various new features tending still more efficiently to improve the moral, intellectual, and physical condition of the people. In order the more effectually to secure the maintenance of this principle it is contemplated to form, if possible, under the patronage of His Royal Highness the Prince Consort, the patron of the late Institution, a body of vice-patrons, to be selected for rank and station, or for eminence in philanthropy, education, and the branches of knowledge specially furthered by the Polytechnic Institution. The vice-patrons to elect a board of visitors who will inspect the institution with a view to maintaining its activity in the right direction." The following are among the arrangements which are intended to be adopted, subject to such modifications as practical experience may suggest to the Board of Management, viz.—"To gather information of, and, if possible, to obtain for exhibition, every genuine novelty in science, art, or industry which may appear in this or any other country"—which, we beg to say, is far too large an undertaking, notwithstanding that it is hoped to obtain for this purpose "the assistance of a committee of hon. referees of well-known competency in the several branches of science and art, and whose names will be a guarantee that little is omitted that might be desirable, and nothing admitted that might be undeserving." An efficient staff of demonstrators will be employed in explaining the objects exhibited; competent professors will deliver popular lectures on the most appropriate topics of the day; the economic museum or collection of illustrations of household and health economy, for which considerable materials have been collected and partly arranged in the western portion of the Polytechnic building, will be gradually developed so as to form, as far as practicable, a complete repository of useful knowledge for every-day life. A series of lectures will be delivered in connection therewith, their design being to teach the working classes how they may materially improve their condition by a judicious management of their expenditure. Special courses will be organised for the practical training of housewives in the most essential branches of domestic economy. The reading-room will contain besides the ordinary books, periodicals, charts, dia rams, and other educational appliances, all those that may be required for reference in connection with the leading purposes of the establishment. It is hoped by the projectors that this department will form a convenient centre for international correspondence on matters connected with the well-being of the industrial classes, according to the plan adopted by the Philanthropic Congress held at Brussels in 1856.

They also propose that the efficiency of the Polytechnic laboratory, both as a school of chemical manipulation and for analytical purposes, shall be carefully sustained, and in the latter department it is purposed to carry out a system of consultations, and of careful and conscientious analyses, for the detection of adulteration and fraud in the common necessaries of life, at a scale of charges sufficiently low to render them generally available. Evening classes will be established under the management of a distinct committee and with a separate fund. No pains will be spared, we are further told, for organising special and appropriate courses of lectures for those trades which may supply a sufficient number of subscribers, and every endeavour will be made to prepare worthy candidates for the trades examinations and diplomas, which it is hoped will shortly be added by the Society of Arts to the system of examinations and prizes in general education which it has organised with so much success, at the suggestion and under the guidance of Mr. Harry Chester. It may also be desirable to institute, on subscription, educational courses for being regularly attended by the boarding and day-schools of the neighbourhood in the manner practised with regard to municipal colleges on the Continent. In addition to all that we have named, and even more, the most liberal system will be pursued for the daily admission of working-men and their families by means of half-price tickets, distributed through the medium of their employers, or of the vice-patrons and shareholders of the Institution.

Having thus laid the proposals of the projectors of the New Polytechnic Institution before our readers, we ask their support for it, if, when the names of the gentlemen who are interesting themselves in the movement shall appear, they shall be deemed, as we doubt not they will, worthy of our confidence.

THE HOUSES WE LIVE IN.

WITHOUT knowing it—without even in the least suspecting it—many a fond father becomes the slow poisoner of his family, by selecting an unhealthy house to rear them in. It is exceedingly sad that it should be so. It is grievous enough to know that an absent child is liable to come to an untimely end—to be sure that the poet speaks but too truly to many a parent when he says—

"O father, wheresoe'er thou be,
"That pledgest now thy gallant son;
"A shot, ere half thy draught be done,
"Hath still'd the life that beat from thee.
"O mother, praying God will save
"Thy sailor,—while thy head is bow'd,
"His heavy-shotted hammock-shroud
"Drops in his vast and wandering grave."*

But it is in reality much more tragical to know that hundreds, aye thousands, of sons and daughters, in London alone, are sickening, fading, dying away daily, under the very eyes of those to whose care they are committed, but who are too ignorant to detect the maladies which they occasion.

Our thoughts have been turned to this subject by an address delivered last month at the Royal Institution, by Dr. Druitt, a member of the Royal College of Physicians, the official abstract of which address has just come into our hands. So interesting are the facts and so suggestive the observations of Dr. Druitt on this impressive subject, that they deserve all the publicity and all the prominence we can give them. Having alluded to the sickness, bereavement, and ruinous expense which sometimes ensue from the wrong choice of houses by private individuals, and to the disorders liable to be diffused amongst all classes from the unhealthy dwellings of the poor, he proceeded to consider the subject of houses and their influence on health, under three heads. Under the first, he treated of deficiencies of air, light, warmth, and dryness, and of the maladies of degeneration to which they give rise, of which consumption and scrofula are types; under the second, he spoke of the common typhoid fever of this country, and of choleraic disorders, and of their origin in defective house-drainage; and under the third, he discussed the conditions which give intensity and power of propagation to certain diseases, such as scarlatina and diphtherite.

Amongst the details noticed under the first head, he observed that the ground on which a house is built should have the qualities of porosity and firmness; porosity is required in order that all water charged with organic debris, which happens to penetrate it, may pass onwards and undergo that rapid oxydation which is so happily effected by the London gravel. Wherever the soil is deficient in this quality, or where beds of gravel or sand côme in contact with beds of clay, a thorough subsoil drainage is as essential for the health of man as it is for the growth of sweet herbage. Spots can be pointed out in which the subsoil is swampy, and where fever has prevailed in consequence. Moreover, the land on which houses are being built around London is sometimes raised artificially by what is called made-earth; that is to say, on a low, wet spot, quite undrained, are heaped all sorts of rubbish, road scrapings, mud, and refuse, mixed with organic debris; and over this the houses are built. Besides, the excavation of sweet wholesome gravel, and the filling in the vacuity with rubbish, has long been prevalent at the west of London, and is much to be condemned; and an instance was quoted of a house, whose rental was £400 per annum, built over a laystall of the last century, that is, a pit where every kind of impurity was deposited, and now filled with black mould mixed with sheep bones. This earth, when dried and analyzed, yielded 10 per cent. of organic matter, and was as unwholesome to build on as an old churchyard. Want of firmness might be remedied by a solid floor of concrete, after the Roman manner, which would enable houses to be built with less chance of settlements and cracks, which are causes of unhealthiness, not merely by allowing cold and damp to enter, but by permitting currents of fetid air to come from unknown and distant sources. Thin walls, too, render a house not only extremely cold, but unwarmable in winter.

Passing over the grouping and position of houses, and the width of streets, which ought to be regulated by the height of the sun in winter, we come to the internal arrangements and air supply. The last may be provided by some special ventilating apparatus; or may be left to take care of itself; but even if left to itself, it will be prudent to see that the basement-doors, and other chief apertures, are not near any source of contamination; moreover, great caution should be exercised in roofing in yards and areas with glass, as is often done, because the glass may cover over some sources of effluvia, and bring them into the house. This has been the cause of fever. The supply of air to the apartments should be large, diffused and not in perceptible draughts, and warmed, and should be so contrived as not to attract attention: otherwise persons who are afraid of pure air, especially servants and the poor, will speedily close up the apertures. The plan suggested by the Commissioners on Warming and Ventilation fulfils most of these conditions—inasmuch as the air is warmed by the heat otherwise wasted by the chimney, and is introduced in ascending currents; and care is taken that there is a

* Tennyson's "In Memoriam."

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channel of escape separate from the chimney, and that the upper part of the apartments should be the coolest. Any plan for bringing currents of cold air to the level of the feet or of the bed, is to be condemned. Nothing can be a better evidence of the carelessness of our present system of air-supply to houses than the fact that much of it comes down the chimneys when there is no fire, bringing with it abundance of soot, and many, possibly unwholesome, products of imperfect combustion of organic matter.

A free supply of pure air is the *sine qua non* to persons who lead in-door lives; inasmuch as the direct influence of close bed-room air in producing scrofula and consumption has been proved incontestibly by Carmichael of Dublin; and later, by Dr. Guy. But till people have a sufficiency of food and clothing, it is a mockery to speak of pure air. Man's instinct chooses foulness before hunger; when the contact of pure air with the lungs, and of pure water with the skin, creates an appetite for food which he has no means of satisfying.

Further researches on the composition of house air are to be desired. It is evident that the amount of carbonic acid represents that of the most volatile, and probably that of the most innoxious product of the presence of living beings, and consequently the minimum of atmospheric impurity. Dr. Druitt has made several determinations which showed how rapidly the quantity fluctuated according to the amount of ventilation and the state of the wind. For example, in a small room in May's-buildings, Brick-street, inhabited by two adults and three children—

	Volumes of Carbonic Acid in 10,000 vols. of air.
April 20th. Noon; family dining	13·74
„ 21st. „ „ „	9·19
„ 24th. Room empty, door open...	3·34
„ 20th. All night	15·97
„ 21st. „	15·10
„ 22nd. „	12·27
In the Infant School-room, Curzon Schools, Mayfair, room crowded, with a window open at each end	9·46
In a bed-room unoccupied, but with the doors and windows closed all day, the quantity fluctuated between 5 and 7 volumes per 10,000.	

The list of maladies arising from cold, damp, airless, and sunless dwellings, is a long one, and is identical with the maladies caused by hunger, depraved nutrition, solitude, and grief; moreover, the effects of dark, monotonous, and decayed dwellings upon the mind must not be overlooked, inasmuch as they produce a direct temptation to indulge in spirituous liquors.

Under the second head, Dr. Druitt alluded to the great number of modes in which a house may receive poisonous vapours from sewers. If the house-drainage has not been revised during the last ten years, there may probably be every variety of imperfect and dilapidated drainage; wells that once supplied a family with water may have been converted into dead wells and receptacles of filth; and even when a house possesses a perfect drainage system of its own, it may be invaded by its neighbours: or the remains of old drainage systems may have been left by the carelessness or ignorance of workmen. Every pipe, too, of whatever sort, may be a means of bringing foul air from sewers; every such apparatus should, therefore, be examined from time to time, and be regulated with philosophical precision. The possibilities were described of the entrance of air from the public sewers into houses; either from stagnation and decomposition, or through the wind which at certain times penetrates the great sewers from the river; then, wherever a sewer ends abruptly, the gases are sure to be driven out of it, through the apertures in the streets made for ventilating purposes. The effects of bad house-drainage, and of sewer poison, are found in the prevalence of typhoid fever and choleraic maladies. The great fevers at Clapham, Croydon, Westminster, and Windsor, were all of this sort, and traceable to this cause; and instances are given of illness, year after year, visiting a family, and robbing it of one or more lives; and when too late, the discovery is made that an ancient, unknown, and decayed sewer ran under the premises. Many such sewers exist underground, not noticed in any map, and unknown to the present generation of officials; serving only as reservoirs of foul gases, which find vent through most unexpected channels. It is in vain for the physician to discuss remedies, whilst the patient is still breathing the vapours which caused the disease.

Lastly, the property which diseases have of lurking in certain quarters, and then breaking out with virulence, and acquiring a self-propagating force, was ascribed to impurity in general and to defective drainage in particular. Scarlet fever, especially, was asserted by the speaker to be caused *ab initio*, as well as to receive power of extension from this source. Thirteen contagious maladies, at the least, can be produced at will; and Dr. Druitt believes that in time epidemic diseases will be found subject to human control; and that the surest mode of protecting the dwellings of the rich is to cleanse and ventilate the dwellings of the poor.

In the parish of St. George, Hanover-square, out of 20,000 inhabitants of first and second class streets there died *at home*, in the three years 1856, 1857, and 1858, 10·78 per thousand per annum; whilst, in third and fourth class streets, there died *at home*, in those three years, 20 per thousand per annum, exclusive of deaths in hospitals and workhouses. Taking the *mews* separately, there died *at home* 15·36 per thousand per annum. The low mortality of purely aristocratic and first-class business streets contrasts painfully with that of the nest of low streets between Grosvenor-square and Oxford-street, where, owing to the crowded and unventilatable state of the houses, there is a mortality of 30 per thousand—a mortality enhanced, of course, by the deaths of the children who are born but cannot be reared in such habitations.

It is time more thought and more earnest labour were devoted to this subject, upon which not only the life and health, but the morality, the intelligence, and the whole well-being of the community depend.

ENGLAND AND HER SOLDIERS.

The following article from the *Athenæum*, written upon the appearance of Miss Martineau's new work on "England and her Soldiers," so strongly urges the considerations which we lately suggested in an article upon Tent Architecture that we reproduce it here with much satisfaction.

"The English soldier is at length regarded as more than a figure in a red, blue, or rifle-green uniform. Laymen and even women have begun to treat him as a rational reponsible being, with some of the qualities appertaining to citizenship, and with the general attributes of humanity. An army in the field is a machine, no doubt; but at home it consists of men, who must be clothed and housed, and who ought to be fostered in good moral and bodily health. Florence Nightingale with her firm and tender hand separated the list of those who fell under the stroke of actual war in the Crimea from the terrible majority that died from preventable causes. We then saw that epidemic was a greater foe to life, even during a campaign, than steel or gunpowder. But if the camp was ill provided, equally so was the barrack. It was discovered that, if Scutari hospitals and Sebastopol tents were scenes of gratuitous misery and criminal neglect, still more so were our military establishments developed in the midst of peace and continual plenty. The interior perspective opened up by a late report on barracks might well dissipate all illusion from the fancy even of a clod-hopper swinging on a gate and yearning to be seen in gold and scarlet—spur on heel and plume on head—a man of godlike mien, with the mustachios of a gentleman and the frippery of a hero. On parade, the dragoon or guard was that which New Englanders call "a great and glorious insect to behold;" but his private life, his undress habits, his dormitory, wash-tub, and refections were somewhat equivocal. Outside, all was resplendent and gaudy; within were stenches, dirt, clamour, confusion, grease, smoke, a foul atmosphere, and social abasement. Not that the soldier was deliberately maltreated. He suffered from official routine, and by no means from national parsimony. His barracks, although among the worst, were, generally speaking, the costliest in Europe; his meat rations, if monotonously salt and dry, were probably more liberal than those of the Imperial Guard in France or the purple squadron in Russia. And, after all, the results were not, comparatively, so pernicious as might have been expected. The British soldier, by whatever process, was made a clean being. Neither Zouave nor Hulans could reckon him amongst The Great Unwashed; indeed, the Hulans and Zouaves would do well not to speak of soap or water.

"Still, as Miss Martineau undertakes to show, the British soldier enjoys, at present, few securities for the preservation of health or life, even on home stations and in time of peace. In war, he has to encounter one chance of death from wounds, and five or six chances from neglect and exposure. Our readers will remember how the Coldstreams published their own narrative of suffering and sacrifice, demonstrating that the fearful chasms in their ranks were caused, not by Todleben's batteries, not by Gortschakoff's bayonets, but by maladministration. There is something peculiarly shocking in this melting away of an army. It is not without a thrill, even at this distance of time, that we think of the host that Cambyses sent into Lydia never to return; but the examples nearer our own day have been sufficiently terrible—the utter engulfing of Russian columns amid the sands of Tartary—the vanishing of the famous expedition to Khiva—the skeleton march of Napoleon's legions from Moscow—the British annihilation in the Khyber-pass—the dissolving in blood of the Light Brigade at Balaklava—the shattering of the Scotch Greys at Waterloo—the disappearance of a French division in Algeria twenty years ago after it had "fled into a storm," probably to be overwhelmed by some vast drift by the Adas. It is even more appalling, however, to think of men withering like leaves under their own tent rags, from famine and fatigue, while the holds of huge vessels gorged with supplies were close at hand. England lost in this way at Walcheren, says Miss Martineau, more troops than ever Marlborough led to battle; and we saw that halocaust repeated in the Crimea. Since then numerous reforms have been introduced, and, which is even more important, elaborate investigations have been entered upon. But Miss Martineau urges, that no exertions have as yet been made commen-

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surate with the exigencies of the present day. Her argument on the economy of the question is, at all events, convincing. To glance over a summing up of losses incurred through apathy or incapacity is like reading Burke's 'Vindication of Natural Society' deprived of its hyperbole.

"It is not to be denied that, viewed on the surface, the position of a peasant appears to be bettered when he becomes a soldier. He is installed in such a dwelling-house as he never before inhabited, has better bedding, eats meat every day—this is a great change—and wears, we might think, incomparably superior clothes. Yet his health incessantly, and almost invariably deteriorates. He becomes liable to cold; his coughs return with every winter; he sleeps in less comfort; in rainy weather his heavy boots leak; in summer he is a special victim of the sun: worse than all, he sees his comrades struck off the muster-roll by death more that twice as fast as policemen, who are not proverbially long-lived. In military days like the present, this subject is nationally interesting. Miss Martineau discusses it practically and popularly, drawing her illustrations from far and wide, but chiefly from the experiences of Sebastopol and Scutari. Her volume is one that should be studied by such Englishmen as were ashamed to see their soldiers in the last war marching for ever under the Black Flag, not of Piracy, but of Pestilence."

HOW PECULATION IS PREVENTED AT THE ROYAL MINT.

THE means employed at the Royal Mint for the prevention of peculation is a subject of interest to the public, and visitors to that remarkable manufactory, bewildered with the sight of thousands of pounds' worth of the precious metals scattered around them in apparently careless profusion, inevitably ask the question of their guide, "How are losses avoided?" It will be our task to explain the arrangements in existence for protecting the valuable materials intrusted to the Queen's money-makers for conversion into coin, and to show how it happens that, under the judicious mastership of Dr. Graham, little or no loss occurs in the various manipulations to which gold and silver are submitted in their transit as ingots from the Bank of England to their return to it from Tower Hill as current coin of the realm.

At the head of each room wherein the necessary operations are carried on is a responsible officer, who has, during the day, complete control over a "stronghold" built of stone, and having an iron door fitted with two admirably constructed locks. Imagining, then, that a coinage of gold is being executed, that the whole of these strongholds are filled with rich yellow metal in its various stages of progress, that it is eight o'clock in the morning, and that all the workmen and boys are assembled, let our readers suppose that a portion of the contents of these golden reservoirs is then brought forth to be forwarded on its important mission. In order, however, that our explanation may be the more clear, we will take the liberty of numbering the rooms or officers aforenamed—as, 1, 2, 3, and 4, and then enumerate their duties and practices, so far as regards safe custody of the metal. No. 1 has charge of the Rolling-room, in which place the first change from the rough bar of the melting house towards the bright and cheerful-looking sovereign takes place, and receives from the master-melter a detachment of gold bars, with a certificate of their weight, as per Mint-office scales. As, however, it is a rule in the Mint to take nothing of the kind upon trust, No. 1 straightway causes the whole detachment, in companies of five or six, to be passed through his own scales, noting in the room journal their aggregate weight, with such difference, plus or minus, as haply he may find, compared with that with which he has been debited. No. 1 thus becomes, *pro tem*, sole proprietor of a number of bars of gold, the weight of which, to the hundredth of an ounce, he, of his own knowledge, is assured. He next gives out a sufficient quantity of them to last his workmen a given time, and locks up the rest in his "stronghold." The lamination now commences, and the rigid bars, thanks to the action of powerful machinery which never tires, and the activity of workpeople, who are paid by the piece, but who sometimes do tire, even of money-making, are attenuated until they become mere ribands. These are brought, of course, to a gauged thickness and width, their waste ends are cut off, and with all splinters, fragments, and scraps, they are made ready for weighment once more. Accurate weighing, and a perfect knowledge of the extent of any variation which may have resulted from any part of the working processes, enable the officer now to determine, to the hundredth of an ounce—the smallest decimal weight used in this branch of the establishment—whether he has received back all the gold he gave out. If *not*, a rigid search of the room, and of the work-people in it, follows. If *so*, another batch is given forth from the depths of the stronghold, whilst the ribands pass forward from iron trucks, with their appended weight, to officer No. 2. Leaving Messieurs the rollers to "break down" other bars, we will follow the ribands. No. 2 takes note of the ticketed weight, but he does not believe it, any more than No. 1 believed *his* ticket from the Mint officer. He, too, appeals to trial by *scales*, records the difference, if any, which they reveal, and delivers the material to the workers. These forthwith fall to at adjusting the ribands, equalizing them in thickness yet further, and in punching out "blanks" from end to end of them, which accomplished, No. 2 prepares to ascertain whether in altered form he, too, has received from his men just weight. Again, the scales, faithful ministers of justice, give their verdict—"honest," or "dishonest," "careful," or "careless," and the officer acquits, or admonishes, or makes search as he finds it right. Assuming that all is well, No. 2 affixes *two* tickets to the products of the operations of the day, one to pass forward with the blank pieces to No. 3, and one with the perforated strips—or "straps" as they call them in the Calcutta Mint—to the melter. Leaving the latter to deal in his own way with the scrap, let us pursue the golden pellets to officer No. 3. Again, the oracle of the Mint, the weighing beam, is applied to test the truth of the ticket forwarded, and its answer is duly registered, with differences, if any. After thus weighing the blanks in bulk, this officer distributes them among a bench of judges, who test their individual merits, and pass sentence of approval or condemnation on each—these are the automaton balances of Napier. The medium pieces are by them approved and deposited for coining in a central box, or rejected and impelled into the condemned compartment for remelting. After this operation, the blanks are gathered together and weighed in small batches of 180 ounces, or 15 lbs troy. From great accuracy of workmanship, 180 ounces of sovereigns *must* consist of 701 pieces; consequently No. 3 officer in this weighing also *counts* his embryo money. Now they are deposited—the good ones, that is—in bags, and are handed forward to officer No. 4, ticketed as before. These bags of gold, henceforth known as "journies"—from the old Norman French word, *journée*, a "day's work"—are next weighed again, then given forth for "marking," "annealing," "blanching," "drying," and "stamping"—processes which, in conjunction with a full account of the WHOLE ART OF MONEY MAKING, will be explained in successive numbers of this Magazine, commencing next week; and are then, after yet another weighing at the Mint-office scales, transmitted to the Bank of England, and thence scattered through the rivers, streams, and tributaries of general circulation.

It will be seen, then, that there are complete and distinct checks against peculation in each department of the Mint, and that correctness of weighing is the officer's sheet anchor. As regards visitors, there are notices affixed in every room, forbidding them to touch the work in progress, except when placed in their hands for examination by the messenger or guide who accompanies them, and who explains—in his own way—the manipulations going on. Thus, immunity from loss is attained. It may be stated, however, that before any workman is allowed to pass the police at the gate after once entering to his duty in the morning, he must deposit with the sergeant a certificate, signed by one of the four intelligent gentlemen upon whom, for convenience sake only, we have in this paper conferred numbers, and which removes responsibility to the officer giving it.

There is something so extremely attractive about the art of making money, and so many wrong impressions — raised by imperfect and superficial accounts given in cheap serials—are abroad respecting it, that, as we have stated, it is our intention, at once, to commence a series of articles authentic and clear upon the subject, and which shall dispel the wordy clouds in which some distinguished writers have enveloped it.

ON THE NATURE OF THE ACTION OF FIRED GUNPOWDER.

By LYNALL THOMAS, Esq., lately Communicated to the Royal Society by Dr. GRAY.

SINCE the year of 1797, when Count Rumford made his experiments for ascertaining the initial force of fired gunpowder, an account of which appears in the Philosophical Transactions of that year, very little light has been thrown on the subject. Count Rumford's experiments, valuable in many respects, afforded indeed nothing conclusive respecting it. The object of the present paper is to show the unsatisfactory nature of the present theory of the action of gunpowder, and to point out some of the principal errors upon which this theory is based. For this purpose, the results of various experiments made by the author, and which were repeated in the presence of a select committee at Woolwich, are described and explained. These experiments are held by the author not only to afford complete evidence of the unsoundness of the present theory, but as sufficiently conclusive to serve as the bases for the formation of a new set of formulæ, both correct and simple, in place of those at present in use. The initial action of the fired charge of powder upon the shot—the first movement of the shot itself in the gun, and the force exerted upon the gun by different charges of powder, and, therefore, the actual strength of metal required by the gun—are circumstances which, as the author believes, have not only been misunderstood, but for which laws have been assigned directly opposed to the truth. As an instance of this, the hitherto-received theory supposes that when a shot is forced from a gun it acquires its velocity gradually, from the pressure of the elastic fluid generated by the fired powder acting upon it through a certain space. It is also supposed that the initial pressure of the elastic fluid is the *same* in all cases (the quantities of powder being proportional), whether the gun from which the shot is fired be large or small; so that the larger the calibre of the gun, the slower the first movement of the shot is supposed to be. The result of the following experiment is given to prove that the first of these propositions is incorrect. The author placed a cast-iron shot, 3 inches in diameter and 3lbs. 14 oz. in weight, upon a chamber half-an-inch in diameter, and half-an-inch deep. This chamber was formed in a block of gun metal, and contained, when filled, one dram of powder. Upon lighting the powder, the ball was driven to a height of 5 feet 6 inches; when the ball was placed a $\frac{1}{4}$th of an inch over the chamber, the charge failed to move it. From this it is inferred that the first force of the powder is an *impulsive* force, that is to say, it imparts to the shot at once a finite velocity. In order to place the matter beyond a doubt, and to ascertain the relative force of different quantities of powder, the author caused a chamber to be made similar in form to,

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but of twice the linear dimensions of, the former; he then placed a cast-iron ball of 6 inches in diameter upon the orifice of this chamber, which was filled with powder; upon firing the latter, the ball was driven up to a height of 11 feet; that is to say, to double the height of the smaller. The state of the metal in which the chamber was formed also showed the increase of the initial force of the powder; this is considered to be sufficient proof that the last two of the above-mentioned propositions are as incorrect as the first. Assuming the initial force of the powder to be of an impulsive nature, it is not difficult to understand the increase of force shown in the last-named experiment, inasmuch as a certain time being required for the complete conversion of the powder into an elastic fluid, a quantity contained in a chamber of a similar form, but of greater linear dimensions than another, must ignite in a less comparative time, the linear dimensions increasing in the ratio of the first power, and the quantity of powder increasing in the ratio of the third power, so that the flame will traverse a larger quantity in comparative less time. Thus it appears that the powder which inflames more rapidly has a much greater initial force, being more *concentrated* in its action; a quick burning powder, therefore, is better for ordnance of small length, such as mortars and iron howitzers. The different results produced by powder of different quality have, according to the author, been entirely overlooked in the hitherto-received theory. This theory, which considers the *secondary* force, namely, the elasticity of the fluid only, and takes no account whatever of the enormous impulsive, or initial force, produced by the sudden conversion of the powder into an elastic fluid, is that which regulates the system upon which ordnance are at present constructed; hence the reason why large guns are so liable to burst—so much so, that it has been said that no gun larger than a 32-pounder is safe to fire. From the variety of experiments made by the author, he arrives at the conclusion that when powder is of the same quality, and confined in chambers of similar form, but of different sizes, the initial force varies, within certain limits, in the ratio of $\frac{w^{\frac{1}{3}}}{w}$ where w is the weight of the powder, and w' of the ball. Thus were this new theory recognised, the question of the increase of strength, with increased thickness of metal, would wear an entirely new aspect. So far from the metal in large guns diminishing in strength in the proportion assumed, it will be a matter for inquiry how it resists the great strain to which it is subjected, rather than why it yields; for we find from the experiments described above, that a 68-pounder gun, which has a calibre of twice the diameter of a 9-pounder gun, must, when fired with the same proportionate charge of powder as the latter, continually be subject to as great a strain as the latter would suffer if always fired with the proof-charge, which is three times the quantity of the ordinary service-charge.

Proceedings of Societies.

ROYAL INSTITUTION OF GREAT BRITAIN.

April 8.—Sir Henry Holland, Bart., M.D. F.R.S.' in the chair. James Paget, Esq., F.R.S., read a paper "On the Chronometry of Life." The design of the discourse was, to illustrate the law that the processes of organic life are regulated with a regard to time, as exact as that which is observed by them in respect of size and weight and quantity of material employed in them; and to show that such an observance of time is characteristic of life, depending essentially on properties inherent in the living bodies themselves, and not on conditions external to them. Laws indicating the limitation of the organic formative processes, in respect of quantity, are evident in the facts that, in the ordinary conditions in which each living being is found, it and all its parts have appropriate size and weight and mutual proportion. These may, indeed, be modified by the variations of external conditions, or by events that are of the nature of accidents: but the range of possible variations is, in nearly all cases, comparatively narrow; and the boundaries are soon reached, in which changes of external conditions become incompatible with life. An instance of a corresponding limitation of the organic processes in regard to time might be noted in the natural duration of each creature's life. Observance of time may again be noted in the formative processes concerned in any of the organs whose changes mark the divisions of a life into its chief periods; *e.g.*, in the teeth. For examples of organic processes, adjusted to be complete in definite periods of time, the germination of seeds, and the hatching of eggs could be cited. Further, the provisions made by parents for their future young afford evidence of the time-regulation of organic processes, in so far as those provisions seem to indicate a reckoning of the time necessary for their completion. For example, certain turtles lay their eggs in hollows made in the sand, leave them there to be hatched, and at the time of hatching return to them for the sake of their young. It might be asked, how can these creatures and many others in similar cases, reckon on the passage of time? Most probably they do not reckon it at all; but just as the timely-attained fitness of their organization for preparing and filling their nests impelled them to those acts, so some time-regulated organic processes, taking place in them after the laying of their eggs, bring about at length a new condition, of which a dim consciousness becomes an impulse to them to return to their nests. Such an explanation would involve little guess-work; for changed organization is manifestly often the source of impulse to instinctive actions, and the parental organization does commonly change at a rate commensurate with that of the development of the offspring. And a similar reference to that chronometric processes in the body might explain many, though probably not all, other instances in which animals seem to have a power of reckoning the passage of time. The phenomena of disease, especially in fevers, agues, the consequences of injuries, and many cutaneous eruptions, would afford abundant instances of the observance of time in the organic processes. The vaccine disease might be generally watched as an illustration, being characterized by a vesicle at each place of insertion of the virus, which vesicle begins to appear on the third day, and on the following days passes through changes which are as exactly regulated in time as they are in visible characters. The changes in this vesicle are, moreover, indicative of a coincident succession of events in, or produced by, the virus inserted, which, in the blood of the vaccinated person, increases, and, incorporating itself in the vesicle, reaches its highest development and greatest inoculating power on the eight day, and then degenerates. The instances of morbid poisons would supply examples of organic processes timed to various numbers of days; and many that are completed in a day, or in given portions of a day, are traceable in the events of sleep and waking in animals (and, perhaps, also in plants), in the daily variations of the pulse, and of breathing, the returns of hunger and thirst, the regulated times of the digestive functions, &c. The most minute observances of time in organic processes might be noted in organs that have rhythmic motion, as in hearts and breathing muscles, cilia, the vacuoles of certain zoospores, as Volvox and Gonium. The instances adduced thus far might supply examples of organic processes adjusted to periods of time varying from the length of human life to less than a second. They were all examples of large classes of facts, from which might be filled up the instances of observance of other and very diverse periods of time; and in all of them, the time-rate is essentially determined, not by external conditions (though these may, in some measure, modify it) but by the inherent properties of the organic bodies themselves. In another large group of instances, those, namely, in which vital processes are completed, or attain some climax, in a year or in a set portion or season of a year, an independence of external conditions appears less evident. There likewise appear to be indications of a chronometry in the organic processes of warm-blooded animals, which corresponds with that of the seasons, but is essentially independent. And if it be so, these might form a group of facts, in addition to those diurnal variations of the organic processes, in which vital changes are set to the same rules of time as changes of the surface of the earth, yet have their own proper laws; and concerning which it might be said, that the cycles of life, and of the earth, do, indeed, correspond, but only as concentric circles do, which are drawn round one centre, but are not connected, except in design and mutual fitness. But, however this might be, all the instances of time-regulation cited in the discourse (all being examples of large groups of facts), would seem sufficient to prove, that the observance of time in organic processes is as exact and as universal as that of any other measure; that each species has a certain time-rate for the processes of its life, variable, but not determined, by external conditions; and that the several phenomena commonly studied as the periodicities of organic life, are only prominent instances of the law which it was the object of the discourse to illustrate.

April 15.—Sir Roderick I. Murchison, D.C.L., F.R.S., Vice-President, in the chair. Sir Charles Lyell, M.A., D.C.L., F.R.S., read a paper "On the Consolidation of Lava on Steep Slopes, and on the Origin of the Conical Form of Volcanos." During two recent excursions made in the autumns of 1857 and 1858 to Mount Etna, Sir C. Lyell had an opportunity of examining sections of lava-currents of known date, which had descended steep slopes, and had consolidated thereon in tubular and stony masses, the inclination of which sometimes exceeded 30°. This fact has an important bearing on the theory of "craters of elevation," it having been affirmed by geologists of high authority, that when lavas congeal on a declivity exceeding 5° or 6°, they never form continuous beds of compact stone, but consist entirely of scoriaceous and fragmentary materials. The discovery that lava is capable of forming continuous and tubular masses of crystalline rock on steep slopes, often exceeding 30°, enables us henceforth to dispense with that paroxysmal and terminal upheaval, which the advocates of "craters of elevation" legitimately inferred from their premises, for it was as necessary for them, so long as the volcanic beds were assumed to have been originally horizontal, to ascribe the whole elevation to a force acting from below, as it would have been if the uppermost layers of each volcanic mountain could be assumed to be of marine origin. In opposition to such a doctrine, Sir C. Lyell maintains that mechanical force has nowhere played such a dominant part in the cone-making process as to warrant our applying any other term save that of "cones of eruption" to volcanic mountains in general. In conclusion, the lecturer gave a brief sketch of the series of geological events which he supposed to have occurred on the site of Etna since the time of the earliest eruptions, events which may have required thousands of centuries for their development. The first eruptions are believed to have been submarine, occurring probably in a bay of the sea, which was gradually converted into land by the outpouring of lava and scoriæ, as well as by a slow and simultaneous upheaval of the whole territory. The basalts, and other igneous products of the Cyclopean Islands, were formed contemporaneously in the same sea, the molluscous fauna of which approached very near to that now inhabiting the Mediterranean; so much so, that about nineteen-twentieths of the fossil species of the sub-Etnean tertiary strata still live in the adjoining seas. Hence, as that part of Etna which is of subaerial origin is newer than such fossils, the age of the mountain is proved to be, geologically speaking, extremely modern. During the period when the volcano was slowly built up, a movement of upheaval was gradually converting tracts of the neighbouring bed of the sea into land, and causing the oldest volcanic and sedimentary strata to rise, until they reached eventually, a height of 1,200 feet (and perhaps more) above the sea-level. At the same time the old coast-line, together with the alluvial deposits of rivers, was upraised, and inland cliffs and terraces formed at successive heights. The remains of elephants, and other quadrupeds, some of extinct species, are found in these old and upraised alluviums. Fossil leaves of terrestrial plants also, such as the laurel, myrtle, and pistachio, of species indigenous to Sicily, have been detected in the oldest subaerial tuffs. At first the cone of Trifoglietto, and probably the lower part of the cone of Mongibello, was built up; still later the cone last mentioned, becoming the sole centre of activity, overwhelmed the eastern cone, and finally underwent in itself various transformations, including the truncation of its summit, and the formation of the Val del Bove on its eastern flank. Lastly, the phase of lateral eruptions began, which still continues in full vigour.

May 6.—The Lord Wensleydale, Vice-President, in the chair. Robert Druitt, Esq., read a paper "On Houses in Relation to Health," to which copious allusion is made in our leading article.

MEETINGS FOR THE ENSUING WEEK.

TUES.—*Royal Inst.*, "General Facts and Leading Principles of Geological Science," by John Morris, F.G.S., at 3 p.m.

THUR.—*Royal Society*, Election of Fellows at 4 p.m., no Evening Meeting.
Society of Antiquaries, at 8 p.m.
Royal Inst., "On the Seven Periods of Art," by Austen Henry Layard, Esq., at 3 p.m.

FRID.—*Royal Inst.*, Lecture by Professor Tyndall, F.R.S., at 8 p.m.

SAT.—*Royal Inst.*, "On Modern Italian Literature," by John P. Lacaita, Esq.

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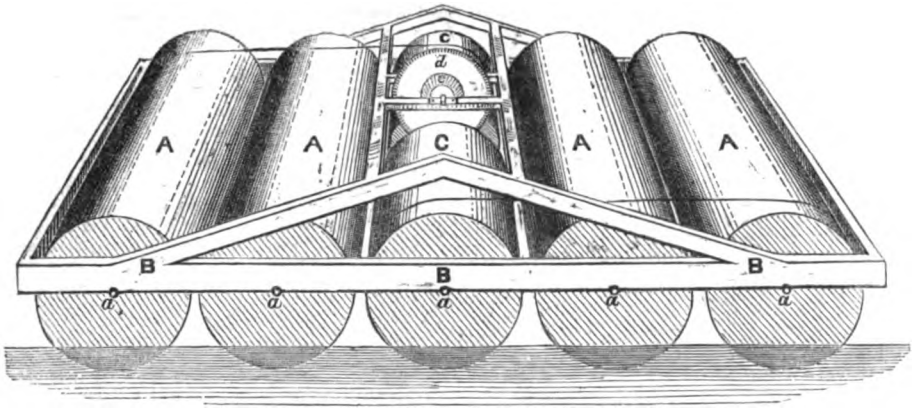
THE NOVELLO-CRAFT AND THE VELOCIVANE.



THE past week has introduced two old friends with new faces to us—the "Novello-Craft" and the "Velocivane"—both of which are intended to supersede screw steam-ships of the ordinary construction. The Velocivane is brought to our notice by a paragraph in the *Bulletin*, and, although it now comes from France as a novelty, it appears to be only the old plan of forming the bows and sterns of vessels of revolving cones, in order to escape the direct resistance of the water upon them. At this system Captain Beadon, R.N., and Mr. Paterson, have been at work for years past, with no remarkable results thus far, we believe. We will only say of it that the sounder a man's knowledge of the science of fluids and of dynamics is, the more likely he will be to deem it chimerical.

The "Novello-craft" proceeds, we are sorry to say, from Mr. J. Alfred Novello, of deserved celebrity as a music-publisher, and is designated "a proposed method for the accomplishing great speed [*sic*] in journeying over water." A paper descriptive of the same has been put into our hands, and from this we learn that the invention is "not patented in any country, but open to the free use of all." We can only say to Mr. Novello, "Thank you—for nothing!" But, before we pronounce an opinion upon this invention, let us hear what Mr. Novello has to say of it. He tells us that railroads have lately made travellers so accustomed to from 30 to 50 miles an hour, that the swiftest steam-ship progress has failed to satisfy the requirements of the age; and ship-builders have taxed their invention to modify the shape of their vessels, with the object of gaining additional speed. It was thought that the limit of profitable and safe dimensions had reen reached when steam-ships from 300 to 400 feet in length were constructed; and yet the resulting speed has practically never exceeded 14 or 15 miles an hour through the water, and has generally been much slower. The experiments of further enlargement (as in the Great Eastern, and other long vessels said to be building at Liverpool) are looked forward to with great interest; yet he believes it is not expected, even by the designers, that the speed to be attained will be more than a small increase beyond the apparent limit of 14 or 15 miles an hour. Every existing modification of boating resolves itself, according to him, into a *water-sledge*. Buoyancy is obtained by displacing a sufficient quantity of water, and such displacement is then forced *through* the waters either by oars, sails, screws, or paddle-wheels; but it has long since appeared to him that the successful attainment of high speed can only result from completely abandoning the old methods of forcing these boats or water-sledges *through* the water. He proposes to do on water what has long been done on land, viz., to place his vehicle on wheels, instead of on a sledge, the wheels being modified to the watery surface over which they have to run. "The principle being a new adaptation, I have called it," he says, "*The Novello-craft principle*, and the vehicle itself I have called a *Novello-craft*, because they are convenient terms, and also for other reasons." The engraving shows one of several modifications tried on water. "*A A A A* are four cylinders or drums made of thin sheet zinc, and they serve as the wheels to the wooden frame *B*, which rests on their axles at *a a a a a*. In the centre of the wooden frame are also *C C*, short cylinders or drums, both fixed on the same axle, with a pinion between them, and motion is given to this axle by a strong clock-spring in the box *e* attached to the cogged-wheel *d*, and tapes are passed round *C* and *A* to impart motion to the A's. The diameters of the cylinders are 7½ inches, and, when lying on the water, the weight of the whole machine (29 lbs.) sinks them into the water 1½ inch (or about a sixth) below the surface." "The displacement of water," says Mr. Novello, "(by thus sinking one-sixth) supports the whole weight, as in every precedent floating vehicle; but the novelty presented by the *Novello-craft* is, that instead of forcing this *same* displacement *through* the water, the cylinders, by being rolled over, cause successively a *fresh* displacement to take place, leaving the *previous* displacement behind." He explains the action thus:—"With sufficient power, the cylinders may be made to revolve very fast, and the displacement being no longer forced *through* water, but rolled *over* it, the speed will cease to be limited by the reluctance of the dense watery fluid to open in front, and the slowness of water to follow into the vacuum behind, but will be equal to the speed with which the *fresh* displacements are successively brought under the weight of the machine; and as the resistance to onward progress will be reduced to that of climbing the hill presented by the angle at which the cylinders meet the water, there appears every possibility for the *Novello-craft* to attain the speed of a railway train on land (50, or even 70 miles an hour), as both have to overcome the resistance of passing through the air. It will be remembered that a watery surface is a dead level, and the *Novello-craft* would not meet with varying gradients, as on a land railway. In the model *Novello-craft*, the friction of the smooth cylinders pressing against the depressed water-surface has been alone relied upon to produce forward motion, and I think in practice it will be found that no mischievous amount of slip will take place. The absence of anything like the floats of a paddle-wheel will save the waste of power caused at their first entering the water, and in their throwing up the water behind. The weight of the *Novello-craft* will make the cylinders adhere to the water, as a driving strap adheres to a drum. Getting rid of floats will probably be found to work as well as the smooth driving-wheel on a railroad."

Now, to save Mr. Novello both the time and the money which he seems disposed to squander on this hobby, as well as to preserve him from experiencing the bitterness of becoming acquainted with his error when it is too late, we at once tell him that his views are essentially unsound, and have no novelty whatever in them. Let him, or the reader, turn back to the 59th volume of the MECHANICS' MAGAZINE, and to those Numbers of it which were published on the 24th and 31st of December, 1853, and he will there discover all that he proposes forestalled and disposed of. A correspondent signing himself "N. B."—a gentleman as well able, we believe, as any man in England to discuss this subject—there gives an account of what really is no more and no less than Mr. Novello's invention.

Its author was "M. Planavergne, Professeur de Mathématiques au lycée de Cahors." "He wishes to effect," said the journal *La Presse* of that day, "such a revolution in ships as was effected in locomotion upon land, when some genius, probably unknown, displaced the sledge by a car mounted on wheels." "Our vessels plough through the water, and thrust it out of their course; he imagines them to roll upon the surface." He constructs what he calls hydro-locomotives, which, either alone or dragging a train of carriages, skim over the seas, the rivers, the canals, at the rate of 80, 90, 120 miles an hour: "they outrun the tempest." "The constituent parts of the vessel are three in number—a case corresponding to the body of a coach, four great floating cylinders to the wheels of it, and a motive power in the interior of the case." "This case is light, has two floors, and rests upon a strong frame, to which it is firmly secured. The bottom compartment contains the motive power and the provision; the upper the travellers and the luggage." The supporting cylinders were supposed to be hollow and perfectly water-tight.

At the conclusion of the articles in *La Presse*, from which the description of M. Planavergne's invention is extracted, the editor apologises to M. Mondot de la Gorce, an engineer in the service of the French Government, for having treated this invention as entirely new, although another somewhat analogous was invented by him, and noticed by *La Presse* in 1844: then quoting from a book published by him in that year, on "Chemins de Fer Flottants dans la Méditerranée," it describes M. Mondot's invention as consisting in causing a drum or cylinder, 18 feet in diameter and 30 feet long, to roll on the water; this drum is the ship, and contains motive power, passengers, luggage, &c. Large circular holes are cut in the ends of the drum for the admission of air and light, and it is propelled by a common locomotive engine, running on a line of rails encircling the interior of the drum at the middle of its length, and of course producing motion in the same way as a squirrel does in a revolving cage; the passengers are packed in and upon the locomotive, by which clever contrivance certain disagreeable consequences are avoided.

We shall not enter upon a discussion of the false views of science which enter into Mr. Novello's plans. If he possessed a proper knowledge of mechanics, hydrostatics, &c., he would never have said what he has said, or done what he has done; and without such knowledge on his part we could not hope to convince him. The truth of the matter is virtually contained in these words of "N.B":—"It seems to me," said he, "that the effect of the cylinders would be the same as that of inclined planes pushed through the water at a high velocity, for the revolution of the cylinders continually presents the same amount of surface to the water in front, at an angle depending on their immersion and diameter."

Mr. Novello will not understand this, we dare say; but, if he be a wise man, instead of spending time and money on experiments in this matter, he will spend them in the acquisition of a sound knowledge of elementary science. Meanwhile, we would recommend the letters of "N. B.," before quoted, to his attention.

Mr. Joseph Locke, M.P., President of the Institution of Civil Engineers, received a distinguished company of members and friends of the institution at a conversazione on Tuesday evening last. A splendid display of drawings and models was exhibited.

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HATTERSLEY'S TYPE-COMPOSING MACHINE.

By HENRY BRADBURY, Esq.

[The following article from the pen of Mr. Bradbury, which appeared in a late number of the Society of Arts' Journal, is too interesting and important to be omitted from our columns.]

HAVING observed the interest with which Mr. Hattersley's Type-composing Machine was received at the last soiree of the Society of Arts, and having myself taken some practical interest in the machine, by placing it under a fair business-like trial for two months, I venture to offer the following remarks as to its merits for the benefit of those interested like myself in promoting the substitution, if possible and practicable, of machine for hand labour in the composition of type.

Unlike previous attempts in the construction of machines for this purpose, Mr. Hattersley's is at once simple and compact—not liable to derangement—delicate, but strong—and not requiring that type should be cast with special grooves for the purpose.

The machine consists of a horizontal table, divided into channels of sufficient width to allow the type to slide freely. At one end of these channels is fixed a metal slide, against which, by a vulcanised india-rubber cord, the type is constantly pressed, and held with sufficient force to prevent the last one in each channel from falling through an aperture immediately under it. Under these apertures is fixed what is termed the guide plate, fitted with downward channels directly under, and corresponding with, the apertures. These channels verge, for the delivery of the type, into one common mouth, which is immediately over the stick holder, in the shape of an inclined plane. A modified composing stick is adjusted to the stick-holder, in which it is made to slide longitudinally. The machine is furnished with keys, arranged as near to the present system of compositors' cases as possible. Each key, marked with the letter it represents, is connected with a piston or pusher, situated immediately above the face of the last type in the upper (horizontal) channels. The action of the key is to push the last type through the aperture leading into the guide plate, thus liberating the type, when its own gravity causes it to descend through the channels of the guide-plate into the compositor's stick: as each type drops it is guided into its place in the stick, which at the same time is pushed longitudinally forward, thereby making a place for the next descending type. A vulcanised india-rubber spring raises each piston into its original position as soon as pressure is taken off the key. Towards the end of each line a bell gives a signal, enabling the operator to judge how many more types he may play into the stick before justifying out, as in the ordinary way, the stick being in a convenient position for such purpose.

The channels of the horizontal table are calculated to hold a quantity of type equal to that contained in two pairs of ordinary cases. To avoid delay, arising from the channels becoming exhausted, the machine is provided with extra supply tables, which can be changed in a few seconds. The average speed as yet attained by the youth who has been practising upon the machine may be said to be 4,000 letters per hour, from reprint copy, including the justification. To bring it into operation would involve a systematic division of labour, as follows:—

1. Distributing type by hand.
2. Classing type, *i.e.*, arranging letters of the same character in rows.
3. Charging tables with classed type.
4. Composition.

Distributing, classing, and charging the tables, are mere mechanical operations, and can be done as well by youths as by adults. Composition from MS. or reprint, however, is an operation necessarily of a higher kind, but still capable of being done equally as well by the one as the other labour.

The following statement, comparing the old with the new system, is an example of what might be realised from the employment of machines. The calculation has been made simply with reference to the cost of the number of letters composed, and quite independent of all other extras to which all works more or less are subject, in the shape of making-up, &c.

The extra, or advertisement sheet of the *Times* consists of eight pages of ruby type. The composition amounts to 1,029,888 letters, or 205 galleys, at 4s. 3d. each, or £43 12s. Whereas, by the new system, the same number of galleys could be composed for £14 14s.; this multiplied daily, or 313 times, would yield a difference of £9,045 14s. in the year.

Again, *Knight's English Cyclopædia* consists of 488 sheets, or 7,804 pages of brevier type. The composition amounts to 83,770,000 letters, or 83,770 at 6d., or £2,094 5s. Whereas by the new system the same number of thousands could be composed for £930 13s., yielding a difference of £1,163 12s.

These results have been based upon the employment of six machines, eighteen intelligent youths, at 15s. per week, and one machine superintendent at £2 10s. The youths are qualified for either description of work—distributing, classing, charging, or composition—and are, therefore, able to relieve each other at the composing-machine. It has been ascertained that, to sustain the speed of 4,000 letters per hour, a youth or adult would require change about every three hours.

The introduction of the one system for the other would be at first attended with a certain amount of inconvenience; the two instances given, however, show that sooner or later the type-composing machine will be adopted by necessity, and will have the same relatively proportional advantage over hand-composition as the printing machine has had over the hand-press.

THE CLEARING OF DRAINS AND WATER COURSES.

MESSRS. EASTON AND AMOS, the well-known engineers, of Southwark, have patented a curious method of adapting to some convenient part of a drain, sewer, or water-course, a grating of peculiar construction, whereby any extraneous solid matters such as weeds, pieces of wood, brick-bats, stones, the dead bodies of animals, or other substances may be arrested in their progress, and removed, so as to prevent them from blocking up the water-course, and stopping the flow of the water. To this end a chamber or recess is constructed at some convenient part of the drain, sewer, or water-course, and made to extend across it from side to side. In this chamber is mounted a moveable grating in such a manner as to extend transversely across the whole of the water-way. The grating is to be formed of a suitable number of endless chains, connected together laterally in any convenient manner, and provided with projecting pins, points, or hooks. Or a number of short bars similarly provided with projecting pins may be jointed together in an endless series, so as to form an endless grating, which is to be passed round wheels or rollers mounted in the chamber or recess. This endless chain or grating should not be placed vertically, but at an inclination to the line of the drain or sewer. It will be understood that the water and liquid matters will pass freely through the endless chain or grating, but that solid matters of any great size or dimensions, or that would be likely to cause an obstruction in the water-course, will be arrested by the grating, and by causing the same to rotate (by communicating motion to the wheels or rollers on which the endless chain or grating is mounted) the pins, points, or hooks attached to the grating will be caused to lift up such solid matters out of the chamber formed in the drain, and deposit them in some receptacle provided above for that purpose.

THE THRUST OF THE SCREW PROPELLER.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—In the leading article on "The Engines of Her Majesty's Ships of War," in the MECHANICS' MAGAZINE of the 27th instant, you state that the thrust of the screw-shaft on the ship is an exact measure of the resistance that the ship meets with in moving through the water, and suggest that a simple and efficient dynamometer would register the actual amount of resistance. This is a very important subject, and I respectfully beg to suggest that you should reconsider it.

The thrust of the screw-shaft can in no instance equal the resistance encountered by the vessel—the thrust, also, of paddle-shafts is never equal to the vessel's resistance, and even the thrust against the axle-bearings of locomotive engines is below the tractive force exerted, simply on account of the *slip*.

I have often been surprised that scientific men should speak of "slip" as *power lost*; it is nothing of the kind.

If the screw or paddle-wheel could drive a ship without any slip occurring, as if they worked in an unyielding medium, the engines would work slower, but they would require to have cylinders of larger diameter, and *then* the thrust of the shaft would indicate the exact resistance encountered; there would be more friction against the bearings, but no benefit would result.

In like manner, if the driving-wheels of a locomotive were toothed and worked in racks, there would then be no slip, and the thrust of the axle would equal the hauling power exerted, but the engines would require a greater diameter, or higher pressure of steam, and no gain would ensue.

If the resistance a vessel meets with equals, say 20 tons, and the slip of the screw is 50 per cent, the thrust of the shaft would equal 10 tons only.

Owners of towing vessels might avail themselves of these facts, and, by altering the dipping surface of the paddle-boards, could work their engines at one uniform speed, whether towing or not.

I am, Gentlemen, your very obedient servant,

T. MOY.

1 Clifford's Inn, May 30, 1859.

[The principle involved in our article is a deduction from the first law of motion, and is this—when a body is in uniform motion, the forces which act upon it are in equilibrium. That is, in this case, the force (the thrust of the screw-shaft on the ship) which pushes the ship ahead, is equal to that (the resistance) which opposes its progress. We don't see very clearly upon what principle Mr. Moy's theory is based; but he holds that when there is no slip, the thrust is equal to the resistance; and when the slip is 50 per cent., the thrust is only one-half the resistance. It will follow, therefore, that when the slip is 100 per cent., which is the case when the ship is prevented from going ahead by being lashed to a wharf, or otherwise, the thrust is zero. It is quite a mistake, therefore, for engineers, when trying the engines in a wet dock or basin, to place the bow against the jetty, and protect the cut-water from injury by fenders; there can be no mutual pressure between the ship and the jetty, for there is no thrust of the screw-shaft on the ship!—Eds. *M. M.*]

MALAM'S PATENT PORTABLE APPARATUS FOR MAKING GAS.

THE great superiority of gas over every other source of artificial light renders it so desirable, that it is not now, as formerly, confined to the street, the public building, or the shop; but is extensively introduced into the dwelling-house; and there is little doubt that the practice will be all but universal in a few years hence. Hitherto, in order to be enabled to enjoy the advantages of gas, it was necessary to be located somewhat contiguous to towns or other places where there were public gas-works, but that necessity is now completely obviated by the invention of portable gas-making apparatus, and particularly, we believe, by that of Mr. Malam, just patented, not only on account of its portability, but also of the ease and cleanliness with which the operation is managed, especially when the materials are oils, fats, or bones. Any lad or other person, without any previous experience, can conduct the process with facility; but in a manufactory or other place where steam-power is used, it is the easiest thing imaginable for the man who has the charge of the engine to make gas for the supply of the establishment.

The portability of these machines may be judged of, when it is stated that one capable of supplying twenty-five gas-burners (each burner equal to ten wax-lights) occupies only the space of 2 ft. 6 in. square and 4 ft. 6 in. high. Another important feature of this invention is its adaptability for making gas from almost any animal or vegetable substance; hence wherever such material can be obtained, a beautiful and powerful illuminating gas may be made. These gas-machines are admirably adapted for the farm, where there is always a supply of animal and vegetable refuse,

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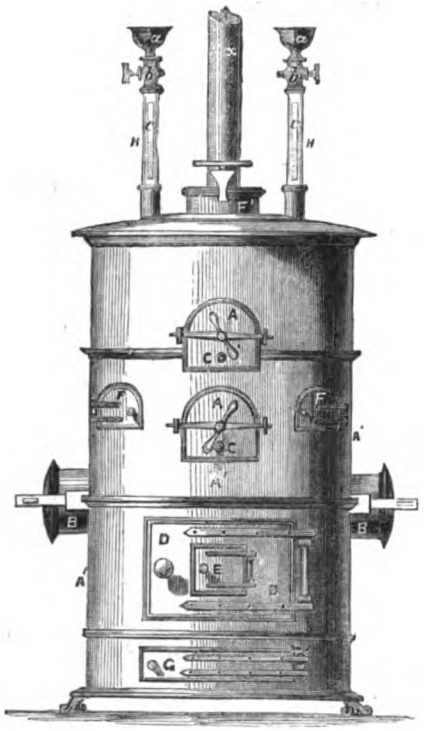
as they can be used with the most economical results, for after producing gas, the remains of the material will be found useful as a manure. In the colonies, where population is comparatively thin and organic matter abundant, nothing could be more useful than such an invention as this; it can be carried anywhere, placed anywhere, and managed by the merest tyro. On shipboard the services of this gas apparatus must be invaluable, both for the interior illumination of the vessel and night signalling. It would occupy too much space here to do more than name a few of the numerous other instances where such a contrivance would be beneficial, such as mansions in the country, small towns and villages, paper-mills and manufactories of every description, railway stations, railway carriages, lighthouses, beacons, churches, river-steamers, omnibuses, mines, &c.

The invention consists in the following new arrangement of apparatuses. Over a fire protected by fire-lumps, the inventor places two retorts into which oil is fed through gauge-tubes from above. Over these retorts in a suitable chamber he places coke, and above this chamber he fits a vessel containing fat or grease. Flues from the furnace at the bottom of the apparatus surround the coke-chamber and grease-vessel. The gas generated from the fat or grease is made to descend and mix with that from the oil, and is passed through one or more strata of cleansing material.

Instead of coke, ordinary coal may be placed in the coke-chamber, when it becomes an ordinary retort, and the gas generated from the coal may be mixed or not with that from the oil and grease.

Fig. 1 of the annexed engravings is an elevation of one of these gas-apparatuses complete. *A A* are two double retorts set in the exterior cast-iron frame

FIG. 1.



A' A'; *B* is a three-chamber retort; *C C* are sight-holes in the covers to the mouths of the retorts; *D* is the furnace-door, which has a second or smaller door *E* formed in the centre thereof. This door *E* is made for the sake of convenience, and to prevent the necessity of opening the larger door *D*, except when the furnace requires cleaning. *F F* are doors through which fuel is supplied to the furnace while the apparatus is at work; *G* is a door to the ash-pit; *H H* are tubes of glass, iron, or other suitable material, the upper ends of which terminate in cups or receivers *a a* for the reception of fatty or oily liquids employed for the manufacture of gas; *b b* are stop-cocks; *c c*

FIG. 2.

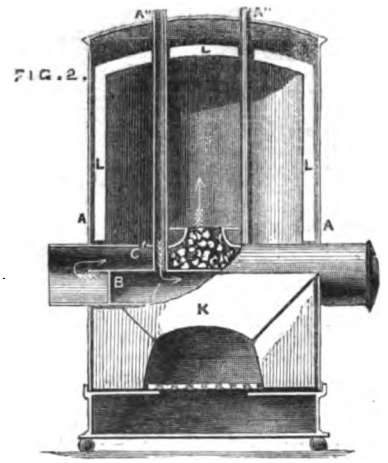
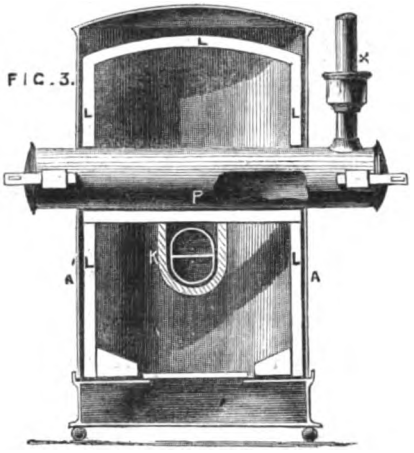


FIG. 3.



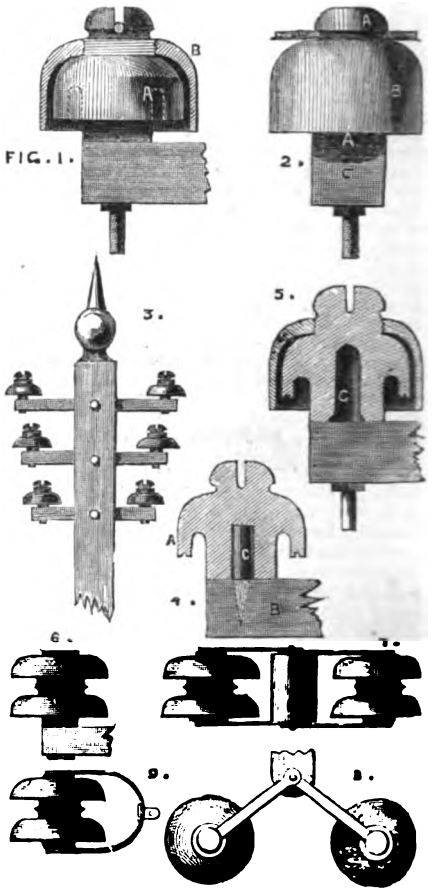
are graduated guages to show the pressure in the apparatus. Fig. 2 is a sectional elevation, and Fig 3 is another sectional elevation taken in a different position (both of these are on a smaller scale than Fig. 1). The feed-tubes *H H*, Fig. 1, are screwed or attached to the pipes *A'' A'''*, Fig. 2, which pass through the apparatus to the chambers *B B*; *C C* are other chambers above the chambers *B B*; *P* is a purifying retort. The oils or liquids are supplied to the cups *a a*, and pass through the feed tubes *H H* to the pipes *A'' A'''* (the quantity being regulated by the cocks *b b*), to the chambers *B B*, where the gas is generated from the oily or fatty liquid employed. The gas then passes into the chambers *C' C'*, where it becomes partially purified, and finally leaves the apparatus by passing through the purifying retort *P* to the pipe *x*, and thence to the gas-holder. The gas-holder preferred in connection with this apparatus is that patented by Mr. Malam on the 31st Jan., 1854, No. 242, but any other gas-holder may be used. *L L* are fire-clay cases, formed either in blocks or segments, and placed in the interior of the case *A' A'*, a small air-space being left between the case *A'* and the blocks *L*. The three-chamber retort *B* is also surrounded with a fire-clay case *K*, which is arched, and serves as a support and protection to the retort. When these fire-clay cases are once thoroughly heated a large fire is not necessary in the furnace, as the heat retained by the clay will be found sufficient for the manufacture of gas for several hours after the fire has become low. Grease or fat is placed in the retort *F F*, the vapours and gases from which descend and pass into the pipes *A'' A'''*, enter into the chambers *B B*, thence to the chambers *C' C'*, where they are subjected to the same action for their purification as has been before described, and pass off to the gas-holder through the common pipe *x*. With this apparatus gas may be manufactured from oils alone or combined with grease, or with gas from coal, or any other carbonaceous materials. Any required number of feed-tubes may be applied to the apparatus according to the number of lights to be supplied with gas.

A splendid screw corvette, the Charybdis, was launched at Chatham on Wednesday last. She appeared to us, in passing her after she was afloat, a very handsome vessel.

SIR CHARLES BRIGHT'S PATENT INSULATORS FOR OVER-GROUND TELEGRAPH WIRES.

SIR CHARLES T. BRIGHT has just completed a patent for improvement in insulators, and an improved mode of connecting insulators to posts and other supports. The following is his specification of the invention.

"My invention consists in protecting insulators used to support over-ground wires by combining with the insulator a roof, or cover, composed of papier maché, wood, leather, iron, gutta-percha, or any mixture thereof, or any suitable material which will act as a shield to, and protector for the insulator; by means of this cover, or protector, the degree of insulation afforded by the insulator is also augmented. Fig. 1 is a side view of a glass,



or earthenware insulator *A*, with its cover, *B B*, shown in section. It is affixed to the insulator by screwing on a thread upon the neck of the latter. The spaces between the thread of the screw should be filled up with red lead, or any cement adapted to the materials of which the insulator and cover are made, and to the climate where they are used. Fig. 2 is an external view of the insulator *A A*, and cover *B* complete, affixed to an arm, *C*, by a bolt, *a*, fastened into the stem of the insulator by a cement composed of pitch, gutta-percha, red lead, and bees'-wax. At Fig. 3 is shown the mode of applying these insulators to the system of suspending over-ground wires described in the specification of a patent granted to Edward Brailsford Bright and myself the 21st day of October, 1852. My invention also consists in connecting the insulators to the posts, arms, or other supports, by means of a slightly elastic medium, by which the difficulties arising from the unyielding nature of the cement commonly used are obviated. Figures 4 and 5 show the manner in which I effect this part of my invention. In Fig. 4 the insulator *A*, shown in section, is attached to the arm *B*, by means of an

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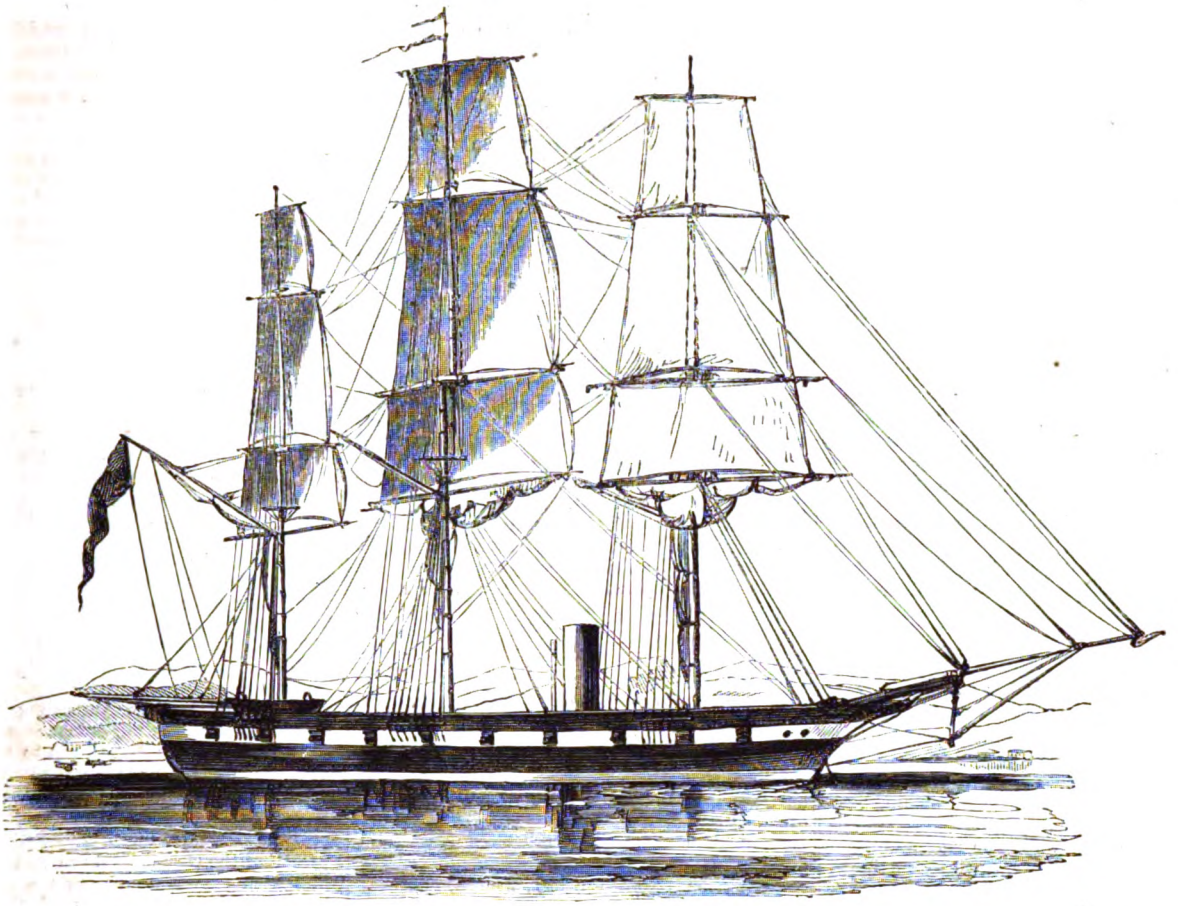
CAPTAIN SCHOMBERG'S IMPROVED RIG FOR SHIPS OF WAR.



iron pin, *C*, which is tightly sewed with well tarred yarn, upon which the insulator is then screwed down. At Fig. 5 the insulator is shown in section, and with a cover also in section, the form of connecting pin *C* is different. By increasing the size of the hole in the stem of the insulator, a wooden pin may be used with advantage in place of the iron pin; and it is obvious that many variations may be made in carrying out this part of my invention, both in the materials (as by the use of leather, felt, or other yielding substance around the pin), as well as in the form of the insulator, pin, or cover used. I also employ, where the curves are very sharp, or the strain very great from any other cause, the form of insulator shown at Fig. 6, which may be attached to the support by an upright pin passing through it, as there shown by the dotted lines *a a*. I prefer to place a piece of vulcanised india-rubber tubing round the pin. Or the insulators may be used in the manner represented in plan at Fig. 7, and in side view at Fig. 8. In this case the strain bears evenly upon the insulators at all times, and great facility is afforded for leading down wires on each side of the insulators for testing purposes, if the great weight at which the wires are erected, or other circumstances, render it desirable to do so.

"At Fig. 9 I show a convenient mode of employing this insulator for terminating line wires. The form of shackle shown was described in the specification of the patent to which I have before referred.

"A cover may be fitted to this insulator, and when it is used to break the continuity of the line wire (as for leading into a station) where it is not convenient to place a terminal pole, a weight may be fixed to the under side of the metal strap, in order to keep the roof, or cover, in its horizontal position."

CAPTAIN SCHOMBERG'S IMPROVED RIG FOR SHIPS OF WAR.

CAPTAIN SCHOMBERG, Royal Navy, Chief Officer of Emigration at Liverpool, has designed the following new rig for ships of war. In his official capacity at Liverpool he has had ample opportunity of observing the progressive improvement made in the equipment of the noble merchant ships which sail from and trade to that port, all tending to one end, *economy of labour;* and he has zealously turned to account the knowledge thus gained for the benefit of his own profession.

There never was a time when such zeal on the part of naval officers needed so much encouragement as at present.

The restless desire for the attainment of excellence in foreign navies is undoubted; and it is only to the zeal, intelligence, and talent of our own naval officers that we should legitimately look for the production of improvements calculated to keep our navy on a footing with those of other countries.

When we look at the equipment of our ships-of-war aloft, precisely the same as it was nearly a century ago—when we compare it with the progress made in our mercantile marine, we cannot help being painfully conscious that we have been asleep!—that, considering the changes which have taken place in navigation, our navy has not kept pace with the times. It is, in this matter, refreshing to see any attempt to break out of this lethargy; and we gladly call attention to Captain Schomberg's proposed rig. We should not, in fairness, close these remarks without an allusion to one naval officer, who, although in the "non-executive" line of the service, has done very much for the sailor;* indeed, has been the first to aim a decided and effective blow at the worn-out system of ages. Captain Schomberg has availed himself of that officer's labours in his proposed rig; indeed, it is the application of the "Cunningham system" of working sails from the decks which perfects Captain Schomberg's design.

The accompanying engraving represents an iron-sided heavily-armed ship, fitted with Capt. Schomberg's proposed rig. The principle adopted by him is the "double topsail-yard rig;" that is, the topsail is divided into two parts; the lower part or topsail is set upon a yard fixed at the cap. The upper part or topsail is set above this, and works up and down the topmast in the ordinary manner. This topsail Capt. Schomberg proposes should be on the "Cunningham system," so that the sail shall be rolled up its entire depth by the simple action of lowering; and again unrolled and set to any extent required by the action of hoisting. Instead of fitting topgallant masts, pole topmasts are proposed, that is, the topmast and top-gallant mast in one continuous spar. The top-gallant sail is also to be fitted with the "Cunningham System," to roll up its entire depth, and to be deeper than an ordinary sail, so that it shall contain sufficient propelling power to dispense with the royal; thus condensing the top-gallant sail and royal into one. By this arrangement it will be seen that all the upper sails can be taken in and set from the deck without sending men aloft. So that in the event of the screw being damaged in action—say in engaging a fort—and it is desirable to withdraw from under fire by means of sails, sufficient sails can be set to draw the ship off without exposing a man aloft, which now that the use of the rifle is so general, its range so great, and its aim so precise, is a most important consideraion.

* Henry D. P. Cunningham, Esq., ex-Paymaster, Royal Navy, F.R.G.S.

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THE EFFECT OF THE INTRODUCTION OF THE ARMSTRONG GUN ON NAVAL ARCHITECTURE.

BY CAPTAIN J. GARDINER FISHBOURNE, R.N.

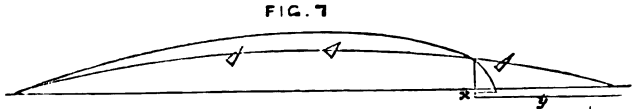
(*Concluded from p. 344.*)

ONE or two important points bearing rather upon the practice than the principles of naval architecture that should be adverted to are—

1st. The excessively destructive nature of Armstrong's shells, the certainty of bursting them, and at pleasure, and the very much greater degree of accuracy with which they can be thrown, warrant the conclusion that it would be a useless expenditure of men and guns to crowd so many as is now done in ships of the line, since small but suitable ships mounting Armstrong's guns could destroy them without much risk to themselves, if the larger vessels mount only smooth-bore guns and without undue risk if they mount rifle guns. Lofty ships will also be more open to objection as rifle guns are introduced.

The deviation of rifled shot from the vertical plane is so small that, from a steady platform, throwing a shot within the breadth of a vessel of the smallest dimensions, even at 3,000 yards, is a matter of certainty; consequently, the only hope of escape from such would be by avoiding to build ships high. The difference arising from the use of rifles compared with smooth-bore guns may be seen from a comparison of the form of their respective trajectories, which are approximately as

FIG. 7



On the assumption that these represent approximately the trajectories of shot from the respective kinds of ordnance referred to, it appears that unless the round shot falls within very narrow limits—that of the short line *x*, fig. 7—it does not take effect, while the rifle admits of considerable error in distance, equal to the line *y*, fig. 7. The great importance of this difference in ship practice can only be realised by considering, first, that the round shot is subjected to much greater error in range than is the oblong shot; and, secondly, the fact that, ships being generally in motion, there is always more or less of uncertainty in the distance of the objects fired at.

No steam fleet can be complete in its equipments without its fleet of colliers, the speed of which will generally regulate that of the steamers, otherwise they will require armed ships to convoy them. The most appropriate use of many of our old sailing vessels would be that of making them colliers, rather than selling them, or allowing them to rot. Give them Armstrong's guns on their main decks, and small auxiliary power to use in calms, they would double the effectiveness of the steamships by the supplies of power they would carry, and would themselves form no inconsiderable additional force. From their greater steadiness, and the destructive character of Armstrong's shells, they would handle a Grande Bretagne or Duke of Wellington very severely before they could close to such a limited distance that the number of guns in the latter should overbear the greater precision of the former. The number and size of colliers must be proportional to the aggregate horse-power of the steam-fleet, which shows the necessity of building vessels that will realise the necessary speed with the least amount of horse-power; not directly on the score of economy, though that would be no inconsiderable advantage, but for purposes of efficiency.* From an absence of proper adaptation, the Diadem, of 32 guns, with 800 horse power, realises little more speed than the Renown, of 91 guns, with only a similar amount of horse power, and doubtless not consuming more coal, though the area of their respective midship sections are about 10 to 13.

Yet, with or without the addition of the auxiliary force above alluded to, we may affirm that till our naval history, which now details almost uninterrupted triumphs, is substituted by records of disasters, England will not have anything to fear from a single-handed foe.* From a combination in the early stages of a war she might apprehend injury; then only because of wanting men, or because the rear of her fleets might not be open to obtain supplies of coals. Were Armstrong's guns and fittings adapted throughout our service, it would afford us a solution of this our greatest difficulty. His 70-pounders can be worked by five men as easily as the smooth-bore 68-pounders by seventeen; while in certain conditions of the sea the former could be used with effect, though the latter could not be "cast adrift" with safety, Nor is it a small advantage, physically and morally, that these five men are relieved from the labour and distraction of running the guns in and out. Even courage would evaporate with the intense exertion of working large guns, and carefulness in pointing would be at an end. In fact, the weight of men and guns moved in this operation every round shifts the centre of gravity of the ship from 12 to 18 inches, which generates oscillations in the smoothest water fatal to that accuracy which is of increasing importance. Armstrong's gun, on the other hand, working on a pivot—the recoil being provided for by a beautiful arrangement—the hustle and bustle of tackles and the exhaustion alluded to is provided against.

Again, the demoralisation which was found during the war to arise from wounds and death occurring on crowded decks will be entirely avoided by small crews.

Effective sea-going ships with iron-plated sides can be obtained only by building them for the purpose, and then narrow and deep. Plated ships we shall come to, though it might be that neither the plates nor the ships' frames should resist rifle 70-pounders, or heavier shot, at comparatively short distances; for at such distances plating becomes of much less value, as the accuracy attainable with Armstrong's guns will admit of the shot and shell being put through the portholes—the proper way, indeed, to assail, as the enemy's guns and men are collected there; but it may be that less heavy plating than that proposed may be used with advantage.

Such adaptations as the Gemappes can be but bad make-shifts, justifiable only because of having ships that ought to be utilized; to build anything like her or still less like any of our wide ships would be unpardonable, as this were to throw away the principal advantages offered by this gun.

The crew that would suffice for thirty-six of Armstrong's guns would be wholly inadequate for the large masts of such vessels as the Gemappes; or suppose ninety of his 70-pounders placed in the Renown in lieu of her hollow-shot 68-pounders, it would be absurd to draw any comparison between the two armaments, the former is so superior in range, in accuracy, in lightness, in the certainty of the action of the shells, in security in a seaway, in the limited amount of powder they require, in dispensing with tackles, and, notwithstanding the assertions to the contrary, in the destructive character of his shells. Other shells, owing to the circumstance of their centre of gravity being on one side, are subject to great deviation, and they are uncertain in bursting; many fell into the ditch at Sevastopol unexploded; Armstrong's, on the contrary, always explode. And though the hole made by their entrance is very small, this is a cause of their greater efficacy, making a small hole, and entering the wood rapidly, the hole closes after them, so that when the bursting powder, of which there is a larger quantity, explodes, its effect is greatly intensified in consequence of its being so confined, vastly more than takes place where the hole is larger, as part of the explosive force passes away through it. Consequently, were the Renown thus armed, she would have a far more effective armament; and were it not for her large masts and sails, might have her crew applied to the manning of two other 90-gun ships; reduce her breadth, and her masts and engines may be reduced in the same proportion. This also would be altering in a direction to obtain a steady platform, and, great as these advantages would be in effectiveness and in economy, they would be nothing in comparison of the priceless value of the men made available for manning other ships.

I fully believe that a saving on one such ship, if it were deemed expedient to place so many as ninety of Armstrong's guns in one vessel, including first cost and current expense of men and ship for one year only, would amount to the greater part of £100,000.

It may not be deemed advisable to reduce the crews to the extent implied in the foregoing; nor could it be so done with existing ships, though their armaments were changed, yet it cannot be that such large crews shall be retained only because of large masts and sails! ships must be built that will not require such.

At no distant day, Armstrong will suggest modifications in existing ordnance and their carriages as will better adapt them to the object for which they were intended, and admit of a reduction of the number of men required for working them; so on all accounts ships that require large masts and sails will fall into desuetude.

Cutting the Gemappes down and covering her sides with iron plate suggests a doubt of the propriety of building ships of the line, even though they were suited to undergo a similar transformation. It is very much to be doubted that this ship will prove a good sea-going ship, and yet, owing to her small breadth as compared with her immersed depth, and the large amount of ballast she carries, she will be much more likely to yield a satisfactory result than any in our service.

I had hoped to have given some proofs drawn from recent trials; if any have been tried, they are kept from us, the principal effect of which is to keep naval officers ignorant, and naval architecture unimproved.

Our dockyards having been for a long series of years the largest ship-building establishments in the world, and vessels of the greatest diversity of form having been built in them, we ought to possess an amount of experience, limited by no personal pecuniary considerations, as all experiments have been at the public expense, and a mass of facts that, if tabulated and used with ordinary intelligence, would have prevented the necessity for our copying the French floating batteries, as we are said to have done, at a cost of well-nigh half a million, and have afforded a guarantee against other eminent failures that have occurred from time to time.

The subject is vastly too important to be treated in the flippant way it has been, even by professional men—another illustration that they get into ruts which those outside are the first to discover.

I have stated my opinions decidedly, because I feel assured that the whole subject of naval architecture requires reconsideration, and that our ships should be designed on some more definite and satisfactory principle than they are; and because I feel strongly that the nation which fully adopts Armstrong's gun, and all the measures necessary for developing its great powers, will be benefited to an extent that no numerical advantage

* It has been well said by an American naval officer that *great* steam-power is of most value for running away. It certainly will not in action prove of the high value which has been given it, nor will the result justify the great sacrifices which have been made to obtain it. When such ships have used much of their coals, they roll very much, which will in action place them very much in the power of auxiliary-powered ships, if not also in those of sailing ships. If large powered steamships go into action they must come down to the terms of their opponents; and if the latter are also to make good use of their time, the speed of the former may not suffice to take them out of action in time.

* We possess a very much larger number of sailing ships than any other power; and the necessity for an auxiliary force, such as I have described, shows that these vessels should all be counted as part of our effective force, provided only that men can be obtained for them.

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of ships and guns similar to those now in use can counterbalance.

In this case the invention will prove vastly more advantageous to us, as it will enable us, while increasing the efficiency of the *materiel*, to place the *personnel* of the navy on a sufficient and entirely satisfactory footing, without further taxing the springs of industry.

After the reading of Captain Fishbourne's paper the following remarks were made :—

Sir WILLIAM ARMSTRONG, Kt., C.B.—In consequence of the injunctions at present imposed to secresy, there is but little I can say on the subject of rifled guns, but there are a few points connected with the trajectory of the projectiles which I may observe upon.

In a vacuum the trajectory would be the same whether the projectile were elongated or spherical, so long as the angle of elevation and the initial velocity were constant; but the presence of a resisting atmosphere makes this remarkable difference, that while it greatly shortens the range of the round shot it actually prolongs that of the elongated projectile, provided the angle of elevation do not exceed a certain limit, which in my experiments I have found to be about 6°. This appears at first very paradoxical, but it may be easily explained. The elongated shot, if properly formed and having a sufficient rotation, retains the same inclination to the horizontal plane throughout its flight, and consequently acquires a continually-increasing obliquity to the curve of its flight. Now the effect of this obliquity is, that the projectile is in a measure sustained upon the air, just as a kite is supported by the current of air meeting the inclined surface, and the result is, that its descent is retarded so that it has time to reach to a greater distance.

With regard to lateral deflection, if from any cause the axis of the projectile should become inclined to the vertical plane, the resistance of the air operating on the inclined surface will press it to the right or to the left, according to the direction of such inclination.

The causes of the axis thus deviating from the vertical plane are somewhat complex, but are due to the manner in which the atmospheric resistance operates upon the under surface of the projectile in relation to the upper part, and upon the curved or conical end in relation to the cylindrical part. As a general observation, I may state that a rotation from left to right (looking on the upper side) will produce a deflection to the right, but the more the form of the projectile approaches that of a simple flat-ended cylinder, the less will be the amount of that deflection. In fact, when a rounded or conical end is altogether absent, the deflection will even be reversed, or take place to the left. Another cause of deflection exists in that class of projectiles which have projections upon them for the purpose of taking hold of the rifled grooves. Such projections act as fanners upon the air, but not with equal effect upon both sides of the projectile, inasmuch as the air is condensed on the one side and rarefied on the other. It becomes an important point, therefore, to determine at what part of the projectile such projections should be placed so as to produce the least possible disturbance of equilibrium affecting the axis.

The deflections of which I have been speaking are of a permanent character, but it is the variable deflections which are the most difficult to deal with. I cannot here enter upon this part of the subject further than by stating that want of fit in the gun is the principal cause which produces irregular deflections in an elongated rifled projectile.

With regard to the application of rifled guns in ships of war, I entirely concur with Captain Fishbourne in what he has stated as to the importance of a steady platform. I think also the number of guns in a ship should be very much less than at present; but that the power of each should be as great as possible. Numerous guns involve crowds of men, and produce so much smoke as to render it impossible to aim. But, above all things, it is important in introducing these guns that the training of the seamen in the use of them should be proportionate to the more refined character of the weapon; and I earnestly hope that the Government will take effectual means to ensure the adoption of a proper system of instruction.

HALL AND WELL'S TELEGRAPH CABLES.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—In answer to "an Enquirer," in your journal of the 27th inst., in reference to the use of cotton for insulating telegraph wires, we believe there is no *bonâ fide* objection to the use of cotton, or any fibrous material when perfectly pure in quality; this we know to be a fact, in consequence of the large quantity we have covered for electrical purposes. Knowing, therefore, that no objection is made to its use, we can, by our patent machinery for manufacturing telegraphic cables, turn the same to a very great advantage in the construction thereof.

First, by covering telegraphic wires by any of the known methods with cotton, we thereby lay a foundation for the india-rubber, which is very essential, as it prevents the india-rubber or gutta-percha from adhering to the wires after the process of insulation is completed. We are of opinion that when the wires are *too closely* imbedded in the insulating material, that the wires are likely to be broken when the cable is *bent* in any particular form, from the fact that the wires cannot regain their original position, more especially if gutta-percha is used for the insulation; as it is an undeniable fact, that the same becomes hard and somewhat brittle at a low temperature.

Secondly, the advantage in using a fibrous material in the process of insulation is of very great importance; as we are thereby enabled to take *nearly* all the strain off the conducting wire or wires during the process of being covered with the india-rubber, because we consider that a cable ought to be made from the beginning to the end, with very *little* strain being put upon the conducting wire or wires in the process of its manufacture.

We shall feel a pleasure in answering any questions your correspondents may feel disposed to ask in relation to cables constructed under our patent.

We are, Gentlemen,
Your most obedient Servants,
HALL AND WELLS.

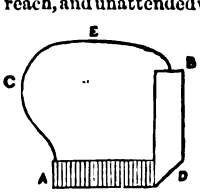
Steam Mills, Borough-road, Southwark.

ELECTRICAL EXPERIMENTS.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—In my last communication to you on the subject of the Atlantic cable*, I described an experiment made by means of a powerful electrical battery, to prove the earth to be an imperfect conducting material, to form a portion of an electrical circuit for telegraphic purposes; the experiment was made nearly half a century back, and it will not, therefore, be amiss if I describe in a few words, with your leave, a novel and interesting experiment which will be found to prove the same thing in a manner much more satisfactory than any of the experiments heretofore described by me.

In the experiments I am about to describe, the object I had in view was to dispense with a powerful battery; to make use of currents of electricity small in quantity, and of low intensity, and with an apparatus within every person's reach, and unattended with trouble; and to ascertain with facility the behaviour of these weak currents of electricity when passing through moist earth.



Procure a strip of zinc, about one inch broad, and about six inches long, bent into this shape, and that portion marked *A D* at the bottom is covered with paper, and afterwards some ten or twelve yards of small copper wire, about half the size of bell-wire, is coiled once round over the paper; it is not necessary to insulate this wire with silk or any other insulating substance, and the end of the wire is riveted fast to the zinc at the top at *B*, between plates of harder metal, or with thumb-screws secured.

This simple galvanic circle is put into a tumbler of clear water, without any acid whatever, a portion of the zinc wire at *B* being above the water; with this instrument three important experiments can be performed without trouble or difficulty. In the first experiment it will be found, after the metals are in the tumbler of clear water three or four days, that the water becomes turbid, and in about a week or ten days there will be perceived in the tumbler a copious precipitate of oxide of zinc, and which will continue increasing while the water will be diminishing in quantity. There is, therefore, as well may be supposed, a current of electricity circulating sufficient to deflect a sensitive indicator; and such is found to be actually the fact, notwithstanding the weak current of electricity. Let us now alter the arrangement for the second experiment; let the loop of wire marked *A C B* be cut in two parts at *C*, and the two ends of the wire thus separated are immersed in a second glass tumbler; clear water without acid is now put into both tumblers; under these circumstances a phenomena somewhat unexpected takes place. It will now be found that the production of oxide of zinc has ceased to be produced in the first glass, the water remaining perfectly clear; this might have been expected, in consequence of the wire being cut, and a portion of the current passing through water; but with respect to the second glass, the water in a few days will be found slightly to change colour, and finally in a week or ten days that end of the wire disconnected with the zinc will be covered with a very fine green oxide of copper, the wire proceeding from the zinc being dissolved in the pure water in the second glass; and if the two wires before they enter the second glass pass through any other vessel containing clear water, one of these wires will also be covered with oxide, namely, all that portion under water. There must, therefore, be a current of electricity circulating in this experiment, although the only indication we can have of it is the precipitation of this oxide on the wires. No sign of it can be perceived by the indicator, as was observed in the first experiment. We will now proceed to the third experiment, the instrument remaining as in the second experiment, and clear water put into both glasses; that portion of the wire situate between *C* and *B* is cut in two parts at *E*, and to the two ends of the wire thus separated copper plates are soldered, and these plates are plunged into moist earth; the action is now continued for several months, but no appearance of oxide of copper can be seen, and the first glass also continues perfectly clear; but when the plates are taken out of the earth, cleaned and pressed strongly together, then in a few weeks the oxide of copper appears as before, and becomes visible, so that in the first experiment there is but a small quantity of electricity circulating. In the second there is considerably less circulating, but in the third experiment it has ceased altogether; this would not be the case if the earth was as good a conductor as the copper wire.

I am, &c. P. M.

26th May, 1859.

* See last week's "Gossip."

FEEDER FOR STEAM BOILERS.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—A short time since I saw in your journal an explanation of the principle of action of a new water feeder for steam-engines. As the object of the MECHANICS' MAGAZINE is, of course, to give a true account of every invention, I would beg leave to suggest that your correspondent's account, or explanation, is erroneous.

It is said that the action of the steam is to create a vacuum in the chambers, and that there-

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fore the water runs up the pipe into the chamber between the two steam-pipes, where it is subjected to the force of the steam from the large supply-pipe, which steam drives the water out of the chamber through the smaller pipe into the boiler, after overcoming the resistance of the steam in the smaller pipe; but the reason given why the water should run up the pipe into the chamber simply because there is a vacuum in the upper chamber, and without any force upon the water, seems funny, and after assuming the chamber to be full of water, why it should not run down the pipe (its gravitation being aided by the steam-pressure above) seems quite as much so.

I do not doubt the action of the instrument, although I think it is not so simple as the plan I proposed to feed my steam-racket propeller, which plan is afterwards explained.

I would beg leave to offer the following as the more rational one, although not quite so wonderful in its action. That the water in the supply-tank is enclosed, and the surface of it is exposed to the same steam-pressure as in the boiler (which is not stated in the explanation) and that it is by this pressure the water runs up the pipe into the chamber, where it is acted upon by the steam-jet, and that the column of water in motion, with the same pressure behind as in front, overcomes the steam by its superior density, or gravity, the force of the steam being to a great extent latent.

My plan is to have a small water-tank, the bottom of which is to be above the water-surface in the boiler, the supply-pipe to the boiler having a valve, or stop-cock, to prevent the return of steam, a steam-pipe communicating with top of the supply-tank with a stop-cock, and a water supply-pipe to the tank, from any water exposed to the atmospheric pressure with a valve, or stop-cock.

The action of this feeder is very simple; a little steam is first let in to create a vacuum in the supply-tank, upon which the atmospheric pressure upon the exposed water immediately fills the supply-tank with water; the steam is then turned on so that the surface of the water in that tank is exposed to the same pressure as the water-pipe to the boiler receives, therefore both being equal, the water descends by its own gravity into the boiler.

I am, Gentlemen, your obedient servant,

JAMES PARKER.

6 Lilford Road, Camberwell, May 26th, 1859.

THE NEW STEEL STEAMER WINDSOR CASTLE.

A friend, upon whom we can rely, has kindly favoured us with the following memoranda respecting the new steel steamer built by Messrs. Caird and Co.:—The "Windsor Castle," new steel steamer, built and engined by Messrs. Caird and Co. Greenock. —Length, 190 feet; beam, 20 feet; depth of hold, 7 feet; registered tonnage, 93 tons. The boat, boiler, paddle wheels, and portions of the engines are of steel, furnished by the Blockairn Iron Company. When tried on the 28th inst. on the Clyde with a mean draught of 3 feet 1 inch, she performed the distance between the "Clock" and "Cumbræ," which is 13·666 knots, or 15·744 statute miles, in 48 minutes 5 seconds, giving a speed of 17·083 knots, or 19·679 statute miles per hour; and had the vessel not been taken considerably off her course through not being able to sight the Cumbræ the same would have been accomplished, we are informed, in under 47 minutes or at least 20·097 statue miles per hour. The immersed midship section of vessel at time of trial was about 52 square feet, the paddle-wheels on the feathering principle, 46 feet in circumference, of beautifully light proportions, each fitted with 10 floats. The boards being 8 feet by 2 feet 3 inches, were making an average of 43·3 revolutions, propelled by 2 cylinders 40 inches diameter, 60 inch stroke, cutting off steam at 12 inches—steam for ditto supplied by an upright tubular boiler of the form first introduced into the Thames by Mr. David Napier, the steam from which is led into a tubular arrangement at the base of the funnel and *superheated*. Our correspondent informs us that a delicate thermometer immersed in an oil bath gave the following results:—

11.0 a.m. steam 33 lbs. by pressure gauge, revolutions 42.

Temperat. due to 33 lbs. above the atmosphere	280·5 F.
— of steam entering superheater ...	287 F.
— — leaving — ...	353 F.
— on entering cylinder	339 F.

12.25 p.m., steam 37 lbs. by pressure gauge revolutions 44.

Temperat. due to 37 above the atmosphere	285·7 F.
— of steam entering superheater ...	300 F.
— — leaving — ...	377 F.
— on entering cylinder	341 F.

The consumption of fuel was not tested on this trial, neither could it have been with fairness to the manufacturers, Messrs. Caird and Company; the coal (Airdrie-hill) being small and interspersed with an abundance of shale, so much so as to coat the bars with clinkers in some six hours' steaming. The engines, by Government formulæ, give a combined horse power of 112·; but the actual horse power gave a maximum of 632 and a minimum of 611·6, the latter with a mean effective pressure of 18·25 lbs. to the square-inch and 44 revolutions, giving an actual of 5·46 times the nominal horse power; safety valves loaded to 40·25 lbs. to the square-inch.

Law Cases.

COURT OF QUEEN'S BENCH, Westminster, May 28.—(*Sitting in Banco, before Lord Campbell, and Justices Wightman, Erle, and Compton.*)

BETTS *v.* MENZIES.

THIS was an action in which the plaintiff, the inventor of what is called Betts's metal, sued the defendant to recover damages for the infringement of his patent, granted to him in the year 1849, for "a new manufacture of capsules, and of a material to be employed therein, and for other purposes." The action had been twice tried in this court, on the last occasion before Mr. Justice Erle, at the sittings after last Hilary Term, when the trial lasted six days. The verdict on that occasion, as at the previous trial, was found for the plaintiff; but, subsequently, a rule was granted to enter the verdict for the defendant, upon the following among other grounds—viz., 1. That the plaintiff manufactured large quantities of the capsules for sale before the date of the patent, and that the invention was not a new manufacture at the time of the grant; 2, that plaintiff's invention as claimed, or some material part of it was included in the specification of Thomas Dobbs's patent, granted in 1804. According to the plaintiff's specification, his patent metal consisted of lead and tin, which in the first instance were cast in ingots, and separately rolled out till the tin became about one-twentieth part of the thickness of the lead, and both were of a thickness suitable for making the patent metal required. The two metals, being thus reduced to their proper relative thicknesses, were laid on each other, and pressed between rollers, the effect of which was that the two metals were combined into one by the pressure, and so became in effect one sheet of metal, with a coating of tin on one or both sides, as might be required. Of the metal thus formed the plaintiff's patent capsules were manufactured and sold in large quantities, and the manufacture had also been extensively applied to many other purposes of ornament and utility. The plaintiff, in his specification, claimed, first, "the manufacture of the new material, lead combined with tin on one or both of its surfaces, by rolling or other mechanical pressure, as herein described; and, secondly, the manufacture of capsules of the new material of lead and tin combined by mechanical pressure, as herein described." It was proved at the trial that before the plaintiff's patent was sealed a large number of capsules had been manufactured by the plaintiff for sale, but not sold, and it was contended, on the part of the defendant, that this invalidated his patent. It was also contended that the plaintiff's invention as claimed, or some material part of it was included in the specification of Thomas Dobbs's patent, granted in 1804, for what he termed "Albion metal," and which was produced by the union of tin with lead by means of mechanical pressure.

The Attorney-General, Mr. Macaulay, Q.C., Mr. Serjeant Hayes, Mr. Udall, and Mr. Webster were heard on Saturday last to show cause against the rule, and in support of the plaintiff's patent.

Mr. Mellor, Q.C., Mr. M. Smith, Q.C,, and Mr. Hindmarch (with whom was Mr. Joseph Brown) were this day heard in support of the rule.

Lord Campbell said he did not think that the fact that the plaintiff had manufactured his capsules before the patent was sealed invalidated his patent. There was some delay in granting the patent, and the plaintiff had manufactured the capsules, but the invention was known only to the plaintiff and his partner, and none were sold until the patent was granted. On the other point, his Lordship said he had entertained great doubt, and had deliberated fully, and, in the result, he was of opinion that the plaintiff's patent was bad. If the plaintiff had limited his claim to the particular proportions specified his Lordship thought the patent might have been good, but, on looking at his claim, it appeared that he claimed "the manufacture of the new material, lead combined with tin, on one or both of its surfaces, by rolling or other mechanical pressure, as herein described," the combination of the two metals by pressure being the subject of Dobbs's patent. The plaintiff's patent was, therefore, invalid, and the rule to enter the verdict for the defendant must be made absolute.

Mr. Justice Wightman, Mr. Justice Erle, and Mr. Justice Crompton expressed themselves to the same effect. Rule absolute to enter the verdict for the defendant.

NOTICES.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

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Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number

Our Weekly Gossip.

Mr. E. T. Loseby, the well-known chronometer-maker, sends us the following suggestion:—"An optical effect, which I suppose to be new, may be developed with the gimballed gyroscope as follows: having set the wheel in motion, place both rings of the gimbal vertical, and the axis of rotation of the wheel will then be horizontal; communicate a reciprocating motion to the outer ring by moving it backward and forward with the hand, so as to cause a rotatory motion of the inner ring and axis to take place at a right angle to the plane of the primary rotation of the wheel; an object on the axis, such as the hole used for the string, will then become visible and the outline be distinctly defined in black whilst the axis is revolving rapidly. The effect referred to must not be mistaken for the ordinary appearance of the hole as it becomes visible during the rotation of the axis by placing it before the light without the second motion being given to the axis; in this case the light and objects are seen through the hole simply as the spokes of a wheel in motion permit objects on the opposite side to be seen. The secondary rotation given to the axis, which need not be quicker than once in a second, is of a tremulous character. There is nothing between the eye and the object equivalent to the disc or slits of the well-known apparatus by which objects in motion are rendered visible."

The following is the substance of a letter in the *Times*:—"A singular application of the stereoscope has recently been suggested by Professor Dove, of Berlin. If two accurately identical copies of ordinary print be placed side by side in the stereoscope, they will not offer any unusual appearance. But if there be the slightest although inappreciable difference between the copies, as, for instance, in the interval separating the same words, the difference will be made evident in the stereoscope, by the elevation into relief (or the reverse) of the corresponding space above the adjoining parts. M. Dove proposes this as an infallible means of distinguishing a forged bank note from a genuine one.

Mr. W. Gosling writes as follows:—"Your correspondent, Mr. T. Le Cheminant, of 30 Queen Ann-street, who addressed you as reported in your valuable journal last week, must not only be totally ignorant of the principles of the construction of my proposed improved gun, but also of that patented by Mr. Wm. Hobbs. If he will only take the trouble to compare the engraving and specification of my improvement with those of Mr. Hobbs's, as set forth and described at the Patent Office, Chancery-lane, London, he will find that they will not bear the slightest comparison. The favour of your inserting this letter in your next journal will greatly oblige."

It has been very evident, since the close of the last Russian War, that that country has turned much attention to the means for improving its manufactures, agriculture, commerce, and its railways, which has given rise to an enormous demand for building materials, and bricks in particular. Mr. Henry Clayton, of the Atlas Works, London, the eminent maker of brick machinery, obtained some time since special privileges from the Russian Government for the introduction of his well-known and successful machinery and his system of Brick manufacture throughout. For the establishment of very extensive brick manufactories in St. Peterburg and Moscow, Mr. Clayton has, during this month, sent out a staff of first-class men to superintend the erection of the buildings and machinery requisite for those works—one of which is to be capable of producing at least ten millions of bricks per annum.

We extract the following from the *Sun*:—"Mr. Hopley, of Eastbourne, the author of various well-known publications having for their object the physical, intellectual, and moral improvement of the country, is, it appears, about to erect in the vicinity of Eastbourne or Brighton a house which, so far as

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we can judge, is likely to prove a specimen of a *Model Domestic Dwelling* for the upper and the wealthy middle classes. In it he 'is desirous that there should be manifested the most advanced principles of building science as applicable to health, domestic comforts, domestic economy, the saving of time, labour,' &c. 'Efficiency, simplicity, and lowness of price will be conjointly considered in judging of the value of a principle;' and all engaged in the manufacture or sale of articles applied to house construction are invited to forward any circulars explanatory of new inventions, or well-approved plans for ventilation, drainage, water-supply, house-warming, bell-hanging, &c., &c., and these will receive careful attention. The best approved water-closets, traps, drain-pipes, grates, kitchen-ranges, locks, taps, &c., are all, so far as is possible, in connection with one simple dwelling-place, to have a fair trial. In fact, this is likely to prove a very valuable undertaking. No one who has noted how the *practical* abounds in all Mr. Hopley's writings, will think it likely that he will be led away by enthusiasm to attempt more than will be practically useful. He appears fully aware that to serve its intended purpose the house must be a model of *cheapness* as well as of everything else that is good. Strength and durability are to be kept constantly in view. The style to be aimed at is a chaste but elegant simplicity. Taste is to be studied everywhere; but no unnecessary shilling is to be expended on unnecessary ornament. We augur well of this undertaking. Mr. Hopley, in his 'Essay on Respiration,' has laboured hard to bring about a better style of dwelling for the poor; and now it seems the common defects in the houses of the wealthier classes are to be practically pointed out. What these defects are, most people are pretty well aware of—smokey chimneys, comfortless and most unphilosophical grates, ill-ventilated and low-pitched bed-rooms, especially for the servants; wall-papers exhibiting colours which are known to the scientific world as giving forth matters of a deleterious and often of a highly poisonous character; bell-wires that are constantly wanting mending; drains that are constantly wanting cleansing; ceilings that are constantly cracking—and so on. He who shows by an assemblage, at a reasonable rate, of all the domestic building proprieties under one roof, or upon one building plot, that such common disagreeables are quite unnecessary, will be doing, we take it, no mean thing for the domestic comfort of England. We believe we cannot wish Mr. Hopley any greater reward for his endeavours in this direction than that he may live to see many houses similar to that which he proposes to build spring up in his own immediate neighbourhood and throughout the country."

The engagement of the host of performers for the Great Handel Festival at the Crystal Palace has now been completed by the Sacred Harmonic Society. The extent of the orchestra will be appreciated when it is stated that it will comprise 242 violins and violas, 120 violoncellos and double basses, with about 100 wind and other instruments, which, with 2,700 choralists—all efficient and most carefully selected—will form an aggregate considerably beyond three thousand performers. The orchestra itself is 216 feet wide, or double the diameter of the dome of St. Paul's Cathedral. It is capable of containing many hundreds more than the numbers above stated; but as it has been the express object of the managers of the festival to develop the tone produced by this gigantic assemblage of musicians under the most favourable conditions, such a liberal allowance of space has been given to each performer, and so many wide avenues intersect and divide each portion of the chorus, that it has been found absolutely imperative—despite the many thousands of efficient applicants now registered in the books kept by the Sacred Harmonic Society—to limit the performers to the number above stated. Arrangements are now in progress at the Crystal Palace for the exhibition of various relics and memorials of Handel, in a court arranged for the purpose. This collection gives promise of great interest. The wide-spread interest excited has led the directors to apply to the Commander-in-Chief to give facilities to officers in the army for attending the festival; and an official intimation has been given that, on application, leave of absence will be given for the festival week to such officers as may desire to be present. Steps have also been taken for affording the opportunity for attending the festival to members of the provincial press. The telegraphic arrangements being made on the present occasion will offer increased facilities over those in 1857.

PATENT FILE-CUTTING MACHINE.—We visited a few days ago the mechanical establishment of Messrs. Greenwood and Batley, of this town, for the purpose of inspecting a patent file-cutting machine recently imported from France. This machine is exceedingly ingenious, and does great credit to the inventor, for it has long been a desideratum to cut files by machinery, which object seems now to be completely attained. The file is placed upon a self-adjusting bed, capable of being turned in any direction, and the chisel or cutting instrument is fixed in a vertical slide, actuated by a spring and a carn, and giving about a thousand blows per minute. The machine is perfectly under the control of the workman, and occupies very little room; it produces better files than can be made by hand labour, and will do ten or twelve times as much work as an ordinary skilled workman. The machine is already in operation in France and Belgium; in the former country nearly half a million of files can be annually produced at the patent file manufactory. We understand it is intended to establish a Joint Stock Company to carry out at Leeds the manufacture of files by this process on an extensive scale. This would add another very important branch of trade to our town, and afford an additional supply of work to its industrious artizans. We therefore wish the promoters every success in their undertaking. *Leeds Mercury.*

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated March 31, 1859.

808. D. B. White, of Newcastle-on-Tyne, Doctor of Medicine. An improved indicating guage-lead or plummet.

Dated April 23, 1859.

1012. H. Keach and G. H. Farrington, of Bush-lane, Wholesale Stationers. Improved advertising circulars.

Dated May 12, 1859.

1189. D. Foxwell, of Manchester, Card Manufacturer. Improvements in sewing machines and apparatus connected therewith.

1193. T. R. Oswald, of Sunderland, Ship Builder. Improvements in building ships and other vessels.

Dated May 13, 1859.

1195. J. Woodley, of Limehouse, Cooper. Improvements in sawing machines.

1197. W. Clark, of Chancery-lane. Certain improvements in knitting machines. A communication from J. B. Aiken.

1199. W. Whitehouse, of New Ferry, near Birkenhead, Gentleman. Improvements in steam vessels.

1201. T. Vicars, sen., T. Vicars, jun., and T. Ashmore, of Liverpool, Engineers, and J. Smith, of the same place, Baker. Improvements in the manufacture of bread, biscuits, and like articles, and in the machinery and apparatus connected therewith.

1203. J. H. Johnson, of Lincoln's-inn-fields. Improvements in machinery or apparatus for treating india-rubber and other similar gums. A communication from A. G. Day.

1205. J. T. Beale, of Greenwich, Engineer, and T. N. Kirkham, of Upper Halliford, Civil Engineer. Improvements in the preparation of colours for dyeing and printing.

Dated May 14, 1859.

1207. J. M. Munro, of Bristol, Agricultural Implement Manufacturer. Improvements in the manufacture and arrangements of chain harrows.

1209. W. E. Gedge, of Wellington-st., Strand. Improvements in dyeing. A communication from J. B. Thénault.

1211. T. Cooper, of West Bromwich, Builder, and T. J. Evans, of West Bromwich, Manager. A new or improved oven or stove for baking, for drying japanned and lacquered goods, and for such other purposes as the same is or may be applicable to.

1213. J. Chatterton, of Islington. Improvements in covering wires and other metal conductors for telegraphic purposes.

Dated May 16, 1859.

1215. E. Adams, of the Stanton Iron Works, Derby, Furnace Manager. The employment of machinery for drawing or extracting the gas flame or smoke from furnaces, and forcing the same into them, or into the cupola, to be used as blast or fuel for melting iron or mines of any description.

1217. J. Jones, of Dorstone, Hereford, Gentleman. Improvements in musical instruments.

1219. G. Allcraft, of Upper Thames-st. Improvements in pressure guages. A communication from J. Allcraft.

1221. W. E. Newton, of Chancery-lane. Improvements in manufacturing instruments for sharpening knives. A communication from C. S. Pomeroy.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1249. G. R. Sampson, of Massachusetts. A new and useful improvement in propelling navigable vessels through water. A communication from J. Taggart. Dated May 20, 1859.

1259. E. Pasquier, Mechanic, of Reims, France. Apparatus for drying wool, and all filaceous matters. Dated May 23, 1859.

1286. M. A. F. Mennons, of Paris. An improved apparatus for the preparation of sand moulds for metal casting. A communication from Maudoy and Couty. Dated May 24, 1859.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, May* 31, 1859.)

152. R. A. Brooman. Silk thread. A communication.
160. P. A. Sparre. Paper.
176. S. Phillips. Sliding sashes, &c.
179. J. Bent. Clasps.
185. L. Le Prince. Boots and shoes.
187. G. Ellis. Muffs.
189. R. Howell and R. J. Wilder. Taps.
198. B. Lauth. Rolling plates, &c.
199. J. Edwards. Buckles.
206. T. W. Rammell. Atmospheric propulsion.
210. R. Mushet. Cast steel and iron.
211. R. Mushet. Cast steel.
212. R. A. Brooman. Pumps. A communication.
213. J. Laubereau. Air engines.
226. W. and H. Hodgson. Spinning.
236. I. Hammond. Fire-arms and cartridges.
240. F. C. C. Paulsen and A. Alsing. Beverages.
254. J. Gathercole. Envelopes and paper bags.
270. J. J. A. de Bronac and A. J. M. Decherrypon. Treating metallic sulphurets, &c.
281. L. Regolieu. Brake for carriages.
294. E. H. Bentall. Grinding or pulverizing.
320. R. A. Brooman. Cooling beer. A communication.
372. W. E. Newton. Fire-arms and cartridges. A communication.
497. G. Turnbull. Permanent way.
603. G. Twigg. Fusee-igniter.
676. R. A. Brooman. Treating barley. A communication.
731. R. A. Brooman. Fire-arms, ordnance, and projectiles. A communication.
766. G. Naylor. Apparatus for measuring distance.
844. M. A. Crooker. Paddle-wheels.
896. H. F. Gardner. Boots and shoes. Partly a communication.
910. W. Clark. Lowering ships' boats.
926. R. Coleman. Agricultural implements.
934. J. Gillett. Mill.
1043. H. Allman. Window-blind mountings.
1083. J. Toussaint. Modelling and moulding.
1090. C. H. G. Williams. Colouring matters.
1124. J. Scholfield and W. Cudworth. Spinning.
1153. R. Pearsall. Glass shades.
1155. R. D. Kay. Colouring matters. A communication.
1167. W. F. Nuthall. Ordnance, fire-arms and projectiles.
1203. J. H. Johnson. India-rubber. A communication.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed May 27, 1859.

2696. J. Ramsbottom.
2704. S. Diggle.
2706. L. A. Possoz.
2707. G. Oates.
2710. G. Collier and W. Noble.
2712. G. Hadfield.
2713. W. Parsons.
2714. C. Hancock.
2716. W. A. Henry.
2729. J. Thow and T. M. Hall.
2733. J. Colyer.
2734. J. Coulson.
2740. R. Laming.
2770. H. Bevan.
2788. J. G. Arnold.
2795. F. W. Fletcher.
2831. B. Lauth.
2863. G. W. Baker.
2892. J. J. Aston.
2925. W. Spence.
3007. J. H. Johnson.
80. C. M. Kernot.
155. R. Bradley and W. Craven.
209. W. C. Homersham.
222. H. Owen.
809. S. Bateson.
819. W. E. Newton.
821. W. Tod.
849. G. Haseltine.

Sealed May 30, 1859.

2739. T. P. Purssglove.
2742. J. Samuel and J. Nicholson.
2743. E. Viney.
2744. H. Adcock.
2745. F. Warner, J. Derbyshire, and A. Mann.
2748. S. Newington.
2760. G. Spiller.
2772. R. Legg.
2777. T. Sibley.
2806. W. Burness.
2818. H. Meidinger.
2828. J. Wilson.
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2838. W. Beardmore.
2840. G. W. B. Kiallmark, and W. T. Timewell.
2842. J. B. Guthrie.
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2873. J. Bullough.
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2891. W. Clark.
2899. J. Aitken and J. Brooks.
2901. A. Mitchell.
2916. A. S. Beliard.
544. J. Pile.
558. J. Kershaw.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1244. W. Illingworth.
1252. A. R. L. de Normandy.
1263. J. Baird.
1275. G. Bell and G. Grimes.
1283. F. L. Stott, T. Belward, and J. Findlow.
1288. W. Needham and J. Kite.
1292. H. Bessemer.
1310. E. Marsden.
1313. T. W. Willett.

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ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement :—

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2362. A. SHAW. *A new method or mode of raising nap on the linings of sheep skins.* Dated Oct. 22, 1858.

This consists in employing pumice stone for raising nap on the lining of sheep skins. *Patent completed.*

2363. R. WALLER. *Improvements in obtaining motive power, and in apparatus connected therewith.* Dated Oct. 22, 1858.

This consists, under one modification, in constructing the apparatus or engine with a series of magnets radiating in a circular or conical form, and in arranging the armature or keeeper also in a circular or conical form, but somewhat less in diameter than the circle of the magnets, and placed eccentric thereto. A shaft is arranged within the centre of the magnets, and an arm or cam is attached thereto. On the inner circle of the armature there is a pulley or roller, the axis of which is arranged to actuate the arm or cam on the shaft. The armature may be also arranged with a series of magnets, or the outer series may be moveable and the inner one stationary, so that the two circular series being eccentric to each other, will be so attracted as to cause the central shafts to revolve. The improvements in batteries consist in giving a current or stream to the liquid employed in the cells for cleaning and other purposes; also in working the cells or troughs under pressure greater or less than that of the atmosphere. *Patent completed.*

2364. R. KENNEDY and J. ARMSTRONG. *An improved kiln for drying grain.* Dated October 22, 1858.

This consists in arranging the tiles of the kiln in a slanting position, one over the other, across a drying chamber. The grain passes through an aperture at the top of the chamber on to the upper side of the highest inclined plane. The grain passes down this first plane to the opposite side of the chamber, where in passing to the next inclined surface—which is inclined in an opposite direction—the grain is turned over by means of a curve. This process of turning the grain from one plane to the other has the effect of reversing the surface of the grain that has been in contact with the heated tiles, and the reversing of the grain is continued as often as required until the grain be properly dried. The flow of the grain downwards is regulated by a cylinder or wheel placed at the lower side of the undermost inclined surface. The velocity of this cylinder or wheel is regulated by clockwork. The inclined surfaces are supplied underneath with heated air. There are other modifications included. *Patent completed.*

2365. C. CLAY. *Improvements in apparatus for harrowing, scarifying, and cultivating land.* Dated Oct. 22, 1858.

Here a frame is employed, to which is fixed bars having tines secured to them, the stem of the tine being bent or curved round the bar, so as, supposing the bar to be square in section, to fit to three of its sides; or if the bar be of any other form, the stem of the tine is bent round it to a similar extent. Through the stem of the tine two key-ways are cut, one opposite to the other, in such a position that a key pushed through them comes against the fourth or remaining side of the bar, thus fixing the tine very firmly in its place, and allowing of its being readily removed. The implement may be drawn by horses; and the depth to which the tines penetrate the land may be regulated by adjustable wheels. There are various modifications included. *Patent completed.*

2366. E. PALMER and E. PALMER. *Improvements in machinery or apparatus for cutting hay, straw, or other similar substances.* Dated October 23, 1858.

This consists of a shaft supported and revolving in bearings, and carrying, by means of arms or otherwise, two or more blades or cutters having their length running in a direction parallel to that of the axis, and their width more or less approaching the direction of their circle of revolution. These blades or cutters are tapered off so as to form cutting edges in the direction of their length, and are adjustable by suitable screws, so that as they are carried round by the revolution of the axis they successively pass, and may to some extent rub against a blade or "ledger plate" placed in an inclined position with regard to the axis and revolving blades before named, and serving as a fixed cutter between which and the revolving blades the hay or other substance to be operated upon is cut. It will thus be seen that the moveable blades successively act with the "ledger plate" in the manner of which one blade (the "ledger plate) is fixed, and the other is attached, its edge forming a suitable cutting angle with that of the fixed blade, by arms or otherwise, to an axis whereby it is carried downward past the fixed blade. The "ledger plate" or fixed blade is situated at the end of a suitable trough or guide casing into which the material to be cut is fed, and along which it is drawn gradually forward by toothed rollers to the "ledger plate" to be cut as described. Motion is given to the parts by a toothed wheel revolving horizontally upon or with a vertical shaft or spindle, and of sufficient size to allow one or more horses to be yoked thereto. *Patent completed.*

2367. P. C. STORTZ. *An improvement for taking life-size pictures from smaller pictures either with or without the aid of photography.* Dated October 23, 1858.

Here the inventor places a double or single lens with a camera so that the lens is turned in a dark room a transparent positive or negative image against the daylight. In the dark room is placed on an easel a card, board, canvas, glass, or paper on which will be seen the image on a large scale. If the image is negative the inventor takes indian ink or any colour pencil or chalk and fills up all white lines and designs which, when seen in daylight, will produce an exact image of the smaller one. If it appears positive on the canvas he takes the same ink or colour but does only the outlines, which will produce the same effect; or in rendering the surface of the said card, board, canvas, glass, or paper sensitive to light an image by photographic means may be produced of life or any other size. *Patent abandoned.*

2368. E. C. SHEPARD. *Improvements in electric lamps.* (A communication.) Dated October 23, 1858.

This consists in the employment in an electric lamp of an open seat contained in a stationary bridge plate and receiving the electrode so as to allow the point only thereof to protrude through it the distance required, and permitting the advance of the said electrode so fast only as it is oxydized and reduced by the electric current. And also in the combination of a loaded tube carrying the upper electrode, an open seat, and a mercury tube, in which floats and is secured the lower electrode, so that while the upper tube feeds the upper electrode down to the open seat as fast as it is reduced, the lower electrode is also fed up as fast as reduced, and keeps in its proper position with reference to the upper electrode. *Patent completed.*

2369. R. BODMER. *An improved toy or plaything for children.* (A communication.) Dated October 23, 1858.

This consists in puppets being supported by or suspended from lengths of white horse-hair or bristle, each somewhat exceeding the length of the moveable legs of the puppet, and placed on an elastic surface or platform to which a vibrating movement is imparted by a simple mechanism put into action by hand or by clockwork. *Patent completed.*

2370. G. DAVIES. *Improvements in weaving.* (A communication.) Dated October 23, 1858.

This relates to weaving articles of a circular or elliptic form without a seam. The principal feature consists in weaving such fabrics with two circular or elliptical lists or selvages, either parallel, concentric, or otherwise, the weft threads passing in a radial direction. To effect this, the width of the warp is divided into several separate breadths each independent and distinct from the other, and wound upon beams or rollers weighted in a different manner, those composing the inner circle being weighted the heaviest. The reed is parallel to the warp beams, and the cloth roller is formed of a truncated cone corresponding with the form of the article to be woven. *Patent abandoned.*

2371. J. C. MARTIN. *An improvement in the manufacture of metal moulds for moulding plastic substances.* Dated October 23, 1858.

This consists in making moulds composed of electrotype copper strengthened by the addition of other metal to render them sufficiently strong to bear the necessary pressure for producing the moulded articles. *Patent abandoned.*

2372. W. E. NEWTON. *Improvements in pumps.* (A communication.) Dated October 23, 1858.

Here the ordinary clack-valves are dispensed with, and a peculiar contrivance adapted for admitting and discharging the liquid or fluid into and from the body or cylinder of the pump. This contrivance receives an independent motion from the external mechanism. The contrivance is a two-way cock, and it operates in a similar way to the slide or throttle valve of a steam-engine, and to which it is analogous, having two passages cast in it, and communicating with the interior of the cylinder and the exit pipe or cock. *Patent completed.*

2373. W. E. NEWTON. *Improvements in telegraphic apparatus.* (A communication.) Dated Oct. 23, 1858.

This consists in sending and receiving messages simultaneously over the same wire by an accessory magnet and an accessory battery to each instrument in combination with the main batteries and main magnets, and with a means of reversing the direction of the current of each of the main batteries. The apparatus consists of two parts, the key or transmitting apparatus, and the relay or receiving apparatus. The transmitting key also serves to reverse the direction of the current, and may therefore be called a reversing key. The invention further relates to a means of printing despatches as received. This feature is not described apart from the drawings. *Patent completed.*

2374. E. COTTAM. *Improvements in the internal fittings of carriages.* Dated October 25, 1858.

This relates to the seats, backs, and elbow-rests of carriages (particularly railway carriages), and consists, 1, in the substitution of a combination of metallic springs, laths, and covers for the ordinary seats and backs. It consists, 2, in an arm or elbow-rest, so constructed as to turn up or down, so that the seat may be made into a couch. *Patent abandoned.*

2375. M. MASON. *Improvements in elevating stands or stages for the use of firemen in extinguishing fires; also for decorating windows, public buildings, and other purposes.* Dated October 25, 1858.

The inventor mounts a stage, about 15 feet high, upon a framework carried by four wheels, and supported at the corners by four pillars. Through the centre of the stage he passes an upright tube with a rack attached to its side along its whole length, this rack being driven by a winch on the stage. The vertical rack is arranged in lengths of about five feet long, and a circular hole is left in the bottom frame for a man to stand in, so as to allow these lengths to be inserted below, and the rack can thus be raised to any extent. On the top of the rack or stand a cage is fixed, which is railed round, and in which the fireman is placed. The bottom frame is to be weighted to give the structure the required stability. A rope is attached to each of the four corners of the cage and so arranged as to steady the rack during the ascent, and serving the same purpose to the rack as the shrouds of a ship do to the masts. *Patent abandoned.*

2376. J. J. WELCH and J. S. MARGETSON. *Improvements in the manufacture of scarfs for gentlemen's wear.* Dated October 25, 1858.

This consists in weaving gentlemen's scarfs with the ends stiffer and stouter than the part which encircles the neck. This is effected by changing the shuttle in the process of weaving. *Patent completed.*

2377. F. FOWKE. *Improvements in umbrellas and parasols.* Dated October 25, 1858.

This consists in constructing the stick of metal and with recesses which receive the stretchers and ribs. *Patent completed.*

2378. J. ROBB. *Improvements in propellers for ships and boats.* Dated October 25, 1858.

This consists of a horizontal shaft or bar, having a reciprocating motion imparted to it in the direction of its longitudinal axis. To the outer end of this shaft or bar is secured or formed a V-shaped block of metal, having the narrow end towards the ship. To this narrow end is hinged on each side a vertical wing or float, which wings are free to open out at right angles to the propeller, bar, or shafts, or to close against the sides of the piece before referred to, which latter keeps them just sufficiently open to cause them to expand when urged against the water. A transverse cross-bar or stop fitted to the propeller, shaft, or bar behind the wings serves as a rest or stop for the wings to bear against when open for being pushed through the water. The action of this propeller is consequently perfectly direct upon the body-water, the wings opening and closing as the propeller, shaft, or bar moves outwards from or inwards towards the ship. These propellors may be applied either to bow, stern, or sides of a ship. *Patent completed.*

2379. T. and J. ASHWORTH. *Certain improvements in power-looms for weaving.* Dated October 25, 1858.

This relates, 1, to apparatus for actuating the picking rods of power-looms for weaving patterns, and consists in the use of a single endless pattern chain, by which a greater number of single picks of various colours or thread can be given than hitherto. It relates, 2, to the healds, and consists in a novel method and arrangement of apparatus for raising and lowering the healds simultaneously. *Patent completed.*

2380. W. CRADDOCK and J. WHITE. *Improvements in the connecting links of harness hames.* Dated October 25, 1858.

This consists in forming the connecting links of harness hames with a hook at each end, whereby they are hooked into the eyes of the hames, instead of the hames being introduced into the body of the link as usual. *Patent completed.*

2381. G. KENT. *An improved churn.* (A communication.) Dated October 25, 1858.

This consists of an arrangement of parts, including the use of certain pipes for drawing air down continuously into the liquid as the churn is rotated, and is not described apart from the drawings. *Patent completed.*

2382. A. V. NEWTON. *An improvement in the manufacture of candles.* (A communication.) Dated Oct. 25, 1858.

This consists in coating candles made of tallow, &c., with a plurality of compositions formed of stearic acid and tallow in varying proportions, together with proper wicks to give different degrees of fusibility, and also of flame

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degrees of hardness and smoothness to the same, in connection with an increased illuminating power. *Patent completed.*

2383. S. R. PARKHURST. *Improvements in cotton gins.* Dated October 25, 1858.

This consists in connecting the stripper and ginning cylinder with an internal gear, viz., a female wheel gear surrounding and driving the pinion on the end of the stripper shaft, by which several advantages are secured. *Patent completed.*

2384. M. MASON. *Improvements in self-acting feeding machines or apparatus for all descriptions of steam or other letter-press printing machines or presses.* Dated October 26, 1858.

This includes a combination of parts for effecting the purposes of the invention, which the inventor in his specification describes in detail, but for which we cannot afford space. *Patent abandoned.*

2385. A. V. NEWTON. *Improved machinery for pulverising, kneading, pressing, and moulding clay and other plastic materials.* (A communication.) Dated October 26, 1858.

This consists, 1, in pulverising, kneading, and forcing the clay, &c., into the moulds. 2. In preventing the lateral oozing of the clay, &c., during its passage through the machine. 3. In the use of adjustable triangular concave base walls or guides, arranged in such relative manner to the rollers as to afford a kneading recess, and to act as cleaners to the rollers between which they are arranged. 4. In dies or moulds formed to act as scrapers and cleaners to the rollers from which they receive the kneaded and compressed material as it is forced through the machine, and mould the same for architectural or mechanical purposes. 5. In severing the plastic material at desired points as it is forced through the dies. *Patent completed.*

2386. C. WIELAND. *Certain improvements in chronometers, watches, and such like timekeepers.* Dated October 26, 1858.

Here the inventor makes the rim of the balance of one piece of metal, and to the bar and rim he connects the following parts for giving the compensating property thereto, namely, two curved pieces of two different kinds of metal connected together in the usual way, so as to combine and render useful the expanding and contracting properties of these metals. *Patent abandoned.*

2387. B. GOODFELLOW. *Certain improvements in steam-engines.* Dated October 27, 1858.

This particularly applies to horizontal condensing engines, and consists in placing the air pump between the cylinder and the crank, and in attaching the air pump piston to the piston rod of the cylinder. *Patent completed.*

2388. J. LUIS. *A new syphon water-wheel, receiving its water without destroying the water level.* (A communication.) Dated October 27, 1858.

This new system of water-wheel receives its water without destroying the level of the water. Beyond this the nature of the invention is not further explained. *Patent abandoned.*

2389. J. LUIS. *A new machine for boring.* (A communication.) Dated October 27, 1858.

This consists in the substitution of cords in the place of the boring rods hitherto used. It is not completely described apart from the drawings. *Patent completed.*

2390. J. BLEAKLEY. *Improvements in boilers, flues, and the methods of fixing the same.* Dated Oct. 27, 1858.

This consists in arranging a number of shells or boilers inserted inside each other, each one being several inches smaller in diameter than the one into which it is inserted. The shells or boilers thus arranged rest upon fixed supports, leaving a sufficient cavity for the flame or heat to traverse. The inventor places arches or tiles in the combustion chamber for igniting the smoke, so as to consume it or cause it to pass in a flame through the flues, which can be fixed either in the line of the flues or at right angles with them. *Patent abandoned.*

2391. A. P. A. BEAU. *A pocket stereoscope.* Dated October 27, 1858.

The patentee proposes to bind or attach the frame in which the two lenses are set to two covers or flaps, so as to resemble a small pocket-book or note-book. These flaps or covers are made so as to have pockets in the inside, within which may be carried writing materials, visiting cards, postage stamps, &c. *Patent completed.*

2392. J. KINSEY. *Improvements in steam-engines and pumps.* Dated October 27, 1858.

This consists in a mode of combining the plunger and barrel of a pump with a piston and piston rod of the motive power engine, by which a direct pumping action is effected, a simpler and stronger arrangement of working parts connected with the cylinder piston and piston rod gear is enabled to be made, and a reduction in the number of parts and wearing surfaces requiring attention and adjustment, and by which economy in the first cost and in wear and tear is effected. *Patent completed.*

2393. C. CHEYNE. *Improvements in the construction of floors and ceilings.* Dated October 27, 1858.

For floors only, where no ceilings are needed, such as stores and warehouses, the inventor constructs floors by iron girders with flanges, upon which are secured plates of corrugated iron, galvanised or not according to circumstances; upon these plates he places a layer or layers of concrete, mortar, cement, or other like fire-resisting material, in which are embedded rafters of wood, to which the flooring is connected. For floors and ceilings he uses perforated or stout wire-cloth for carrying the material of which the ceiling is to be formed. *Patent abandoned.*

2394. L. WRAY. *The preparation and application of a substitute for gutta-percha, caoutchouc, and similar substances.* Dated October 27, 1858.

This invention was described at page 321, No. 20, of the MECHANICS' MAGAZINE (New Series). *Patent abandoned.*

2395. G. SPEIGHT. *Improved plaits and curls or ringlets for head dresses or ornaments or additions to the natural hair, and an improved apparatus for the manufacture of curls or ringlets.* Dated October 27, 1858.

This invention was described at page 321, No. 20, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

2396. M. MASON. *Improvements in letter-press printing machines.* Dated October 27, 1858.

Here the paper to supply the machine is rolled in one continuous length or web around a cylinder. It then passes into the machine, and is printed on its upper side, the printing cylinder having its type arranged on its surface, and is placed above the paper. It is then carried forward a short distance to another cylinder and printed on the reverse or under side, the printing cylinder being placed below it. On emerging from the machine it is passed on to a sloping form, and when the proper length has been carried through, the paper is severed by a pair of shears, operated by a lever which is struck by a catch placed in a proper position on the periphery of the lower printing cylinder. This description of printing machine is self-feeding, the paper being fed in one continuous length; the two printing cylinders are connected together by bevil gearing, and all the other cylinders and rollers also being connected together, they operate simultaneously. It is also supplied with tapes in the usual manner for carrying forward the paper in its proper course through the printing machine. *Patent abandoned.*

2397. P. G. GARDINER. *Furnaces for reheating steel, preparatory to hardening, tempering, or annealing.* Dated October 27, 1858.

This consists in so arranging the furnace as to cause the flame and heat to act upon a closed oven in which the metal is placed, so as to distribute the heat under, above, and on the back of the oven, and to communicate a powerful and steady heat to the interior of the oven, while such interior and its contents have no communication with the flame or gases of combustion, and as little as possible with the external atmosphere. *Patent abandoned.*

2398. T. ALMOND. *Improvements in furnaces for the better combustion of smoke.* Dated October 27, 1858.

Here the patentee places a partition in the fire-box which partially divides the front part from the part next the tubes. In locomotive boilers this partition is formed of a water-space, having through-holes or smoke-channels, space and passage being provided from the fire over the top, and it may be also underneath this partition. He prefers to place this partition at an incline, so as to be nearly in a line with the angles of the fire-box. On the side of this partition, next the tube, he places a number of hollow fire-tubes, which lie with the hollow side against the water partition; and, being made in short lengths, are placed one above the other to form continuous channels from the lower to the upper part of the partition. These channels conduct the products of combustion passing below the partition and through the tubes or passages in it before mentioned. A series of such inclined channels are formed throughout the breadth of the fire-box, so as to receive the products of combustion all the way across. Immediately on these fire-clay flues or channels is laid a second series of tubes of like construction, which form also a series of channels abutting and resting against the flue channels. These latter are for the passage of air admitted from the exterior through the fire-box at a point under the body of the boiler or at other suitable position. The air inlets have slides to regulate the supply of air admitted. The air, in passing up through the fire-tile channels becomes heated, and is emitted into the fire-box in close proximity to the products of combustion passing up through the channels before mentioned, or over the partition with which it mingles, thereby causing the combustion of the smoke. *Patent completed.*

2399. J. W. MOTT. *Improvements in pouches of india-rubber for holding tobacco or other substances.* Dated October 27, 1858.

The patentee attaches to the flap, or makes in one piece with it, an elastic band, which serves to keep the flap closed by passing from side to side of the flap behind the back of the pouch. *Patent completed.*

2400. D. VARLEY. *An improved picker for looms.* Dated October 28, 1858.

The inventor makes a metal frame with a slot for the picker stick to work in, as in the ordinary picker, and in the vertical part of the frame he makes another slot or hole, by which he fastens a piece of buffalo-hide by a screw. The piece of hide is easily removed and a fresh piece substituted. He also makes two holes in the metal frame, through which the spindle passes. *Patent abandoned.*

2401. G. M. CASENTINI and J. O. BARNARD. *A certain composition to be used in the manufacture of articles composed of, or made with plaster of Paris and other similar substances.* Dated October 28, 1858.

The patentees boil water containing a certain quantity of cream of tartar, and while in the boiling state add by degrees white boiling borax of commerce in the proportion of 1 lb. of borax for each quarter of an ounce of cream of tartar. The mixture is boiled until a thickish paste is formed, and it is finally rolled or pounded. *Patent completed.*

2402. P. G. GARDINER. *A new and useful apparatus for cooling and preserving an equable and low temperature in the oil or composition, or other fluid mixture used for the purposes of tempering, annealing, or hardening steel.* Dated October 28, 1858.

This consists chiefly of two large iron cylindrical tanks placed side by side at a short distance from each other, upon a platform, and in a suitable framing of timber. The two tanks are connected by a pipe near the bottom. Within each of these tanks is placed a worm or coil of metal pipe, through which water is made to circulate for keeping the oil cool. A sufficient space is left at the centre of the coils in the tank for a well, in which the springs or metal may be plunged and withdrawn, without interfering with the coils. These tanks have moveable covers perforated with small holes, and the cover of one of them, which is the immersion-tank, has a circular opening at the centre large enough to admit the springs or pieces of steel with facility. The small holes in the cover act as strainers for the oil from the springs or pieces of steel placed upon them. Over and upon the central part of the other tank there is a metallic cylindrical chamber, within which is placed a central tube and a series of horizontal perforated discs. In connection with this chamber is a pumping apparatus, whereby the heated oil is drawn from the immersion-tank through a pipe and delivered on to the perforated discs of the upper chamber, from which it descends in a shower, and is cooled by currents of air. The cooled oil runs through the perforated cover of the tank below into the said tank, and from thence into the immersion-tank. A perfect circulation of the oil is thus kept up. *Patent abandoned.*

2403. J. WESTERBY. *An improved application of steam vessels filled with oil, tallow, or other materials for lubricating the cylinders of steam engines of high or low pressure.* Dated October 28, 1858.

This consists in the introduction of steam from the steam chest or valve-box, or from the steam pipe or boiler, into the grease-cup attached to the cylinder above the surface of the lubricating matter. The object is to force the lubricating material into the cylinder whatever the pressure of steam in the cylinder. *Patent completed.*

2404. C. POOLEY. *Certain improvements in, and applicable to, carding engines, and other machines for preparing cotton and other fibrous materials.* Dated October 28, 1858.

This relates, 1, to those carding engines in which workers and clearing rollers are employed, and consists in a mode of making and applying covers to the bearings of such rollers, these covers being attached to the main cover of the rollers. It consists, 2, in fixing rods above the line of carding engines, and in suspending hooks to the said rods for holding up the covers of the workers and clearers. It relates, 3, to the drawing rollers of carding engines, drawing frames, &c., and consists in applying to the top rollers revolving clearers furnished with a friction apparatus to retard their rotary motion. It consists, 4, of a machine for unwinding the last layer of rovings from the bobbins or spools of roving or slubbing frames. The bobbin or spool from which the layer of rovings is to be unwound, is placed between two rollers which are nearly in contact, and which are made to revolve rapidly, and the roving is thereby unwound. *Patent completed.*

2405. T. RAILTON. *Improvements in the apparatus employed in the manufacture of cap or bonnet fronts.* Dated October 28, 1858.

This relates to the hinged parallel holders used for making cap fronts, &c., and consists, 1, in making the holders of such a shape that the centre of the front is lower than the two extremities, the first gradually increasing in width. 2. In making one of the holders with a hinged division at each end, and so that the cap front, &c., may be made with three sides. *Patent completed.*

2406. A HEYWOOD. *Improvements in machinery or apparatus for suspending paper and woven fabrics to be dried.* (A communication.) Dated October 28, 1858.

When the paper, &c., leaves the grounding, staining, or other machine, it is taken over a revolving roller, which guides it to a pair of diagonal endless straps with hooks or pegs, to carry forward the lags or rods over which the paper, &c., passes. These lags or rods, with the paper, &c., suspended in loops from them, are deposited by the diagonal endless straps on to a pair of endless belts or ropes, which move horizontally, and gradually convey the loops of paper, &c., along the drying chamber in which they are suspended. The lags or rods are selected from a receptacle by a pair of hooks attached to the diagonal straps. *Patent completed.*

2407. J. EVANS. *Improvements in lubricating the slide valves and pistons of steam engines, and in apparatus for this purpose.* Dated October 28, 1858.

This consists in supplying lubricating matter to the face on which the valve works, and also to the interior of the cylinder, by mounting a lubricating cap on the casing of the slide valve, so that the lubricating matter may pass direct to the valve, and also with the steam into the interior of the cylinder. The inventor uses a cup with a cover, and with one tap only. *Patent abandoned.*

2408. B. FOSTER and P. SMITH. *Improvements in machinery or apparatus for spinning and doubling wool, alpaca, mohair, cotton, silk, flax, and other fibrous substances.* Dated October 28, 1858.

This consists in the application of a cup or bell placed upon the upper end of a spindle for conveying the material to a rotatory bobbin, which rises and falls within the cup or bell. It also relates to the wharves for such bobbins, and consists in forming one of the flanges larger than the other, to enable the attendant to stop it by applying a knee. *Patent completed.*

2409. W. MUNRO. *A new manufacture of capsules and other metallic articles.* Dated October 28, 1858.

Here the patentee first prepares a sulphate of tin by placing 1 lb. of tin cut into thin strips in a bottle containing two quarts of water; to this he adds 3 lbs of muriatic acid. He then filters the same through Dutch filtering paper into a vessel capable of holding five gallons of water. When the solution of tin is filtered, he adds to it as much soft water as will make, when mixed, three gallons of the solution. He then dissolves 28 ounces of common soda in 2 gallons of warm water, and pours it gently into the tin solution, when a white carbonate of tin will be precipitated. He then empties the vessel and washes the carbonate of tin in water and filters it through cotton, so that it becomes a thick paste, which he returns to the vessel previously used and emptied, and by mixing with it three gallons of water he brings the solution of tin into a fine cream-like condition. He then takes two pounds of sulphuric acid, diluted in two gallons of water, and stirs the same into the previously prepared solution of tin, and thus a sulphate of tin will be produced. Having obtained the sulphate of tin he then places so much as may be required of it in a trough of wood or stone of a galvanic battery. He then takes pieces of the same size of the tin and of the lead, well cleaned on the surface, and places them in the trough

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face to face, the tin to be on the copper wire and the lead on the zinc wire of the galvanic battery, by which means and by the action of the galvanic battery—using to create the force one part of sulphuric acid to fourteen parts of water—the lead will become coated with tin to any thickness required, and the combined metal may then be rolled down to a suitable thinness by ordinary flattening rollers or other suitable means. The sheets so produced may then be made into capsules, &c. *Patent completed.*

2410. J. SMITH. *Improved hats and coverings for the head.* Dated October 28, 1858.

This consists in the adaptation to hats, &c., of the crinoline material described in the specification of a former patent, No. 2669, dated 22nd Oct., 1857, that is to say, a material composed of horse-hair as the weft, and having a linen or flaxen chain or warp. *Patent completed.*

2411. W. HALL and A. WELLS. *Improvements in electric telegraph cables, and in machinery employed in the manufacture thereof.* Dated October 28, 1858.

This invention was described and illustrated at page 300, No. 19, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

2412. P. BRUNON. *A improved mode of manufacturing cocks.* Dated October 29, 1858.

This consists in manufacturing cocks of glass, &c., by running the material in a melted state in moulds, &c., so as to form the entire metal or body in one casting. The plug is also cast in the same way, and very little grinding is required to make the plug fit the barrel. *Patent completed.*

2413. W. KIRRAGE. *An improved elastic combination of materials impervious to atmospheric influences, as a substitute for hard woods, metal, leather, or felting, and for other purposes.* Dated October 29, 1858.

The materials constituting the new compound are india-rubber, gutta-percha, tar, and sulphur, with certain other ingredients according to the purposes for which it is required. *Patent completed.*

2414. J. DRANSFIELD. *Certain improvements in cocks, taps, or valves.* Dated October 29, 1858.

This consists in the use of a hollow plug conically formed, the apex of the cone being uppermost, and to which the handle is attached. This plug is furnished with an outlet, and has its exterior surface bearing against the interior surface or seating of the tap or valve; it will thus be evident that the pressure of water within the hollow plug will retain the plug against its seating, the flow of water being caused by turning the plug as usual by a handle or otherwise. *Patent abandoned.*

2415. P. WRIGHT. *Improvements in the manufacture of anvils.* Dated October 29, 1858.

This relates to a former patent, which consisted in making an anvil in two halves welded together; the present improvement consists in dispensing with the necessity for welding them together by shaping the parts in a manner that is not described apart from the drawings. *Patent completed.*

2416. W. E. NEWTON. *An improved method of attaching wheels to the axles of railway carriages.* (A communication.) Dated October 29, 1858.

The object here is to enable the wheels of railway carriages to turn independently, and the invention consists in attaching the wheel to its axle by an auxiliary hub, a certain groove, and certain segments connected with the wheel. Reference to the drawings is necessary for a detailed description of the invention. *Patent completed.*

2417. J. DIXON. *A method of manufacturing steel.* Dated October 29, 1858.

The inventor takes cast iron in plates of ½ or ⅜ths of an inch thick, and places them in a converting or cementing furnace, and stratifies the said plates with sand, ashes, charcoal, &c. The furnace being thus filled with stratified cast iron is subjected to heat for two or three weeks. This operation converts the cast iron directly into steel. *Patent abandoned.*

2418. J. WRIGHT. *An improved application of machinery to be used as a new motive propelling power.* (A communication.) Dated October 29, 1858.

The inventor employs a cylinder with one closed end and a piston. The portion of the cylinder between the closed end and the piston is exhausted of the air; this is effected in the first instance either by steam which is afterwards condensed, or by the valve in the corner of the piston; upon force being applied to the piston it is urged towards the open end of the cylinder in opposition to the resistance of the medium filling that end, which will be either water or air. *Patent completed.*

2419. G. ZANNI. *Improvements in arranging magneto-electric machines for medical and other purposes.* Dated October 29, 1858.

This consists in combining magneto-electric machines with maintaining springs and wheel-work, so that when they are required for use, the spring being liberated causes the armature of the machine to rotate, and so produces a succession of currents or shocks in the circuit of which the wire coils surrounding the armature form a part. *Patent completed.*

2420. R. W. CHANDLER and T. OLIVER. *Improvements in agricultural apparatuses for ploughing and otherwise operating upon land.* Dated October 29, 1858.

This relates in part to a former patent of the patentees dated 1st June, 1858, and consists, 1, in employing two wheels at the middle of the plough, and, where necessary, one at each end also, instead of three, four, or more wheels according to the specification of the former patent. 2. In employing a sceath or loose cutting wheel in advance of each of the ploughs for cutting through roots, &c., which would otherwise accumulate in front of the plough and clog it. 3. In constructing steam-ploughs with the principal features desbribed in the former patent, but with an engine employed between the sets of ploughs. 4. In connecting the draught ropes or chains to a nearly vertical lever or levers depending from a transverse stay on the lower part of the machine at the middle for drawing the ploughs down well into the ground when the strain comes upon the ropes or chains. 5. In forming double snatch and other blocks with pulleys which may be shifted from one position to another in the blocks, to accommodate the directions of the ploughing ropes to the varying positions and directions which it is desirable to give to the ploughs in ploughing fields of various forms. 6. In placing the drums for driving or hauling ploughs, &c., between the main wheels of the engine. *Patent completed.*

2421. R. A. BROOMAN. *Improvements in obtaining motive power.* (A communication.) Dated Oct. 29, 1858.

This consists in obtaining motive power to propel vessels and engines and carriages by the use of steam to act upon water or the liquid contained in a vessel divided into two compartments, and fitted with curved pipes or vanes through which the liquid is alternately driven from one compartment to the other, so as to obtain a re-active effect at or near the mouths of the curved pipes. Valves are used for regulating the admission and exit of the fluids, worked by floats rising and falling with the liquid. *Patent abandoned.*

2422. L. J. LEWIS. *Certain improvements in fastenings for ladies' dresses and other such like purposes, as also in the machinery for manufacturing the same.* Dated Oct. 29, 1858.

The object here is to prevent the voluntary disengagement of the hook and eye. The apparatus consists of a bed or table piece of cast-iron fitted to a stand of wood or iron. At the backpart of the bed bearings are formed for carrying a shaft, in either of which fast and loose pulleys are applied for giving motion to the apparatus, and a fly wheel or wheels. On this shaft are also fixed the various cams for producing the different actions and motions for supplying and cutting off the wire; as also in giving form to the said hooks or eyes made from such wire, likewise the planishing, marking, and delivering the same. *Patent completed.*

2423. J. MORRIS. *Improvements in the manufacture of rollers or cylinders for printing fabrics.* Dated October 29, 1858.

This consists in substituting for the hammering or swaging process a drawing process, by which the fitting of the interior bore of the rollers or cylinders to fac-similes of the printers' mandrils is rapidly, evenly and completely effected and with great economy of labour. *Patent completed.*

2424. J. DRUMMOND. *Improvements in reaping and mowing machines.* Dated Oct. 29, 1858.

This consists in a mode of constructing apparatus for reaping or mowing, in which the cutting, mechanism is arranged so that the cutters recede from the front part of the machine backwards in an angular or diagonal direction. Also in a mode of arranging the cutting apparatus, the gathering reel and the receiving board or platform, so that the whole or part thereof may be adjusted to any desired angle, and also admit by their vertical adjustments of a rising and falling motion in passing over uneven ground. The invention is not described apart from the drawings. *Patent completed.*

2425. J. H. JOHNSON. *Improvements in photography, and in the apparatus connected therewith.* (A communication.) Dated Oct. 29, 1858.

This relates to taking photographic birds'-eye views of portions of the earth's surface, and consists in fitting a photographic camera in a vertical position, with the lens downwards, into the bottom or side of the car of a balloon, such car being formed when requisite with a dark chamber by surrounding it at the upper part with black silk, and covering or closing the space or chamber so formed by a moveable roof or ceiling of yellow silk for obtaining the required yellow or negative light. *Patent abandoned.*

2426. R. J. CONINGSBY. *Improved apparatus for turning over the leaves of music or other books.* Dated October 30, 1858.

At the back of each leaf to be turned over is placed a small rod or finger of ivory, &c., and each of these fingers is furnished with a spring, which, when released, causes the finger to turn over the leaf. These springs are placed one above the other, and are held back by a small fork which is attached to a lever, connected at the other end by a wire or rod to a treadle. Upon depressing this treadle by the foot, the sliding fork allows the first spring to escape and turn over its leaf, and each successive depression of the treadle allows a fresh spring to escape and turn over its respective leaf, until all the springs have been released, when the apparatus will require adjusting afresh. *Patent abandoned.*

2427. E. T. HUGHES. *Improvements in machinery or apparatus to prevent railway accidents.* (A communication). Dated October 30, 1858.

This consists in placing near the crossings of the line certain projections which act upon a powerful striking or signal apparatus attached to the locomotive or guard's van. *Patent completed.*

2428. F. WRIGLEY. *An improved self-acting safety coupling for railway and other purposes.* Dated November 1, 1858.

This consists in a combination of joint links and pins so arranged as to form a complete self-acting coupling. The parts consist of two three-fold joints, &c., each joint moving on its own centre pin. These joints are attached to the ends of the draw-bars of two carriages or trucks, and may be further described as consisting of first, the outside joint or jaw attached to and forming part of the draw-bar; second, an internal double joint or pin link; and, third, the centre or coupling link, the whole being so arranged that when so placed in position, and the carriages, &c. brought together the coupling is accomplished. *Patent completed.*

2429. G. DAVIES. *Improvements in machinery for weaving velvets and other piled fabrics.* (A communication.) Dated November 1, 1858.

This relates principally to looms for weaving two pieces of velvet, &c., face to face at one operation, the pieces being connected by the pile threads, upon severing which two distinct pieces of piled fabric are produced. It consists, 1, in a peculiar combination of two cams for working the healds or harness and the pile cutter. 2. In mechanism for "letting off" the pile warp at the proper speed. 3. In mechanism for distending and raising and depressing the pile warp. 4. In arranging the knife for cutting the pile, and in means of sharpening the knife. 5. In apparatus for throwing the taking-up motion out of gear to let back the pieces of fabric. 6. In means of giving the requisite amount of tension to the fabric as it is woven. We cannot give space for a detailed description of these several features. *Patent completed.*

2430. C. VERO and J. EVERITT. *Improvements in the manufacture of hats and other coverings for the head, a part of which improvements is also applicable to the manufacture of felt.* Dated November 1, 1858.

This consists in the use of a waterproof composition, felt, woven fabric, wool, and some other materials, united according to the kind of covering it is desired to produce. *Patent completed.*

2431. H. H. and W. F. HENSON. *Improvements in the manufacture and treatment of starch for domestic purposes.* Dated November 1, 1858.

The patentees employ alkaline silicates, such as silicate of soda or of potash, or any preparation of them, either alone or in combination with farina, flour, &c., to which they add any colouring or tint, or some decolorizing substance, to the silicate. *Patent completed.*

2432. J. DOBSON and D. PEARCE. *Improvements in the manufacture of bird-cages.* Dated November 1, 1858.

This relates to the manufacture of bird-cages of glass. The patentee uses pipes, tubes, or rods of glass, plain or coloured, in place of wire. The lower part and frame are made of any required material. *Patent completed.*

2433. J. CARISS. *An improved safety switch-box and gear.* Dated November 1, 1858.

This consists in constructing a switch-box so that the lever is made to lie in a horizontal position within the cover of the box, and parallel to the line of rails, by which accidents arising from the levers standing up are prevented. *Patent completed.*

2434. E. MAYNARD. *Improvements in submarine telegraph cables.* Dated November 1, 1858.

This consists in the use of parallel cords or strings of hemp, flax, silk, &c., in connection with a twisted conductor or conductors, whereby all strain in laying the cable is taken on the strands of fibrous material, and the conductor is entirely relieved from strain; and the insulation is far more perfect than with gutta-percha, &c. *Patent completed.*

2435. C. PERLEY. *Certain improved means for disconnecting boats from the davit blocks, and effecting other like objects.* Dated Nov. 1, 1858.

This consists in a block or its equivalent attached to the article itself or to the rope or chain which sustains or regulates the movement of the boat, &c., the same being provided with a lug that receives a link to sustain the article, and the block or its equivalent is provided with a drop so fitted that the link is retained in the block, so that when the drop is raised by a very slight pull the parts will be instantly disconnected. *Patent completed.*

2436. W. PALMER. *Improvements in fire-arms.* Dated Nov. 1, 1858.

This consists in an arrangement of seers, hammer, and triggers whereby the commencement of the pull on the trigger cocks the hammer removes the piece, and then it is disconnected from the other parts and gives a pause in which to take aim, and then the continuation of the pull on the trigger disconnects a second or hair-trigger by a very easy pull which causes the hammer to fire the piece. The invention is not described apart from the drawings. *Patent completed.*

2437. L. BEAVER. *An improvement in sleeve links.* Dated Nov. 2, 1858.

This consists in the novel application or adaptation of a well-known description of spring fastening to "sleeve links," whereby they are firmly secured. *Patent abandoned.*

2438. M. A. F. MENNONS. *An improved system of railway brakes.* (A communication.) Dated Nov. 2, 1858.

The patentees claim the general construction and arrangement of a railway brake, the action of which is based on the simultaneous action of pressure to each plain surface of the wheel, which pressure is effected by couples of parallel plates, or other analogous apparatus. *Patent completed.*

2439. M. A. F. MENNONS. *An improved combination for the production of voltaic electricity, and its application as a curative agent to certain parts of the human body.* (A communication.) Dated November 2, 1858.

In his drawings the applicant shows a crown, or circlet, composed of alternate zinc and copper wires twisted together, and so arranged as to be applied directly to the head, or fitted inside any suitable head covering. He also represents a garter formed in the same way of twisted copper and zinc wire, connected at the extremities; also a hair pin formed of zinc, or iron, and copper wires twisted together. *Patent completed.*

2440. D. TOMASINI. *Improvements in respirators.* Dated November 2, 1858.

This consists in constructing respirators so that they shall, when worn, be concealed from view. When the respirator is to be worn by a man, the inventor attaches it to a false beard and moustache. When it is to be worn by a female, he covers it with a false mouth. *Patent abandoned.*

2441. N. BROUGH. *Certain improvements in buttons, and in the means of attaching them to garments, which said means are also applicable for other purposes.* Dated Nov. 2, 1858.

This consists in constructing buttons so that they can be attached to garments without sewing. The shank is formed from a disc of metal, raised into somewhat of the form of the metal portion of a percussion cap. This is done partly by raising with proper tools in a fly press, and pushing them through a hole formed through a steel plate, such hole being of a conical form at the top, tapering down to the size required. These tubes are afterwards slightly reduced in their circumference, and the head part spread out so as to produce a projecting head, this part being worked up in a button. The projecting part of the head being loose, or held, or confined between the front and back shell, constitutes the principles of the invention, for, the shank fitting freely in the back shell, through which it is passed, allows the button to freely move around the shank as on an axis, and the head of the shank being small, there is also a lateral looseness in the connection. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, JUNE 10, 1859.

STEAM YACHTS.

WE all know the delights of yachting. We do not, of course, speak of those superficial pleasures which "snobs" affect—the donning of the guernsey and the round hat, the assumption of the sailor-like bearing, the momentary blurting out of sea-phrases, the frantic swaying upon sheet and haulyard, the gluttonous consumption of cold fowl, and the perpetual swilling of poisonous grog. These are what "yachting" means to some men—if we may call them men; but it is not what it means to us. To us, as to thousands of others, we hope it implies something far above all these unmanly gratifications. It speaks of daring contests with the powers of nature—generous competitions with the elements—struggles of tact and skill—puttings forth, in short, of some of the best faculties both of body and mind. Nor are these the only sources of delight open to the true yachtsman. An inexpressible charm attends a yacht cruise, particularly upon the open sea, or near it. There is something sublime to a well-informed and well-balanced mind in bounding over the gleaming waters, with their blue deeps far beneath you, their diamond radiance all around you, the fresh flowing breeze rolling coolly over you, and above you the bright-bending dome of heaven. To a man possessing any sense of beauty, any love of the natural world, any reverence for what is Divine in the universe, nothing can be more delightful than this. Unless, indeed, there be some peculiar sensitiveness in ourselves to the charms of sea and sky—which we care not to believe. And yet—to be frank—there may be. A very few days since, we stood upon one of the highest downs of the Isle of Wight, and had the whole silver-set island spread beneath us. At that moment none of the many things which a man may possess was more coveted by us than one of those dipping, dancing craft which would in a few hours have borne us farther through the splendours of the sea than the eye could penetrate, even from that height. The burning wreck of the unhappy Eastern Monarch, which still flamed before us above the far-off waters, with all the sense of sea-perils which such a sight engenders, could not repress the admiration felt for what we mean by "yachting." This certainly looks very much like a special leaning in its favour.

But, enjoy it and laud it as we may, it cannot be denied that yachting has its miseries as well as its enjoyments, the chief of all being, perhaps,—a calm! To lie silent on waveless water, in breathless air, under a motionless sky, far away from the port which you ardently desire to reach—that is misery indeed; misery scarcely less than that of drifting leeward in a storm with broken spars towards rocks and shoals. Both of these evils many a yachtsman has experienced. The minor evil of having to bear with light, or to contend with adverse winds, all have knowledge of. Nor is there any means of avoiding these annoyances in sailing yachts. All the time we trust to the air only for propulsion we must expect to be baffled in this way.

Fortunately, however, the introduction of steam-power has furnished us with a complete and perfect remedy for such evils; and one of our objects here is to express astonishment that our yachting nobility and gentry are not more alive to the advantages of applying auxiliary steam propellers to their vessels, and to urge the subject upon their consideration. That such propellers can be applied without in the least detracting from the sailing qualities of the vessels we most confidently assert. The boilers, engines, and fuel, if properly arranged, may be made to take the place of the ordinary ballast; while a well-constructed feathering screw may be so fitted as to lie, when out of use, wholly within the dead-wood, offering no obstruction whatever to the passage of the vessel through the water.

Those who attended the Thames yacht race which was won by the Quiver a fortnight since, must have observed a steam-yacht that hovered near the competing vessels at the commencement of the race, then rapidly hauled ahead of them and steamed away seaward, returning near to the Commodore's steamer while the Quiver rounded her, and running back to Erith and Greenwich under sail alone. The performances of this steam-yacht on that occasion afford us an excellent example of what can be done in the way of steam-yachting. Let us glance, then, for a moment at the advantages which the owner of such a craft enjoys. In the first place, he would be enabled to remain in town until nearly 10 o'clock, and then proceed to Greenwich, embark, and run down to Erith in ample time to see the start. With a sailing yacht, and the wind as it stood on the day in question, this would have been impossible. In the next place, after watching the race minutely as long as seemed desirable, it was in his power to pass ahead, run down to the open water, inhale the sea breeze under sail for an hour or two in sight of the Nore, and return to witness the second great feature of the contest, viz., the rounding of the earlier vessels. Finally, he was able to let the steam go altogether, feather the screw, and run up the river like an ordinary sailing yacht, and that without the least disadvantage in point of speed. In fact, this steam-yacht played an exceedingly pretty and creditable part under sail on that occasion. With no special suit of sails, indeed with no preparation of any kind, she made such good progress on the upward run that although the second and third of the competing yachts were very near her at starting, only one of the two hauled ahead of her before reaching Erith, and that but slightly, while she kept company throughout the journey with some of the finest and fastest craft of the Club.

Nor is the use of steam in yachts necessarily attended, as some would conjecture, by any loss of comfort to those on board. In this yacht not only is the cabin accommodation both elegant and ample, but by inclining the funnel on one side, and fitting it with a shifting top, all unpleasantness from the smoke and escape steam (the engine being high-pressure) is avoided, while the vibration resulting from the screw is almost inappreciable. This last fact is mainly the result of the employment of a particular kind of screw propeller. By the use of this screw the pitch of the blades is varied according to the speed desired, the contrivance used for the purpose being of the simplest character.

It affords us much pleasure to know that the resort to steam-yachts is at last coming into favour. In Scotland, numerous small screw craft are at present in course of construction, at Greenock and elsewhere; and many other encouraging facts of a like kind have come to our knowledge. With no desire whatever to see sailing matches abandoned, on the contrary, with a strong desire to see them maintained with greater spirit than ever, we nevertheless hope to see the adoption of auxiliary screws become all but universal throughout our Yacht Clubs.

THE STATE OF THE THAMES.

THE enemy has once more occupied London as surely as the French have occupied Milan, and with even a better prospect of remaining. Once more the Thames is in a high state of putrefaction, and has been for a fortnight past exhaling the same kind of poisons as were administered to us during the hot summer of last year. This year it has attained its foul state, Dr. Letheby tells us, a month earlier than usual, and that without any remarkable elevation in the temperature, and in despite of heavy falls of rain. We may guess, therefore, what we have to expect in July and August, and prepare to die like rats, slain by—ourselves!

Last year Dr. Letheby made a full inquiry into the state of the river. The water was examined chemically and microscopically. It was tested at high and low tides, at mid-stream and near to the shores. It was collected at many places between Isleworth and Greenwich, and the inquiry was conducted with regularity every day during the whole time that the river was foul. The general results of the investigations were, that the river was highly charged with sewage and sea-water; and that the circumstances which attended or preceded the fœtid decomposition were a remarkably hot season, a continued absence of rain, a diminution in the public water supply, a flowing up of the oceanic or tidal sea-wave to an unusual height, and the sudden discharge of very offensive sewage from the somewhat stagnant sewers by a heavy fall of rain—the discharge occurring about low tide, when, instead of its passing away to sea, it flowed upwards to the higher districts of the river, and then oscillated between the extreme ranges of the tide. This last fact was particularly observed by Captain Burstall, and this year he has noticed it again. Taking the result of 172 analyses of the water which were then made, it was evident that the putrid decomposition was kept up by the sewage acting on the sulphates, &c., of the sea-water, and that the locality or confines of the decomposition was a wave undulating between Chelsea and Greenwich. At high tide it was at the former place, at low tide at the latter. The unfortunate situation of the Houses of Parliament, nearly midway in the range of undulation, was the cause of their being exposed at all times to the fœtid exhalations from the putrid wave, which never passed away beyond them.

The inquiries which Dr. Letheby has again instituted during the last fortnight have shown a similar condition of things, for the river at London-bridge is now overcharged with sewage and sea-water. In ordinary times the proportion of soluble matter in the water of that locality at mid-stream is about 50 grains per gallon, of which nearly 30 are common salt, and from three to four organic impurity; but at present it contains about 97 grains of solid matter per gallon, of which 61 are common salt and rather more than seven are organic impurities. These are in a high state of decomposition, and are giving off ammonia with that

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peculiarly offensive vapour already described. The water near to the shore is still more offensive from sewage and corrupting mud, but it does not contain so large a proportion of solid saline matter. This, compared with the mean of all the experiments made during the hot season of last summer, shows that the river is not yet charged to so high a degree as it was then; for the average proportion of solid matter in the water at London-bridge was 166 grains per gallon; at Blackfriars, 154 grains; at Hungerford, 116; at Westminster, 118; at Vauxhall, 67; at Chelsea, 84; and at other places between Chelsea and Isleworth it was from 33 to 17 grains. It may, therefore, be concluded that 17 grains per gallon is the amount of solid matter naturally contained in the upland water of the Thames; but as the stream flows downwards and gets the sewage of the metropolis and the tidal current of the ocean, it rapidly becomes charged with impurities to the extent of from 166 grains per gallon to nearly 409, of which from 14 to 24 are dissolved organic matter. The first number in each case is the average of high water in mid-stream at London-bridge, and the second at Greenwich. As it was last year, so also is it now—the water in the middle of the river is charged with the highest forms of infusorial life, but that which is near to the shore is poisonous to every living thing but vibriones and the simplest of vegetable fungi.

Unhappily there is no prospect of deliverance from the curse of this foul stream

> "Which like a vast and poisonous serpent steals
> Into the swarming city."

After all the sufferings, and all the investigations, and discussions, and warnings of last year, the only measure decided upon was to pour the pollution into the river at a lower point. The only sure and sensible remedy, that of withholding it from the river altogether, and returning it to the soil, was never seriously contemplated. Until this is done we may—and, if we can, we must—mitigate the evil; but annihilate it we never shall.

SCIENCE AND LIBERTY.

On another page we publish a brief notice of Mr. John Stuart Mill's new volume on "Liberty." To some it may appear that there exists but an extremely slight connection between the objects aimed at by the writer of that work and those which we, in the pages of this Magazine, seek to compass. But in reality the connection is very deep. It is quite true that if we limit our thoughts to those scientific details with which we have most to do, we shall not come very near to Mr. Mill's theme. But it is our prerogative to rise occasionally above these details, and contemplate the broader aspects of scientific progress. And this it is impossible to do without observing that modern science is destined to play a profound part in the mental history of the world.

Up to the present moment the popular mind is practically insensible to the influence which the study of science has exerted, is still exerting, and is yet destined to exert in this respect. And what is worse, not a few of those who are partially sensible to its influence stand timidly aloof from it, as if it were something of doubtful, not to say injurious tendency. Only this week, for example, at an anniversary meeting of a Society for the Promotion of Pure Literature—a society conceived and put in motion by most excellent and able men—not a syllable was uttered by its chief supporters in recognition of the beneficial influences of scientific studies upon the popular mind. The morbid "Life" of poor Hedley Vicars, the innocent commonplaces of "Sunday at Home," the little religious fictions of the Tract Society—all these, with others of the same stamp, were abundantly recommended; but not one volume, periodical, pamphlet, or any other publication whatever in which the truths of science are taught, had its name whispered to listening ears polite. Yet is scientific literature—if simply and purely written, as much of it is—anything less than a revelation of the Laws of God? And if it be this, may it not—nay, ought it not—be diffused with as much zeal and goodwill as any of the literary inventions of man, however well intended?

We do not desire to be suspicious, but we confess to a half-belief that many excellent men have the fault of wishing to be too good. They have such an exquisite dread of false "doctrines," that they refuse even to trust the laws of nature until they have assured themselves that they exhale no odour of what they deem heresy. And, unfortunately, as they doubtless think, these laws *do* often look a little heretical to some minds. They are not invariably instituted in accordance with the wishes and intentions of well-meaning men. They are not always conformable to the views of the benevolent people of this nation and this day, any more than they are to those of similar people in other nations and former days. Hence there is a kindly disposition on the part of some good people to suppress them—or, as the laws of nature themselves cannot be suppressed, to keep the knowledge of them from the masses. The intention is doubtless an amiable one, but it will not, let us trust, be successful. We believe the truths of science are fit food for the intellect of England; and we believe this the more earnestly because they bring with them fresh supplies of that spiritual light and liberty of which the "best men" are often the most determined enemies. And we are prepared to guard our freedom in this matter.

In the address which Sir Benjamin Brodie lately delivered to the Royal Society as its President he dwelt with much intelligence and emphasis upon this and cognate topics. With the exception of the achievements of those small communities of ancient Greece, to whose works we still refer as affording the highest standard of excellence in literature and the fine arts, and from whom has been transmitted to us that marvellous science of geometry which enabled Newton to unravel the system of the universe—with this exception, there is nothing in the history of what belongs to the advancement of knowledge so remarkable as the progress which the European nations have made in the cultivation of the physical sciences during the last two hundred years. With this fact on his mind, Sir Benjamin proceeded to say that it is not only those who are engaged in researches of this kind that must contemplate with satisfaction the results of this movement. "The moral philosopher, recognising in the desire of knowledge one of the noblest of our aspirations, will regard the extension of that desire, and the more general diffusion of knowledge, as an important means of elevating our species in the scale of intellectual beings. The unprejudiced theologian will allow that there is no better foundation for the religious sentiment than the study of natural phenomena, opening as it does to our view everywhere examples of design, and of the adaptation of means to ends, combined with mighty and benevolent intention. The philosophical statesman who, contemplating the progress of society, endeavours to explain the changes which it has undergone, and thence to anticipate the future, cannot fail to perceive that the cultivation of the physical sciences has been in these later times one of the most important instruments of civilisation; while the mere utilitarian, however little he may be capable of estimating knowledge for its own sake, must admit that it has contributed more than anything else to the comforts and conveniences, not of one order only, but of every order of the community, from those who dwell in palaces to the tenants of cottages and garrets."

So confident is this able man of the truth of this view that he would not have thought it worth while, he said, to allude to the benefits conferred by scientific knowledge at all, if it were not that they show how complete a refutation a lapse of time has afforded of the views of those short-sighted cynics, who formerly opposed or ridiculed the scientific societies, as if they were engaged in trifling pursuits of no advantage to mankind. Science, continued he, has already arrived at great results, far beyond what could have been reasonably anticipated. But the inquisitive mind, looking into the future, will find reason to believe that if we could lift up the veil by which it is concealed, we should find that there are other and still greater results reserved for those who will come after us, and which even some of those who are now among us may live long enough to witness. Astronomy has been said to be the most perfect of all the sciences; and some time since it might have been supposed that, as regards it, we had not the power of carrying our researches much further. But the observations of Lord Rosse, penetrating by means of his improved telescope into the more remote regions of space, have enabled him to determine the nature of the so-called nebulous matter, and to enter on a new order of inquiries respecting the construction of the universe. The needles which now vibrate in the magnetic observatories which have been established in different regions of the earth, have already not only made us acquainted with many important facts connected with terrestrial magnetism, but have disclosed to us some remarkable relations between the earth and the sun, of which we had no conception previously. But these magnetic observations are still in progress, and if not prematurely brought to a conclusion, it would be unreasonable to doubt that they must lead to still more important discoveries as to the operation of a force which, probably like that of gravity, pervades the universe, and places even the most distant parts of it in connection with each other. A Fellow of the Royal Society—devoting to it his time, his fortune, and his intellectual powers—is in a fair way to attain the great object of his life, in the construction of an arithmetical engine of far superior capabilities to any previously invented by himself or others; such as may not only be a lasting monument of profound mathematical knowledge, of inventive genius, and of that perseverance amid difficulties which is one of the highest attributes of genius, but may be of great use to mankind hereafter, by solving with unerring certainty problems which practically are in any other way beyond the reach of the human intellect. Analogous instances might be furnished from almost every department of knowledge. If we add to these the number of investigations of a more limited kind, each complete within itself, which every year produces, also bearing in mind how great an influence the cultivation of the physical sciences during the last century has exercised on our social system, and how much it has contributed to give to modern civilization its peculiar character, we may well ask, What may not be the effect of a continuance of the same spirit of inquiry during the century which is to come, and will not its continuance help to preserve our best liberties?

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MONEY-MAKING AT THE ROYAL MINT.

No. I.

PERHAPS there is no British institution, not excepting even the Bank of England, upon which is centred more interest than upon the Royal Mint. Continuously of late years, ever since the Californian and Australian gold discoveries, in fact, has it been engaged in the production of those metallic portraits of the reigning monarch which are so pleasant to look upon, and so much to be desired, and in passing them forth for the general comfort and convenience of the public. Its interior arrangements, except to employés, and to visitors, who are few and far between, have, however, been as a "sealed book" hitherto; for although the present master of the establishment is far less favourable to exclusiveness than his predecessors were, and, as we have reason to know, is most anxious to increase the facility of admission for the public, yet the nature of the operations conducted within the mystic walls of the Mint preclude that wholesale introduction of Her Majesty's lieges which is allowed at the National Gallery and British Museum. Aware of the curiosity about money-making so naturally existing in the great commercial and trading community amongst whom we are placed, and prepared with all requisite data, it is our intention to publish in this and successive numbers of the MECHANICS' MAGAZINE such an explicit and reliable description of the "inner life" of the great coin factory on Tower Hill, as shall at once supply the want of information so unavoidably experienced, and fill a gap in the mechanical and scientific literature of the country.

It is true, there are in printed existence many ostensible accounts of the processes of the art of coining as practised at the Royal Mint, from the lofty and pretentious *tomes* of the Encyclopædia Britannica down to the lowly and modest "journals of amusement and instruction," circulating at the more humble and modest prices of 2d. or 1d. each number, but these are, to a great extent, out of date or inaccurate. Dr. Ure's dictionary gives perhaps the truest portraiture of the machinery and mechanical arrangements of the place; but minting has undergone so many transmutations since its publication that considerable emendations would now be necessary if a new edition were to be published, and one which should not mislead those who referred to it for information. Of the cheaper and lighter issues from the printing-press, which have essayed to initiate the public into the mystery of making money, it must be said that generally they have failed to convey truthful or lucid impressions of it. Effect in style and eccentricity of metaphor, rather than simplicity of language and plainness of illustration, appear to be studied, indeed, in this class of paper, and the reader consequently obtains from an harmonious jingle of words an hour's empty amusement, but no solid information; some chaff, but no grain. The appetite is now not great for this species of "light reading," and it will become less and less. We are becoming daily a more practical, a more scientific, and a more thinking people, and they who seek to be popular instructors must prove that they have something to teach, or their labour will be lost.

Briefly, and before entering upon a descriptive account of the Mint *as it is*, we may be permitted to cast a glance over its annals and history. The survey thereby obtained will not be entirely without value, for it will enable us to institute comparisons, and perhaps assist in the elucidation of our subject. It becomes the more easy to ascertain particulars of the early English mode of Minting from the fact that the labours of the Royal Mint Commission of 1849-50-51, eventuated in their publishing some interesting data regarding it. This Commission consisted of "Our Right Trusty and Well Beloved Councillor, Richard Lalor Sheil, Master and Worker of our Mint," William Cotton, Esq., Sir Edward Pine Coffin, and Colonel Forbes; and it was appointed to inquire into, and report upon "the constitution, management, and expense of the Mint." Joseph Burnley Hume, a son of the patriot and patriarch, was named secretary, and certainly the inquiry was conducted with much energy. Notoriously the main object of the Government in empowering the Commission to "inquire and report," was to arm themselves with the means of dislodging from the Royal Mint a corporate body consisting of a varying number of persons, and who had from time immemorial claimed and exercised the right of coining the monies of the realm, at a heavy cost to the country, and with much profit to themselves. This body, known as the Company of Moneyers, was not, as may be imagined, very willing to relinquish its privileges, and the appointment of so great a legal authority as Mr. Sheil to a situation which did not call for the exercise of legal knowledge, proves that the Ministry foresaw a struggle with the worshipful corporation. It may be stated, without further detail, that the ancient "right"—as it was deemed of the company—to coin money, was completely set aside by the Sheil-Hume Commission in 1851, and at the close of that year the Company of Moneyers received notice of the final termination of their money-making contract with the Queen. Pensions of no inconsiderable magnitude were then given them for loss of office and prospects, and the exclusive management of the Mint devolved upon the Government. Mr. Sheil, it may be remembered, obtained soon after this *coup de loi*, a more lucrative appointment, that of ambassador to the Court of Florence, which, however, the cold hand of death caused him speedily to relinquish.

The musty parchments of the British Museum, and antiquarian *reliques* of every kind which would throw light on the origin of the Company of Moneyers—said by themselves to date from the Saxon Heptarchy—were ransacked by Mr. Hume, and much historic lore of interest did he gather by his labours. To him, indeed, we are indebted for some of the facts which follow, as to the babyhood of Minting in England. In the early Saxon and Norman periods there existed in England a variety of mints, in a variety of places, and belonging to different persons, and sometimes distinct mints in the same place. In some cases these came under the direct control of the King, in others of prelates, or some favoured subjects. These petty mints were worked by a single master, who, with sundry journeymen coiners, conducted the simple process of minting then practised, and this man was held responsible for the genuineness of the coin issued from his mint. The mints were portable, and each monarch, or prelate, in making progresses through the country, took his mint and his money-makers in his train, as necessary and useful travelling companions. It is needless to say that the hammer was the coining press of those days. The metal was first cast, then beaten to the thickness required, as nearly as the rough means employed would allow, then punched by force of hammer, and afterwards received its impressions, when laid on the face of one die from another die held upon it, and struck *à la* blacksmith, with a hammer. In short, the hammer constituted the principal implement for coining in the times referred to.

At the close of the 12th century a partial consolidation of the Royal Mints took place. At the commencement of the 13th some amended processes in the manufacture of coin were introduced, and a division of the offices took place. Henceforth we read of Workers and Minters. In the year 1279 all the Royal Mints were consolidated under one Mint-master, and he a Frenchman, Turnemire, of Marseilles. This person undertook, by special contract with the King, to execute and to be responsible for the genuineness of the coin, at a certain rate or sum for every pound of bullion coined.

In A.D. 1309 the first charter of exemption from certain taxes was granted to the Minters or Moneyers, and from this date there is little doubt the Company of Moneyers looked upon themselves as especially privileged to coin money. About the year 1465 an amalgamation of Mint journeymen workers and minters took place, and henceforth they constituted one body of "Moneyers."

In the reign of Henry VII., 1486-1509, sovereigns, shillings, and sixpences were introduced, and some minor changes were made in the management of the Mint.

Between the years 1561 and 1578 the "Mill and Screw" processes, a vast mechanical stride, as then considered, were adopted, and these were practised in the Tower of London, which now comprised the concentrated mints of the kingdom. In 1662 the improved machinery of Blondeau was tried, and after much opposition on the part of the Minters succeeded well. From this date forward modifications and improvements of machinery took place under the masterships of Sir Isaac Newton and others, but up to 1810, the rolling mills of the Tower Mint were worked by the power of horses. In the meantime, 1788, Messrs. Boulton and Watt, of Soho, had established their Royal Copper Mint, and had made numerous and extensive alterations in the *modus operandi* of coining. The Government of the day had witnessed the astounding rapidity at which the Soho Mint machinery worked as compared with their own rude appliances for striking money, and observing also the growing demand for coin, determined, in 1806, to commission Boulton and Watt to construct the machinery for a new establishment in London. Property was bought in the neighbourhood of the Tower, at a cost of £7,000, and a site thus obtained for the new Mint. Smirke gave the design for the present noble edifice which, although partly eclipsed by the national school of St. Botolph Aldgate, the first Protestant national school erected in England, presents an imposing frontage to the time-honoured fortress, and is near to St Katharine's Docks.

The steam engines for the establishment, consisting of one of 30, another of 16, and a third of 10-horse power, with the presses, were erected by Boulton and Watt; the rolling mills were the work of the celebrated John Rennie.

In 1810, and at an expense of about a quarter of a million sterling, the existing Royal Mint of England was completed, and the first coinage—one of pence—took place therein. The Company of Moneyers were the workers of the place; and, since their rates of payment remained nearly the same as when the Mint was comprised within the Tower of London, and its productive power was very small, it may be imagined that they reaped an abundant harvest. During the recoinage of silver in 1816, some account of which has been given in our pages, their profits were very large; and again, in 1843-44, the years of the light gold excitement, the Company, no doubt, did well. Better still had they fared, had they survived—as a body corporate and privileged—the great coinages of gold consequent upon the arrival of the shoals of nuggets from Australia and California. As we have said, they compulsorily retired from their lucrative positions in 1851, and great savings have resulted to the National Treasury from their departure. From 1851 to 1855, Sir John Herschel was Master of the Mint, but we are not aware that any startling improvements were made during that time, either in the administrative, executive, or mechanical branches of the establishment. It is not improbable that Sir John's thoughts were *above* money-making. Capt. Harness, R.E., Deputy-Master under Sir John Herschel, was a gentleman of great ability unquestionably, and he re-arranged and re-modelled the officiai and operative staff with an eye—and a keen eye, too—to the public service; but he was too valuable a man to be allowed to remain in so unimportant and narrow a field of action, and he was transferred, first to the Commission of Works at Dublin; then to the War-office, Pall Mall; finally to Hindostan, to fight the Sepoys. Many of Captain Harness's plans for the working of the Mint remain in efficient force at present, and there can be no question that his perspicacity and energy would have induced other new rules to be established for the economical government

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of the works and work-people, had he been suffered to remain at Tower-hill.

After the retirement of Captain Harness, the posts of Comptroller and Deputy-Master were amalgamated, and fortunately for the interests of the establishment and of the State, in April, 1855, Dr. Graham, F.R.S., became Master of the Mint. That gentleman has proved a 'master and worker' indeed. The political Masters of former times received £2,000 per annum, and did nothing; the permanent Master of to-day enjoys a salary of £1,500, and works hard. Such is one of the changes made in these latter days of the Mint.

Without further prelude we now proceed to the task of describing the mode of transforming auriferous sands into current coin of the realm. Of the manner in which the raw material is obtained, of quartz-crushing, and the operations of the digger in his pursuit of the yellow earth, our readers probably know enough already. On the arrival of a lucky digger, he usually disposes of his gains to a bullion dealer at the market value, or to the Bank of England, at such a rate as an assay of its quality made by the Bank refiners warrant the Old Lady in allowing for it. At Brown and Wingrove's, Wood-street, Cheapside, the Bank have their bullion intended for coinage reduced to standard, and cast into ingots. These latter are returned to Threadneedle-street, and thence transferred in bags placed in iron-bound and trebly-locked boxes, and by means of carriers' carts, to the Mint.

These carts—well known to the Mint police, as are the sturdy porters who sit on the lids of the gold-chests, and are their only guards through the City—are admitted at stated intervals, and disgorge their rich freight through one of the open windows of the Mint office. The ingots are then placed in the scales in presence of a Bank and several Mint officers, their weight duly registered, and receipt given for them. Assay pieces are next cut from them, and they are numbered so that reference may be made to each ingot after the Mint assayer has operated upon his assay pieces, and determined their "betterness" or "worseness" (these terms are still in use) than standard gold. The assayer's report determines the amount of alloy necessary to be added in the melting of the ingots for conversion into bars. A similar process is observed with silver as regards the assaying, though silver is purchased for coinage by the Mint Master himself in the cheapest market—as is copper for the inferior coinage—and does not, in other than exceptional cases, as that of worn coin, for example, come from the Bank at all. Into the process of assaying it is not our intention to go, that is purely a chemical matter, and is practised largely by other professionals than Her Majesty's coiners.

Assuming, then, that the assayers of the Mint have obtained assays of a batch of golden ingots, and duly noted, registered, numbered, and reported them, there is no reason why they, the ingots, should not be transferred to the first operative department of the Mint, the melting-house, and they are so forthwith, the melter in chief signing a receipt for them, and afterwards checking their weight by his own weighing beam.

(To be continued.)

Literature.

On Liberty. By JOHN STUART MILL. London: John W. Parker and Son, West Strand. 1858.

LIBERTY is man's dearest possession. The love of it is in proportion to his wealth and vitality and constitutional endowment. All things suggest it to him; the wide sky, the wide sea, the fair cloud that streams from horizon to horizon. The true man will part with one thing after another, but never with it. At any encroachment on it, his blood is up, and the whole man soon in a blaze.

The above-named little book, although scrupulously sensitive, even to minutest details, to one man's invading by a hair's breadth the orbit of another, is yet in the main a book about true liberty—the liberty of the intellect to see and say its utmost; of individual character to assume its own native shapes, and plan its own life, and go its own way in the world. The book is a growth rather than a manufacture; or if the most practised hand has manipulated it, the raw material was the genuine product of life and nature, and of the choicest sort. The freedom here spoken of was first lived and practised; the words are but the voice of experience and ways of life of long years. A most robust, sturdy, entire, and fearlessly outspoken freedom is here. How many noble English souls have hailed this book as a fresh breeze sprung up in a stagnant, sultry air. How many have read it, looking out as from behind prison-bars, secretly pining to be out there in the sunshine and free space in which this thinker disports himself.

The reader will be struck with the dedication: "To the memory of her who was the inspirer of all that is best in my writings," whose "all but unrivalled wisdom" the writer vainly strives to reach. This rigorous logician, then, who always will have his feet upon the firm earth, has an unfathomable heaven over him, wherein he gives place and shape and name to the imaginings of the soul's love and wonder. This sturdy warrior, so erect in his self-sovereignty, bows down before another and a gentler; like his brothers who lie in effigy in our old churches, who loved even the dog at their feet, much more the wife at their side, and who crossed their arms upon their breast in pious adoration beneath the temple-roof and the glory beyond.

The book goes to the root of all liberty, namely, this: that the one thing binding on a man, which comprehends all others, is the unfolding of the nature he is endowed with to the utmost fulness and completest harmony it is capable of reaching. This is no theory or opinion; it is an intuition of common sense. Man's chief beliefs are necessities of his nature. As he cannot be alive bodily, and use his organs without receiving certain general impressions of things corporeal, so he cannot exist mentally, and use his mental organs, without coming to certain conclusions about things incorporeal. Now, we have but to look on human nature with eyes, and not through spectacles, and we cannot mistake what it is for; namely, to be developed to its utmost of harmonious strength and fulness, like any other product of nature. Nothing native there is to be suppressed; nothing alien to be imported. We conjure you to give us the man, the whole man, and nothing but the man. Healthy artists complain of a purist model in painting, which abjures the bright-red arterial blood in the cheek and the fire in the eye; and healthy men have to complain now-a-days of a meek, pale, innocent, bloodless, nerveless type of character set up for their imitation. We want the whole man; we want self-assertion as well as self-denial; passionate impulsive energy as well as innocent submissiveness; laughter as well as seriousness; self-esteem, and high honour, and magnanimity, side by side with lowliness and meekness. Above all things we want whatever is unique, eccentric, and original, in the man. As every man can, with brain, or tongue, or head, do something better than his neighbour, we want him above all things to do that something, whatever else he leaves alone. But more than all, pleads this little book, we want to the full the originality of original men. They alone discover new thoughts, new modes of life, new paths for human activity. They alone keep society from sinking into pure mechanism and routine. They cannot take anything for granted, receive anything at second-hand, but must go to the ground, the reason, the meaning, the living soul of it. And so they make all things new for us, generation after generation. They are the salt of the earth; without them human life would become a stagnant pool.

On the whole, the book is a sorrowful one, full of warning and protest. "A man cannot get a coat or a pair of boots to fit him, unless they are either made to his measure, or he has a whole warehouseful to choose from; and is it easier to fit him with a life than with a coat, or are human beings more like one another in their whole physical and spiritual conformation than in the shape of their feet?" "The general tendency of things throughout the world is to render mediocrity the ascendant power among mankind. Individuals are lost in the crowd. Energetic characters are becoming merely traditional. Collective mediocrity is all the greatness England can boast of now. But it was men of another stamp than this that made England what it has been, and men of another stamp will be needed to prevent its decline." "In our times, from the highest class of society down to the lowest, every one lives as under the eye of a hostile and dreaded censorship. All ask themselves, What is suitable to my position? What is customary? It does not occur to them to have any inclination except for what is customary. Thus the mind itself is bowed to the yoke." "Public opinion in England is as efficacious as Laud in keeping down heretical thoughts; a convenient plan for having peace in the intellectual world, and keeping all things going on therein very much as they do already. But the price paid for this sort of intellectual pacification is the sacrifice of the entire moral courage of the human mind." Such are the plaintive reminders of this book; it is for us to profit by them.

Popular Tables. By CHARLES M. WILLICH, Actuary and Secretary to the University Life Assurance Society. *Fourth Edition.* London: Longman and Co. 1859.

MR. WILLICH'S Tables, in their former editions, have taken so high a place in the estimation of men of business that they no longer need the commendations of the press. The present edition contains, however, so much new and valuable matter that it would be most unfair to the author did we omit to particularize some at least of his new additions. The first of these which claim attention are three new tables showing the prices which may be paid for property depending on the DURATION OF LIFE, so that the purchaser may receive a *certain* high rate of interest on the capital invested, while the re-investments to replace capital are calculated, on an average, to be made at three per cent. A formula is also given for calculating questions which are not resolvable by the tables. The next new table is one for calculating the expectation of life, and is based upon a formula given in an earlier number of the MECHANICS' MAGAZINE as an abstract of a paper read before one of the learned societies. The next is an exceedingly interesting table of Bank Discounts, showing in one view the progress of the Money Market during the last 14 years, and how it was affected by panics, the Russian War, and the Indian Mutiny. The *Mathematical* Tables now comprise the squares, cubes, square roots, cube roots, reciprocals, logarithms, common and hypobolic trigonometry, circumference and area of circles (in a note, page 180, is given a paper laid before the Royal Society, on a simple geometrical quadration of the circle), length of circular arcs, chords, diagonal of squares, solidity and superficies of spheres. Many of these are, of course, of the first importance to scientific men, both theoretical and practical.

The Astronomical Tables, including 56 of the asteroids, are brought up to the latest period, and they have been submitted to the revision of J. C. Adams, Esq., the discoverer of Neptune.

Table VIII, page 88, gives the average price of consols from 1731 to 1858, together with much information connected with the past; under what administration the Government was carried on; progress of National Debt; if peace or war, &c., &c.

At page 80, a table on *Decimal* Coinage is given. If the decimal system should ever be carried out according to the recommendations made, the small table for converting the old into the new currency will be useful.

It is not possible here to give any idea of the extent and comprehensiveness of the tables in this volume. It is a book to be at the hand of every educated man who has the least occasion to refer

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to such standard facts as a clever man can put into tabular form for him. Even those who possess former editions of the work will not attempt to dispense with this if they are wise.

Mental Arithmetic. By HUGO REID, Author of the "Principles of Education," &c. London: Longman, Brown, and Co. 1859.

THIS little book (published for a shilling) deserves to sell by tens of thousands, for its statement of the principles of arithmetic is as clear as a learner can require, and its exercises are such as will be of great service to the teacher. Indeed, the author's explanations of the arithmetical principles appear to us to be the most lucid and correct that we remember having seen.

THE NAVIES OF ENGLAND AND FRANCE.

(From *Blackwood's Magazine* for June, 1859.)

ALL critics, all reports, all writers, in their estimate of the comparative strength of the countries in steam force, select 1852 as the commencement of the steam era, and draw their conclusions from the progress made by each from that time. The relative standing of the navies was then according to the old ratio. England had 5 steam liners afloat, and 12 building, besides 4 block-ships. 24 frigates, 56 corvettes and sloops, and 66 gun vessels, brigs, &c. Of sailing ships she mustered 66 afloat and 7 building, 88 frigates, 84 corvettes and sloops, small vessels 45, making a total of steam 176, of sailing 299. France had 2 steam-ships of the line afloat, 4 building, 21 frigates, 28 corvettes, 3 on the stocks, 64 small craft, 2 in preparation. Of sailing ships there were 25 available, 20 in construction, 36 frigates, and 150 corvettes and smaller craft, with 27 to be added, constituting a fleet, ready and designed, of 176 steam-ships and 258 sailing vessels. In these numbers are seen the old ascendancy, both in the present strength and the future promise, in the possession of the new element and of the old convertible material. We come to the year 1858, and find the statistics numerically unaltered. Still in numbers and in figures Britannia seems to rule the waves. She has raised her steam navy to 464 ships, her sailing force counts 296 more. Against this, France shows 264 steam, 144 sailing vessels. Still an analysis of the respective effectiveness of the navies as national forces admits a result rather different from the numbers. In the line of-battle power, that which would most essentially affect a contest for supremacy, the fleets are equal—each could arrange 29 ships. In frigates France has a preponderance of 8, but in the corvettes and gunboats—the light infantry, the skirmishers, the covering force of future battles and attacks, a force too little thought of, too much underrated in the calculations — England has still a vast superiority. We shall now, however, drop comparisons for a while, and adhere to a statement and dissection of the navy of France, reserving conclusions until we have fairly stated the results and the probabilities of the efforts made by these two great nations for maritime supremacy. The present product exhibited by France is a formidable proof of her power, a worthy test of her resolve, a strong development of her policy. We must again descend to figures; they are dull dry things, but in this case the only real elucidation of facts. The French navy consists now of 29 steam liners, and 2 about to receive engines (which may be now included) according to the English official report. From other sources there would appear to be one more. Of these, 10 are entirely constructed for the new power; of the remainder, 7 were old ships converted; the others were originally laid down or commenced for sailing vessels, and then altered on the stocks in different stages of completion. Out of this number there are five first-class ships, one of which is new, and another has only auxiliary horse-power, and there are six only carrying 100 guns or upwards. Thus the line-of-battle force is represented by 32 ships, mounting 2,878 guns, and possessing 20,700-horse power. The "Conversations Lexicon" asserts as a fact that these ships are all of a very superior class, and that in their quality they offer a counterbalance to a superiority of numbers. This writer appears from the beginning to have indulged in a remarkable fallacy relative to the naval architecture of the two countries. He commences on the theory that the French ships in the old war were very inferior in construction, in durability and strength, and goes on to show that now the comparison is entirely reversed. We believe—from the best and most impartial evidences, from facts and the opinions of practical men who have investigated the subject closely, not viewed it *à la distance*—that the very contrary of this judgment would be the truth. A French writer says on this subject: "En effet, les vaisseaux lancés de 1760 à 1791 furent peut-être les plus beaux, les *plus solides*, et les meilleurs que nous ayons jamais eut;" and states further, that these same ships illustrated the perfection of naval art, and excited the envy of all the great maritime powers, not even excepting England. Mr. Reed, one of the leaders of the modern school of architecture, strongly confirms this statement. "The science of naval architecture," he says,* "was so greatly advanced on the Continent, and so much neglected in England, during the last century, that the forms, dimensions, and speed of the ships of the British navy, were for the most part inferior, class for class, to those of the ships of every other nation with which we had to cope." "Happily for us, and for those colonies and states whose liberties depend on our naval supremacy, the tactics of our admirals and the bravery of our men won for us much more than we lost by the inferiority of our vessels." Yet, spite of all the concurrent testimony of experience and opinion, the German essayist would fain make us believe that our success was owing to our superior capacity for being rammed, and that the solidity of our planks and timbers, rather than the mobility of our ships, won us our victories. This fallacy is well capped by the assertion that the French have at present gone beyond us in the excellence of construction, and have produced the most superior types of vessels of war. Strangely enough, our own authorities would seem rather to encourage this idea; whether from a desire to be humble, or to give impulse to competition, it were hard to say. A wag used to say of a friend, noted for constitutional discontent, that whereas other men always made their geese swans, he delighted to prove his swans to be geese. This is undoubtedly with us a national propensity. In this case, however, we certainly have the swans, whatever we may say of them. The authority we have above quoted, in continuation of his subject, says: "Happily, also, this inferiority no longer exists. The ships of our navy have not only ceased to be imitations, but have become the models for the navies of the world." All who have had the means of comparison, either under a war or peace aspect, must fully agree with him. Even unprofessional eyes which saw the Renown and Prince Albert floating side by side in the Rade of Cherbourg with the Napoleon and the Bretagne, recognised their superiority in beauty and symmetry, and acknowledged the strong contrast they offered to the heaviness of the Austerlitz and the ugliness of the Donawerth. "Ugliness," Mr. Reed is right in saying, "is pardonable in a war ship, if anywhere; yet even here beauty is becoming." More than this, symmetry is strength, and proportion is power as well as beauty. In these respects the English vessels fairly challenged comparison. The practised ken, too, which looked not on ships as masses of woodwork and guns, but as motive things which were to be propelled and handled tactically, which were to buffet with waves, saw, in their lightness and buoyancy, in their capacity for carrying their guns high out of the water, in the fighting space betwixt the guns, qualities which would tell with advantage in exercise or in the real work of war. Even the Napoleon, the famous type, offered no temptation for copy to those who possessed a Renown. Those who saw the tests of the Baltic and Crimean operations, must have acknowledged also the handiness and manageableness and seaworthy capabilities of our modern ships, and felt that at last, after many trials and haltings betwixt systems, we had attained an excellence in the building art worthy of our naval character and our maritime pretensions. Much has been said of the ten 80-gun ships which were converted, and are supposed to be inferior to anything of their class in the rival fleet. It is true that they are very unequal to the new creations, and should not, or will not, of course, be perpetuated. But as makeshifts they are not contemptible; many of them indeed, in nautical parlance, are good wholesome ships, and would hold a good place and do good work in a line of battle. The Royal George might fairly be matched with the Montebello or Charlemagne, and the rest would be certainly equal to the ships in the French navy which had undergone the like kind of transformation. On the components of the new force we may well look with satisfaction, both as to the present development or the future perfection of the science of ship building. The Orion, Renown, Conqueror, James Watt, Princess Royal, Duke of Wellington, *et hoc genus omne*, whether as models or sea-boats, as specimens of art or engines of war, are, we believe, the best types which naval architecture has yet exhibited to the world, and "in dimensions, forms, means of propulsion, and powers of attack and defence,"* may justly be said to be "the embodiments of all such sound and well-tested improvements as have hitherto been found compatible with the purposes for which ships of war are designed." Thus the French line of-battle ships stand before us as a formidable and respectable array of goodly models and engines of war; but there is nought in them to warrant the idea that they assert for their country a supremacy in the art power of construction.

We pass on from the line-of battle power to the frigate force, and here we perceive that the greatest effort has been made, and the greatest results obtained—37 frigates afloat, against 28 English, give a preponderance in this arm of 9, and those in preparation will further increase it. The armament and horse-power they represent is also great, being 1,216 guns, and 17,000-horse power. The total force of frigates and line of-battle ships afloat at the close of 1858 was 69, and of these 16 of the first and 30 of the latter had been constructed in the seven years, giving an average of between 6 and 7 in the year. In the smaller vessels the increase had not been so great; still, however, the French navy was stronger in 1858 than it had been in 1852, by 100 ships of different classes. This was good earnest work, yet after all not so extraordinary for a great power, professing great resources, engaged in the reconstruction of her navy. It must be remembered that in these calculations we allude only to the ships actually complete, and which might presently be placed on the seas against an enemy. It was good work, yet not enough for the supremacy. The energy and resource of her rival, though taking a different direction, had produced greater results in numbers, and had created an immense aggregate of war power. The comparative results will be seen below:—

—	Line-of-batt.-ships†	Frigates, screw.	Ditto, paddle.	Corvettes, screw.	Ditto, paddle.	Mortar ships.	Floating batteries.	Gun and despatch vessels, screw.	Ditto, paddle.	Gunboats, screw.	Troop and store ships, steam.	Tenders, tugs, &c.	Block ships.	TOTAL.
France	32	1	19	9	9	..	5	17	50	28	22	..	..	222
England	33	1	9	38	35	4	8	29	25	161	15	47	9	429

In respect of numbers this navy would demand no comment—it is not above that which a first-rate power might deem necessary for the

* Mr. E. J. Reed's Lecture at the Society of Arts.

* Reed's Lecture.

† The liners receiving engines are included.

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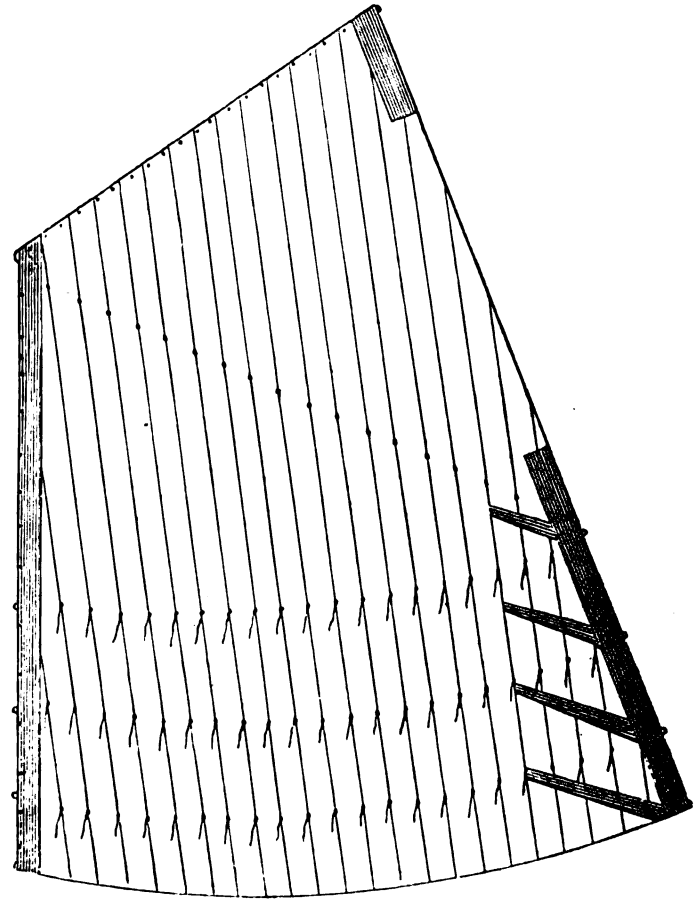
support of its dignity, though far beyond that which France has for many years been able to maintain, and still further beyond in power, as this is an effective statement, and includes no dummies or lame ducks. It challenges attention, however, as to the rapidity and efficiency of its construction, and the proportion of its parts. The same purpose is apparent in both—the same intent coincident. The policy which resolved the one designed the other. That policy is to concentrate all the national strength and force on that element of the naval force which shall best effect the maritime and the military supremacy. Thus we see that the ships of battle and the heavy frigates—all carrying heavy guns, and propelled by great horse-power—constitute the main classes of the fleet. The steam transports, too, occupy a prominent place, and a still greater one in the designs for the future. The building of smaller ships, cruisers, gunboats, &c., has been altogether abandoned of late, and omitted in the calculations; whilst the other classes have been increased by extraordinary efforts. All this would seem to denote that the great aim has been to make the navy effective for contest on the seas, and to combine the maritime with the military force of France, and make it an agent, and a powerful one, in the plans and strategies of future conquest and aggression. The director of the present movement in the naval development of his country, has not apparently shown his usual prescience and forecast in the recognition and adoption of a coming power. The mind which had foreseen and forethought the probable means by which steam would act, has overlooked the most fitting agents for the introduction of the projectile power, which now looms before us as the chief and most terrible agent in the operations of war. He has provided for defence against it, in the construction of iron-cased vessels; but the gunboats and small craft, which, from their mobility and their small size, will be probably the machines by which rifled cannon will be first and most efficiently applied in the purposes of attack, have been omitted altogether in his estimate of the present and future requirements of the French marine. This light force will be henceforth, doubtless, what riflemen are to an army, and by their capability of maintaining a long range and well-aimed fire—which would not be possible in the *mêlée* of a general action—will be powerful auxiliaries or opponents of a line of battle.

(To be concluded in our next.)

VEGETABLE LEATHERS.

HAVING seen some specimens of these leathers, as well as various articles of utility manufactured therewith, we have been induced to pay the extensive works of Messrs. Spill and Co., the eminent Government contractors on Stepney Green, a visit, in order to cull sufficient to place upon record the present position of artificial as a substitute for real leather. The face and general character of the vegetable leather resembles the natural product so closely that it is only by actual examination that the difference can be determined. This is more particularly the case in that description which is made for book-binding, the covering of library tables, and like purposes. Amongst other advantages it possesses over leather proper, may be mentioned, that however thin the imitation is, it will not tear without considerable force is exercised, that it resists all damp, and that moisture may be left upon it for any period without injury, consequently, it does not sodden or cockle, is always dry, and its polish is rather increased than diminished by friction. Add to these facts that any attempt to scratch or raise its surface with the nail, or by contact with any ordinary substance, will not abrade it, and enough will have been said to justify its entering the lists against an article of daily use, which has of late years been deemed far from sufficient for the demand, and has consequently risen in price to the manifest loss and injury of every class of the community. We believe that the largest entire piece of real leather that can be cut from a bullock's hide, is not more than seven feet by five, and this includes the stomach and other inferior parts. Vegetable leather, on the contrary, is now produced 50 yards in length and 1½ yards wide, every portion being of equal and of any required thickness, and the smallest portion is convertible. We were agreeably disappointed, however, to find that instead of vegetable leather being a discovery requiring the aid of ourselves and contemporaries, it was, although so young, an active agent in the fabrication of numerous articles of daily requirement, and that it had already become the subject of large—indeed, we may say enormous—contracts. Caoutchouc and naptha are used in its manufacture, but by a process known to the senior of the firm, who is himself an accomplished chemist, all odour is removed from the naptha, and the smell of vegetable leather is rendered thereby less in strength, if anything, than that of leather. The principal objects to which it is at present applied, although it is obvious it will take a wider range of usefulness than leather itself, are carriage and horse aprons, antigropole, soldier's belts, buckets which pack flat, harness of every description, book-binding, &c. For the latter its toughness, washable quality, and resistance to stains render it remarkably fitted. Its thickness, which may be carried to any extent, is obtained by additional backings of linen, &c., cemented with the caoutchouc, and its strength is something marvellous, while in the all-important commercial view, it is but one-third the price of leather. Many of the articles we were shown possessed the appearance of much elegance and finish; but it was curious to observe that although most of these could be made without a stitch, and within the factory itself, a deference to the feelings of the workmen in the several trades has been shown by the firm, and the material is given out as ordinary leather to undergo the process of the needle, which it submits to with a greater facility than its original prototype. Perhaps this concession upon the part of the discoverers is both wise and politic, inasmuch as their object is more to manufacture and supply the article in the gross to the saddler, &c., than to make it up upon their own premises—a monopoly which might become exceedingly formidable and injurious. We think we have glanced, although hastily, at the principal features of this important discovery, and said quite sufficient to raise the curiosity of all interested in the advance and consequent cheapening of our manufactures.

GUTHRIE'S IMPROVED MAINSAIL.



MR. T. GUTHRIE, of Newcastle, who has had much practical experience, both on board ship and as a sail-maker, submits that ordinary mainsails have defects which it is easy to get rid of. Starting with the correct principle that it is desirable to keep such sails as flat as possible while under the pressure of the wind, he proposes to form them with the widths of canvas cut and arranged as illustrated in the annexed engraving. It will be observed that the chord of the arc which the foot of the sail forms, is in a line with the weft-threads of the canvas, so that when the strain of the "sheet" is brought upon the foot of the sail, the weft-threads are put into a state of tension, and resist all stretching, allowing the sheet to be made fast at once to its proper place on the boom. In ordinary sails this is not so; the tension put upon the foot of the sail by the sheet brings a diagonal pull upon the width of canvas, in consequence of which they are invariably liable to stretch, as will be well understood. Another advantage which Mr. Guthrie claims for his improved sail is, that the after "leech" is cut upon the cross, and, therefore, gives to the wind; consequently, there is no need of taking "slack" in the seams, which, he says, is a great detriment to the wear of the sail. He considers that his improved sail will last one-fourth longer than the ordinary mainsail. At the same time it costs no more.

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Proceedings of Societies.

THE GEOLOGICAL SOCIETY OF LONDON.

May 18.—Major-Gen. Portlock, Vice-President, in the chair. Richard Meeson, Esq., Grays, Essex; Graham Stuart, Esq., Brindcliffe, Sheffield; and Col. Stepney Cowell Stepney, St. George's Place, Hyde Park, were elected Fellows.

The following communications were read:—

1. "Palichthyologic Notes, No. 12. Remarks on the Nomenclature of the Fishes of the Old Red Sandstone." By Sir P. Egerton, Bart., M.P., F.R.S., F.G.S. &c.

2. "On the Yellow Sandstone of Dura Den and its Fossil Fishes." By the Rev. John Anderson, D.D., F.G.S., &c.

June 1, 1859.—Major-Gen. Portlock, Vice-President, in the Chair. J. Lamont, Esq., Knockdow, Argylshire, and W. Longman, Esq., 36 Hyde Park-square, were elected Fellows. The following communications were read:—1. "On the Sinking for Coal at the Shircoaks Colliery, near Worksop, Notts." By J. Lancaster, Esq., and C. C. Wright, Esq., F.G.S. In two shafts sunk for the Duke of Newcastle on the north-west side of his estate of Worksop Manor, it was found that the New Red Sandstone and marl have a thickness of 54 ft., and the Permian beds 112 ft.; the latter consisting of hard yellow limestone (54 ft.), blue limestone and shale (20 ft.), blue shale (33 ft.), and soft gritstone, probably equivalent to the "Quicksand" of the north (5 ft.). Below the gritstone the coal-measures commence with 5 feet of blue shale, in which there are four bands of ironstone; another band, 15 inches thick, lies immediately below. This iron-ore is chiefly in the state of peroxide, gives an average of 42 per cent. of metallic iron, and promises to be of great economical value. The first seam of coal (2 feet thick and of inferior quality) was cut at a depth of 88 yards. Four yards below this is a compact sandstone 66 feet thick. The sinking through this rock occupied 20 months; each pit made 500 gallons of water a minute, which was stopped in detail by cast-iron tubing. The pressure from the gas at the bottom of this thick rock was at times as high as 210 pounds per square inch, but is now about 196 pounds per square inch. Shales, with coal-seams and bands of ironstone, all thin or of inferior quality, were met with in the next 170 yards. At 346 yards the first thick coal was cut, and found to be 4 ft. 6 in. thick, and of good quality. This is considered to be the "Wathwood Coal." The "Top Hard Coal" was cut at a depth of 510 yards, and found to be 3 ft. 10 in. thick; the strata intervening between this and the "Wathwood Coal" were found to have much the same characters and thickness as they are known to have elsewhere. The sinkings were commenced in March, 1854, and perseveringly continued until their completion on February 1st, 1859. Altogether 37 feet of coal were passed through; but only four seams are of workable thickness. The authors of this communication remark that the district appears to be remarkably free from faults, that the dip decreases considerably towards the east, and that the "Top Hard Coal" appears to thin out eastwardly. [This paper was illustrated by carefully-prepared sections (vertical and horizontal), and by specimens of the ironstones, &c.] 2. "Notes on the Geology of Southern Australia." By A. R. C. Selwyn, Esq., Director of the Geological Survey of Victoria. In a letter to Sir R. I. Murchison, F.G.S. Mr. Selwyn remarked that as to the impoverishment of auriferous veins in depth, the only evidence of such being the case in Victoria is the great richness of the older drifts, for, judging from the large size of the nuggets sometimes found in the gravels, compared with that of the nuggets met with in the gold-bearing quartz-veins (usually from about ¼ dwt. to ¼ oz., though occasionally as much as 12 ozs. or even 13 pounds), the upper portions of the veins, now ground down into gravel, were probably richer in gold (as formerly suggested) than the lower parts, now remaining. As far as actual mining experience shows, some of the "quartz-reefs" in Victoria prove as rich in gold at a depth of 200, 230, and 400 feet as at the surface; the yield, however, fluctuates at any depth yet reached. According to the author's latest observations, the gold-drifts, and their accompanying basaltic lavas, are of Pliocene and Post-pliocene age. Miocene beds occur at Corio Bay, Cape Otway coast, Murray basin, and Brighton; and Eocene beds on the east shore of Port Phillip, Muddy Creek, and Hamilton. Two silicified fossils (Echinoderm and Coral), thought by Prof. M'Coy to be of Cretaceous origin, have been found in the gravel near Melbourne. This letter also contains some remarks on the probability of some of the coal of Eastern Victoria being of "Carboniferous" age—on the occurrence of Silurian fossils in the rock of all the gold districts—on the newly-discovered bone cave at Gisborne, about twenty-five miles north of Melbourne—and on the progress of the Geological Survey of the Colony. [Portions of the Geological Survey Map of Victoria, lent by the Secretary of State for the Colonies, and specimens of gold, &c., lent by Prof. Tennant, F.G.S., were exhibited in illustration of this paper.] [Fossils from Mayence, &c., presented by W. J. Hamilton, Esq., For. Sec. G.S., Fossil Trigoniæ from South Africa, presented by Capt. Harvey, R.E., and a series of Photolithographs of fossil foot-tracks from Connecticut, lent by Dr. Bowditch, were exhibited at this meeting.]

ROYAL AGRICULTURAL OF ENGLAND.

May 27.—A Special Council was held, by order of the President, Lord Washingham in the chair. The report of the Finance Committee was read. A communication having been made by the Council to Mr. Hudson, the Secretary, and his reply having been received, it was unanimously resolved on the motion of Mr. Milward, seconded by Lord Feversham, "That Mr. Hudson be suspended from the office of Secretary from this time." On the motion of the Hon. Col. Hood, seconded by Mr. Jonas, "That Mr. Braindreth Gibbs be requested to accept the office of Honorary Acting Secretary *pro tem.*" On the motion of the Hon. Col. Hood, seconded by Lord Feversham, "That all letters be addressed to Mr. Brandreth Gibbs, as Honorary Secretary to the Society." On the motion of the Hon. Col. Hood, seconded by Mr. Jonas, "That these resolutions be made known to the public journals in the usual manner." The Council came to other resolutions relative to the details rendered necessary for carrying into effect the above decisions, and gave orders accordingly.

June 1.—At a Monthly Council (for the transaction of business), held on this day, the Right Hon. Lord Portman, Trustee, in the chair, several new members were elected. The Chairman of the Finance Committee, presented the monthly report on the accounts. Mr. Wren Hoskyns, Chairman of the Chemical Committee, reported that Professor Voelcker had analysed a specimen of Mangel that had been stored two years, and that the Professor will be prepared at an early meeting of the Council to make some remarks upon the analysis he has made. Lord Leigh, Vice-Chairman of the General Warwick Committee, reported the recommendations of the Committee. The President was requested to summon a Special Council for 10 o'clock on June 22, for receiving the report of the Special Committee on accounts, and of the Judges Committee, and appointing the judges for the several departments of live stock, implements, and also for cheese and wool at the Warwick meeting. On the motion of Colonel Challoner, the Right Hon. Lord Leigh was unanimously appointed Steward elect of implements. The Council gave authority to the House Committee as to carrying out the details of matters intrusted to them.

ASSOCIATION OF FOREMEN ENGINEERS.

June 4.—The usual monthly meeting of the above-named society took place at the Bay Tree Rooms, City. An adjourned discussion of Mr. Briggs' paper on the "Concussion of Water," was the principal feature of the evening, the election of two auditors, Messrs. Hosken and Stabler, however, preceding it; and it was opened with a supplementary paper by Mr. Briggs himself on hydraulic matters generally. The very great importance of a knowledge of all the phenomena relating to pumps, pumping, and hydrostatic arrangements was urged by that gentleman, who proved yet further his own mastery of the subject. Mr. Warner coincided almost entirely with the statements of the author of the paper, and spoke of the laws which governed the passage of fluids through pipes connected with pumps. The hydraulic ram afforded Mr. Warner useful matter for illustrating his views, and Mr. Stabler, who followed, and who has had considerable experience in the matter of fire engines, gave practical information on these valuable adjuncts of civilisation. Other speakers remarked upon the use of scientific discussions to persons situated as the Members of the Association were, and of the indirect advantage which their employers must derive from them. These last remarks, the Chairman, Mr. Joseph Newton, warmly agreed with; and he wished that employers were present on all occasions of their meetings. A vote of thanks to Mr. Briggs and the announcement of a paper on the first Saturday in July, by Mr. Stabler, on the "Economical Formation of Steam," brought the meeting to a satisfactory close.

MEETINGS FOR THE ENSUING WEEK.

MON.—*Royal Geographical Society*, the Earl of Ripon, President, in the chair. 1. Capt. R. F. Burton, F.R.G.S.; II. Capt. J. H. Speke, F.R.G.S. "Explorations in Eastern Africa," 8½ p.m.

TUES.—*Royal Inst.*, General Facts and Leading Principles of Geological Science," by John Morris, F.G.S., at 3 p.m.

WED.—*Geological*, Special General Meeting at 8 p.m., afterwards the following papers will be read:—I. "Notes on Spitzbergen," by A. Lamont, Esq., communicated by Sir C. Lyell, F.G.S.; II. "On the Origin of Dolomites and Gypsums," by J. Sterry Hunt, communicated by Prof. Ramsay, F.G.S.: III. "On Tertiary Shells from Central India," by the Rev. S. Hislop, communicated by the President.

THUR.—*Linnean Society*, Professor Andersen, "On East Indian Salaces;" Rev. W. Foulkes, "On the Cultivation of the Cocoa Nut in Ceylon," at 8 p.m.

Chemical Society, "On Gas Analysis," Professor Williamson, at 8 p.m.

FRID.—*Royal Inst.*, Professor Faraday, D.C.L., F.R.S., M.R.D.; "On Becquerel's Phenomena of Phosphorescence," at 8 p.m.

SAT.—*Royal Inst.*, On Modern Italian Literature," by J. P. Lacaita, Esq., at 3 p.m.

LATHE FOR RE-TURNING RAILWAY WHEELS.

IN the annexed engraving we have represented in Fig. 1 a plan and in Fig. 2 a side elevation of a large double-face wheel lathe, adapted more particularly to the turning or trimming up of worn railway wheels, without the expense of taking them off their axles.* This machine consists of two strong and heavy headstocks bolted down to an irregularly-formed bed-plate slotted with grooves throughout its entire length, and recessed back both ways to take the T-headed bolts for holding down the two massive slide-rests shown in Figs. 3 and 4. The centres of these latter are 2 feet 10 inches from the bed, so that they will take in a wheel 5 feet 8 inches diameter. One of the headstocks—that through which the power is in the first instance transmitted—is permanently fixed to the bed, and the other can at will be shifted into closer proximity when required. The greatest length which can be obtained between the centres is about 10 feet, so that we have here a lathe competent to take in anything ordinarily required for either broad or narrow gauge. The main spindles, which are 9 inches diameter at the neck, are driven by 12 inch pinions gearing into teeth at the back of the face-plates, and keyed upon a long shaft *A*, which runs the greatest part of the length of the bed; this shaft is 4 inches diameter, and is supported upon 4 fixed and 1 sliding bearing, which last is bolted to the front end of the moveable headstock. The gearing is first actuated by the 4-speeded pulley *B*, having on its spindle a pinion of 9 inches diameter, which gears into a spur wheel 4 feet diameter, keyed upon the shaft *A*. This arrangement gives a proportion between the velocity of the first motion to that of the spindle of 28¼ to 1. The 12-inch pinion *C C*, which gear into the teeth of the moveable headstock, is fitted with a feather which allows it to slide along a groove on *A*, so that it can be driven when in any position along the bed. By this arrangement each railway wheel is driven from the face-plates without any dependence having to be placed upon the axles except for support, so that a heavy cut can be taken on both wheels at one time without any fear of a spring taking place. It will be seen also that one of the main spindles is fitted with a 3 feet pulley *D*, so as to allow of its being driven at a greater velocity for purposes of polishing or trimming up the journals of the axles when required. The moveable headstock is also supplied with an adjustable cylinder, in which the centre is fixed, and which can be screwed backwards or forwards by means of the wheel *E*, situated at the reverse end to the pulley *D*.

The great object in all large lathes is to make them so solid as, in effect, to nullify all vibration; and this is as important in the case of the slide rest as in the bed itself. The two slide rests, a slide and front elevation of one of which are

* Our correspondent who sends this article omits to state at whose works this lathe is in use. This shall be mentioned in a future number.

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LATHE FOR RE-TURNING RAILWAY WHEELS

FIG. 1.

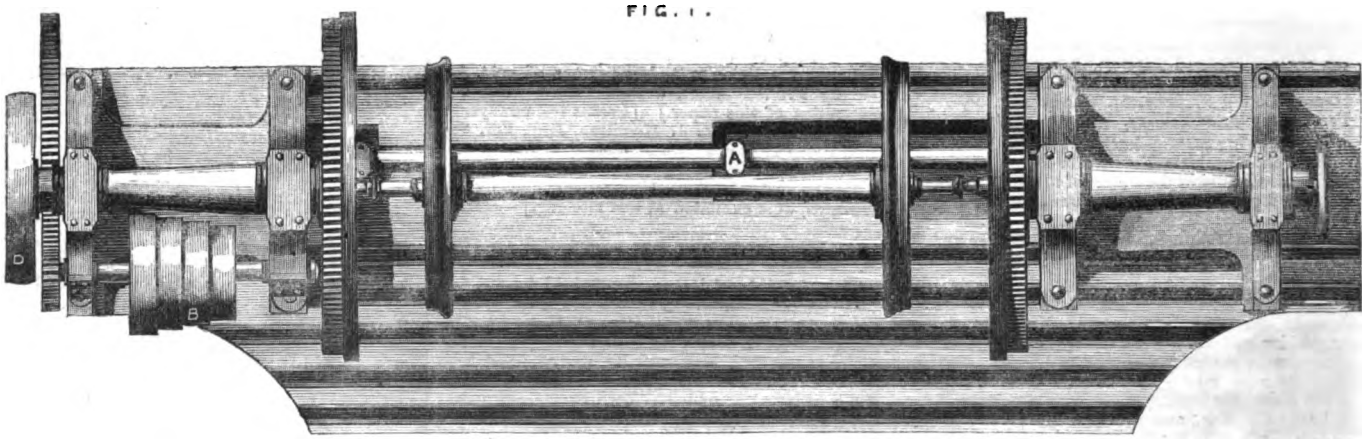


FIG. 2.

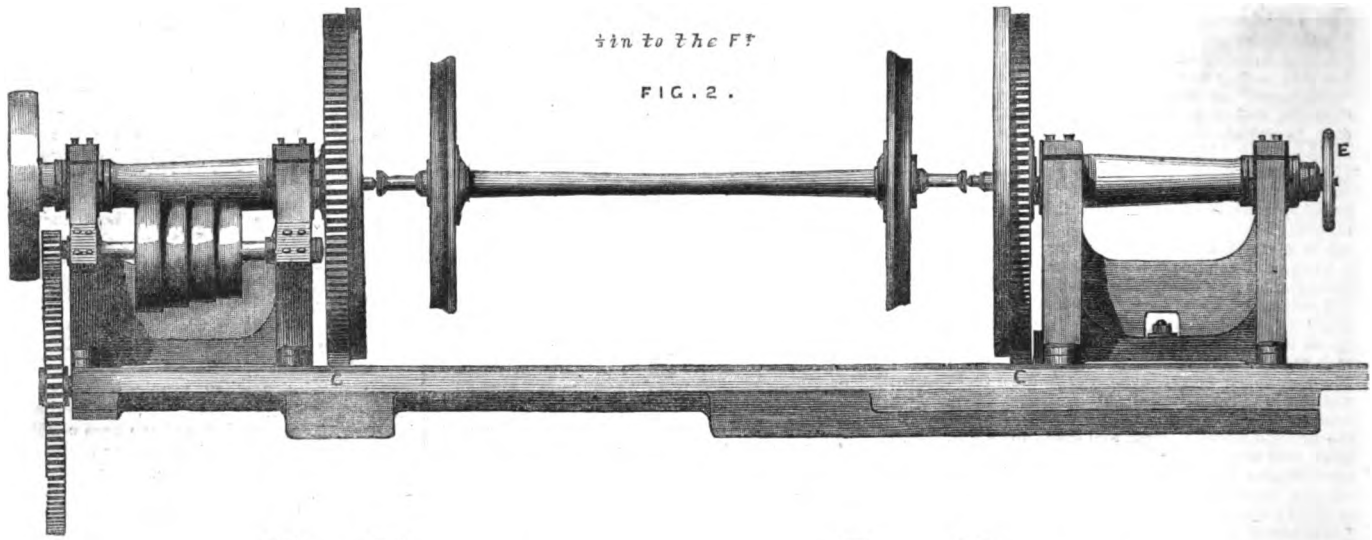


FIG. 4.

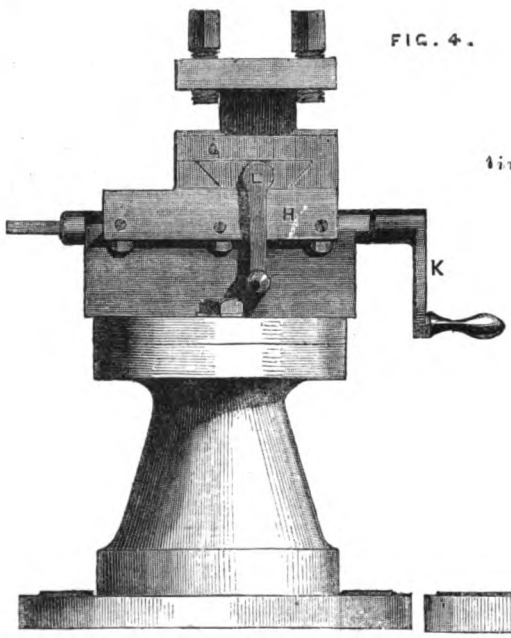
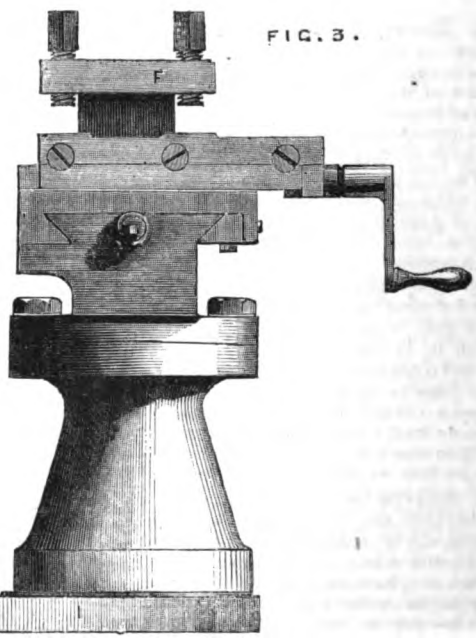


FIG. 3.



shown in Figs. 3 and 4, consist of strong coned columns rising from the tails or lower plates, which are planed true to rest upon the bed-plate fillets. The upper or sliding parts are made very strong with adjustable pieces, and the tools are clipped by means of steel pins working through square plates, which are one with the rests. This enables the tools to be placed in four different positions, according to the work required. The thickness of the metal of the columns of the rests is 1 inch; that of the tool plate *F* is 2¼ inches; the traverses of the two slides *G* and *H* are respectively 12 and 16 inches. The tail plate *I* is 2 feet 10 inches long, 2 feet wide, and 2½ thick; and the diameter of the bolts used to hold them down to the bed are 1⅛ inch. The lower screw for giving the feed, which is shown at *K*, is fitted with two square ends for the receipt of handles, which is useful in certain cases where the front one is inaccessible. Whenever this lathe is not required for re-turning purposes it can be used as a double-face plate lathe, and each face-plate and rest used separately, so that it forms a very useful and effective machine.

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HEWITT'S PATENT SCREW PROPELLER.

FIG. 1.

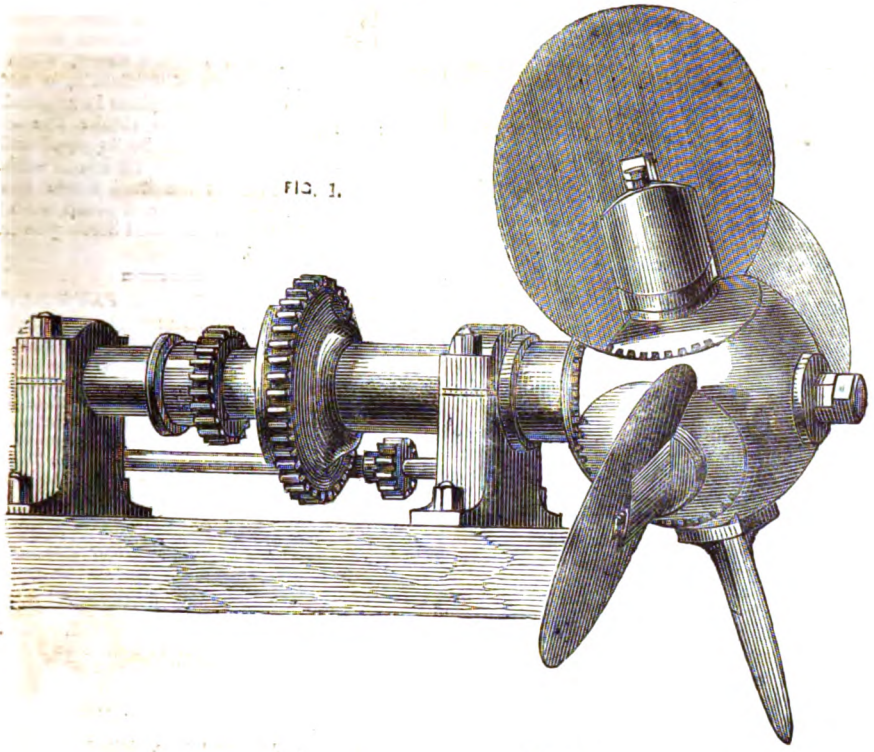
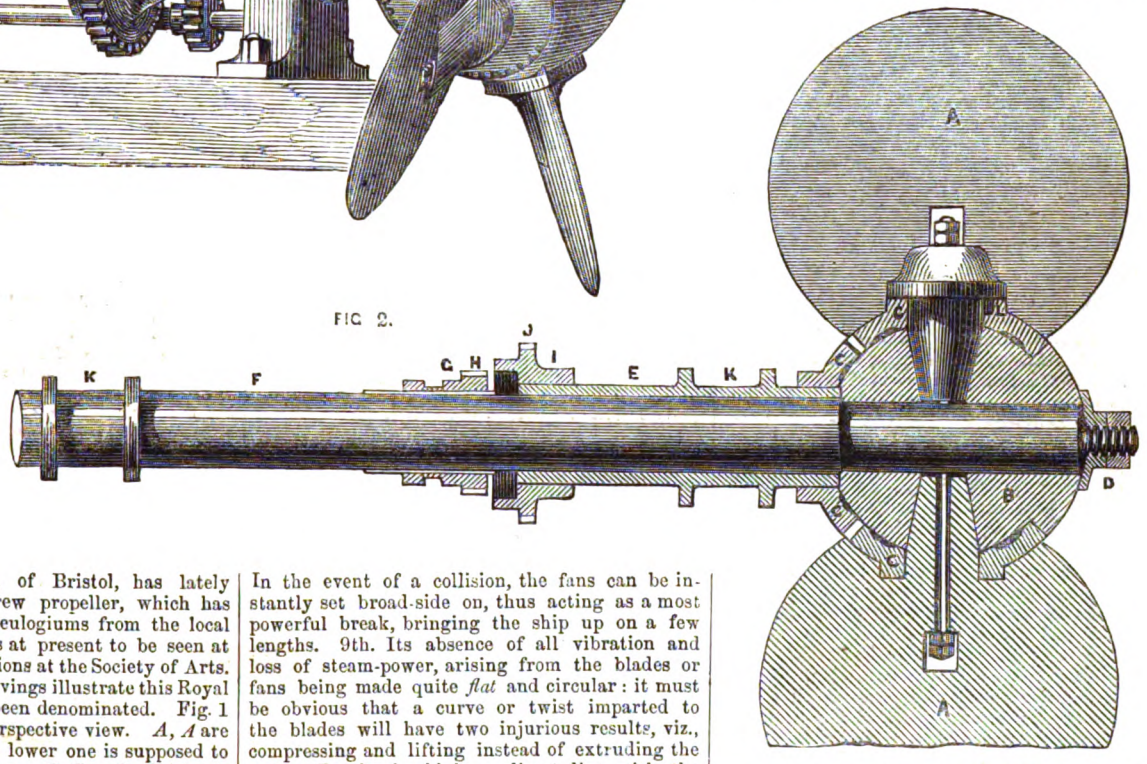


FIG. 2.



MR. WILLIAM HEWITT, of Bristol, has lately patented a form of screw propeller, which has called forth very warm eulogiums from the local press. A model of it is at present to be seen at the Exhibition of Inventions at the Society of Arts. The accompanying engravings illustrate this Royal Alfred Screw, as it has been denominated. Fig. 1 is a section; Fig. 2, a perspective view. *A, A* are the blades, of which the lower one is supposed to be in section; *B* is the boss; *C, C* are bevil wheels keyed on to the boss, and cogged round parts of their circumferences; *C* is a complete bevil wheel keyed on to the quill or tubular shaft *E*; *D, D* are nuts for securing the boss to the main shaft; *E* is the quill or tubular shaft for communicating motion to the fans or blades; *F* is the main shaft; *G* and *H* are a male clutch—an external wheel; *I* is the female clutch—an internal wheel; *J* is a spur wheel cut round the female clutch, into which a pinion works for adjusting or feathering the fans. The following are some of the important advantages which this invention is said to possess:—1st. Each of the parts can be made of *wrought* iron. 2nd. The pitch can be increased or diminished "to meet every contingency" with the greatest facility and ease. 3rd. It can be instantly feathered or placed on a neutral position previous to placing the vessel under canvas. 4th. A "disabled" fan can be immediately removed and re-placed by another without docking the vessel. 5th. The trunk or chamber provided for lifting the screw out of the water is entirely dispensed with. 6th. The arrangement for altering the pitch is within the ship, and, by the aid of a self-registering tell-tale, the angle or position is always indicated. 7th. Its non-liability to pick up a rope or chain—the fans or blades being circular. 8th. In the event of a collision, the fans can be instantly set broad-side on, thus acting as a most powerful break, bringing the ship up on a few lengths. 9th. Its absence of all vibration and loss of steam-power, arising from the blades or fans being made quite *flat* and circular: it must be obvious that a curve or twist imparted to the blades will have two injurious results, viz., compressing and lifting instead of extruding the water off as it should in a direct line with the screw—it has an exuscitating tendency, hence loss of speed and steam-power unnecessarily absorbed. 10th. It dispenses with carrying a spare screw, duplicate blades only being required. 11th. It further dispenses with considerable expenses and loss of time which fixed screws entail, inasmuch as before the known pitch can be determined, the vessel has to make half a dozen voyages or more, and placed in dock as many times to take off and put on screws varying in pitch. With this invention, the right pitch can be ascertained in the run of a few miles.

FLEXIBLE SCREW PROPELLERS.

A PAPER was read on flexible screw propellers in the theatre of the United Service Institution, on Monday evening, May 30th, 1859, by James Reddie, Esq. (Captain J. G. Fishbourne, R.N., in the chair). After alluding to various inventions of paddle and screw propellers from 1690 and downwards, and mentioning that some recent successful experiments had been made by a Mr. Lochman with a new kind of screw propeller with blades peculiarly-shaped, being broader at the base than the ordinary screw, and with the corners always cut off, and which, from their construction, had the advantage of being made of wrought instead of cast metal; the lecturer proceeded to notice collapsing or duck's-foot propellers which had been tried with various modifications, but general similarity. The objection to these collapsing propellers is, that their action is not continuous, and the motion of the duck or swan, which they strive to imitate, is not sufficiently swift to render an imitation of it of any consequence. He then observed that as the problem was how best to produce a motive power in water, we should turn at once to the fish, and neither to aquatic birds nor amphibious animals, for an example of what we want. The action of a fish's tail has, indeed, been rudely imitated by the Indian with his canoe and paddle, by ourselves when one oar is used in the operation called sculling; and various ingenious, but necessarily complicated contrivances have been patented to produce the figure eight motion of sculling by machinery. Few, however, seem to have thought of imitating nature more closely by using a flexible propeller, which simply requires to be moved to and fro like the motion of a fish's tail. Something of this kind was patented by Durs Egg in 1815 for an aërial machine, but who also claimed the right of applying the invention to boats; in the following year, James Dawson obtained a patent for flexble paddle floats, flexible masts and sails, and a flexible lever or oar with a broad end formed of rods and elastic materials in imitation of a fish's tail; in 1824 William Busk obtained a patent for propelling vessels by a flexible steel plate applied like a rudder to a vessel, and to be moved either by hand or machinery; and lastly, so recent as 1854 the Earl of Aldborough had patented something of the kind, but chiefly for balloons.

It was to the probable afficiency of propellers something like those of Dawson and Busk that the lecturer wished to call attention; his only experiments had been tried with a home-made gutta percha propeller, much too slight for the boats to which it was attached, and which broke in consequence. The advantages he expects to gain from flexible or fish-tail propellers are their easy application to boats, in which, by crank machinery and multiplying power, one or two men in the stern of the boat could accomplish as much as eight or ten rowers; and boats so propelled could pass up narrow streams and creeks where oars could not be used. For war purposes boats so propelled would evidently have many advantages.

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As regards their application to larger vessels to be moved by steam machinery, the promised advantages are an equally continuous power with that of the screw, and a power almost indefinitely increasing speed by means of a greater steam power, as those propellers would have no slip, and would not, like the screw, oppose any flat and resisting surface to be dragged through the water. For the same reason they would be found better auxiliaries to the use of sails, and when the vessel is moving under sails alone, would offer no obstructive surface as the screw does to the course of the vessel; they would also have immense steering power, and when a vessel is at rest, it could be moved round by a motion of the flexible propeller, which would at once put way on the vessel, and turn it if the motion were not reversed.

Although it could not be hoped that mechanical skill could succeed in producing such a perfect machine for strength and flexibility as a fish's tail, yet a ruder instrument might suffice when driven by means of the power of steam, which is far greater than the fish could exercise.

The lecturer concluded by showing that there was no presumption in thus supposing that science could emulate nature; science itself being only the application, and using the great powers of nature, such as fire and the expansive force of steam, by means of knowledge and art, and that thus it is that knowledge is power, true science being merely nature and art in harmonious co-operation.

FRENCH GUNBOATS.

THE gunboats are, with the exception of those in the outer harbour, undergoing alterations for their adaptation to a new system of naval warfare They are the Eclair, the Flamme, the Flèche, the Grenade, the Alerte, the Mutine, and the Tirailleuse. The first four are provided with engines of 110-horse power, and with two guns, 50-pounders. Only one of them, a three-masted fore and aft schooner rigged, can be compared with the English steam-gun sloops, of which the Coquette, that has been here, is a noble specimen. The French boat carries four 30-pounders amidships in addition to her two long guns forward; but, besides being inferior in engine power, her build and lines would lead one to believe that her speed must be greatly inferior to our steam sloops. The mode in which the heavy guns forward are mounted and are to be worked is a novelty. Whether it is likely to prove successful, naval men will be most competent to decide. During the Russian war the French gunboats that were sent into the Baltic were provided with moveable bulwarks, which, in action, were made to fall down and form an inclined plane, having on the exposed surface thick iron plates. The object of this arrangement was that if an enemy's shot struck the inclined surface it might receive an upward direction at a sufficient angle to pass over the guns and clear the ship. In the place of this arrangement, more ingenious than practical perhaps, a new system has been adopted. The stem and bulwarks are cut down level with the deck to a point just before the foremast. At this point a stout bulwark of oak is built across the deck from one side to the other and before the foremast. The bulwark is inclined backwards at a slight angle, and is to be faced with shotproof iron plates. It is pierced with two embrasures, circular-headed and straight-sided; and through these the guns are to be fired, the bowsprit being made movable to allow of it. From this arrangement it inevitably follows that the guns cannot be trained, the embrasures being much too narrow to allow it, and that they must be fired in a line with the ship's keel. The vessel would, consequently, be obliged in action to always present her bows to the enemy—that is, to offer the greatest facilities for being raked. Even if the iron-plated bulwark did prove an effectual shield, which may be doubted, the enemy's shot could penetrate other portions, and rake just the same. Moreover, suppose the shot struck the bulwark near the top, the inclination of its surface would carry the shot over, and land it probably among the machinery. The result would be the effectual disabling of the vessel until she has been refitted in a home port. It has been reserved for modern French naval artillerists to discover that the best position for fighting a ship is that in which she is exposed to be constantly raked.

The three last named gunboats—Alerte, Mutine, and Tirailleuse—are each fitted with one gun, 50-pounder, mounted on the same principle, the shield being lower, not much higher than a man's waist, and curved inwards. Their engines are 25-horse power for each boat. The floating batteries are much more formidable looking things, provided their crews are not stifled from the smoke of their own guns. I only counted nine ports on a broadside, but was informed that they carried 18 50-pounders, all of which could be fought on the same side. These floating batteries have a further arrangement which appears ingenious; they are provided with gratings outside the bulwarks, which can be let down so as to form a kind of balcony for riflemen to stand upon. Thus, supposing the battery to be fighting her port broadside, the balcony to starboard would be let down outside the bulwarks, and the riflemen who stood upon it would be protected by the whole breadth of the vessel.—*The Marseilles Correspondent of the "Times."*

EXPERIMENTS WITH SCREW PROPELLERS.

THE series of screw trials concluded by the Doris are the most important that have yet taken place since the introduction of the screw for the propulsion of our steamships of war. These trials were designed to test the relative qualities of the Admiralty or common screw and Griffiths's patent propeller. Similar trials were carried out in 1853, on board the Conflict and Fairy, resulting in favour of the Griffiths patent propeller, since which time the Griffiths has been constantly used by the Fairy when under way. The immense power of the engines now in use by our steam ships of war has given an opportunity of testing the merits of the two screws with the certainty of obtaining more practical results, more especially as affecting the vibration and steering of the ship than could be arrived at with vessels of the Conflict and Fairy's class; hence the present trials. The forms of the screws may be thus described:—The blades of the Admiralty screw consist of a sixth part of the whole screw or helix; the centre of the Griffiths propeller is a sphere of one-third the diameter of the screw, with the blades made tapering. The driving surface of the Admiralty lies at the extreme end of the blades; in the Griffiths it lies at the centre nearest the sphere. The first trial with the Admiralty screw was with a diameter of 18 feet, her speed being 11·823 knots. On the second trial, with the diameter increased to 20 feet, the speed realized was 11·826 knots, with a great increase of vibration. On the third trial the "leading" corner of each blade was cut off, and in this form the common screw attained its greatest speed, giving a result of 12,032 knots. On the fourth trial both the corners of each blade were cut off, when, with a greater number of revolutions, less speed was made, being 12 012 knots. Its last trial, with the "following" corner of each blade cut off, but the screw restored to its perfect form in every other respect, gave a result of 11·815 knots. The first trial with the Griffiths propeller—20 feet diameter and 32 feet pitch—gave 11·981 knots. The second trial, with a 26 feet 5 inch pitch, gave 12·269 knots; and the third trial, with a medium pitch, which concluded the series, gave 12·158 knots, with 53¾ revolutions of the engines, and less vibration than on any former trials. Several important features connected with the screw propeller have been proved by these trials. Firstly, that the leading edge of the screw is the part that mostly affects the steerage of the ship, and also causes the greater part of the vibration. Secondly, that increased diameter of the screw is better than increased pitch to reduce the speed of the engines, but it considerably increases the vibration with the common screw, whereas with the Griffiths it did not produce that effect, in consequence of its chief propelling surface being towards the centre. The common screw, when its blades are cut to the form of Griffiths's, is not so effective as when the centre sphere is applied to them; the power required to obtain the same speed is considerably reduced by its application. The power required to obtain 12 knots without the sphere was 2,920·32 indicated horse power, while the same form of blade and pitch with the sphere took only 2,825·6 indicated horse power.—The *Times* of June 6.

THE ROYAL MAIL STEAMER PARAMATTA.

OF the three monster steamships which the Royal Mail (West India) Company have just added to their fine fleet, the Paramatta is the first ready for sea, and is appointed to leave Southampton on the 17th inst. with the West India and Pacific mails of that date. The second, the Shannon, is rapidly fitting out on the Clyde; and the third, the Seine, was launched last week at Blackwall, from the premises of the Thames Iron Shipbuilding Company, where the Paramatta was also built. On Tuesday the Paramatta underwent her official trial, in the presence of the Government authorities, and the directors took advantage of the occasion to give a large number of persons the opportunity of witnessing for themselves the superior character of this noble vessel in regard to capacity, speed, and the general excellence of the arrangements for the purposes to which she is destined. She left the Southampton water about 11 o'clock on Tuesday morning for the measured mile in Stokes' Bay, with a party of nearly 200 on board. At the measured mile the Paramatta made four runs, with the following results:—

Runs.	Min.	Sec.	Average.	Runs.	Min.	Sec.	Average.
1	4	14	14·173	3	4	29	13·383
2	4	15	14·063	4	4	14	14·173

being an average of 13·956, or 14 knots per hour. Revolutions, 17½; pressure of steam, 17 lbs. to the square inch; vacuum gauge, 26½ inches. The following are her principal dimensions:—Length on the main deck, 340 feet; ditto load line, 330 feet; breadth, 43 feet 9 inches; ditto over paddles, 77 feet; depth of hold, from floor to spar deck, 33 feet 6 inches; horse power of engines, 800; builders' tonnage, 3,092; registered tonnage, 2,180; displacement at launching line, 2,215 tons. The engines are Maudslay and Field's patent double cylinder, taken from the Orinoco, and fitted to the Paramatta, with several improvements. The boilers have been made at the company's factory at Southampton, and are said to be the finest specimens of tubular boilers yet out, not being required to be proved a second time, the first proof being at double the pressure intended to be used. In fact, the steam generated was quite sufficient to drive engines with a third more pressure. The feathering paddlewheels were also made at the Southampton factory, and are beautiful pieces of workmanship. Attached to the engines are new pumps for filling the baths, hot and cold, at any hour of the day or night; and a constant supply of fresh water is insured by the application of Dr. Normandy's patent distilling apparatus, while the waste steam is received into iron tanks and condensed for washing and other purposes. The fire-extinguishing pipes (2½ inch) are at the command of any officer or engineer at all times, and can be turned on at a moment's notice to any or all of the compartments of the ship. The engines are also capable of pumping water out of any compartment at all times, or all compartments at the same time. The combined weight of the four boilers is 220 tons. The paddlewheels are 38 feet 6 inches diameter over the floats: diameter to the centre of pressure, 34 feet 3½ inches. There are 24 furnaces, and the ship has stowage capacity for 1,500 tons of coals. Great credit is due to the designer of the vessel, Mr. William Rennie, and also to Mr. Robert Ritchie, for the manner in which her machinery has been turned out of hand.

THE THRUST OF THE SCREW PROPELLER.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—Your remarks following my letter on page 363, call for a little further explanation from me.

Suppose a paddle-wheel steamer to have her old boilers removed, and to be supplied with new ones, and that such new boilers generate more steam

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than the engines can consume, and it is not desired to increase the pressure. By reducing the surface of the paddle-boards, the engines may be made to work faster, thus using all the steam: the power and speed is thereby increased, yet the thrust of the paddle-shafts is not increased at all, the engines being incapable of increasing the thrust without increase of pressure. Now, if the thrust were measured by a dynamometer in each case, the result would be the same; yet, it is certain that the resistance is greater with the increased speed than before.

The same results would be obtained under similar circumstances with the screw propeller. Therefore, the thrust indicated by a dynamometer would not record the resistance encountered by the vessel.

I do not in the least question the law of equilibrium of forces; the *power* employed (after making the necessary deductions for friction, &c.) must be equal to the resistance. Nor do I attempt to frame a law upon the subject.

The pressure of a vessel's stem against the jetty when on trial in a wet dock depending on the nominal horse-power of the engines, leaves out of the question the boiler power, and is not a fair illustration, as I referred only to ships in motion.

Apologising for having occupied so much of your valuable space, I remain, Gentlemen,

Your very obedient servant,

T. MOY.

1 Clifford's Inn, June 6, 1859.

[Our correspondent's evasion of our reply to his last letter by saying that he referred only to ships in motion, affords us no encouragement to discuss the question with him further. Our inference was perfectly legitimate. If Mr. Moy believes that the speed of a screw ship moving under steam alone can be increased without an increase of the thrust upon the screw shaft, we can only regret the fact; argue the matter with him further we cannot. EDS. M. M.]

MARINE ENGINE-ROOM TELEGRAPHS.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—I have read with much surprise your article with reference to the trials of engine-room telegraphs for the navy at Sheerness, in your number of the 27th ult., wherein you make it appear that my telegraph is much inferior to either Suffield's or How's. I do not know who supplied you with that information, but the statements are entirely incorrect and contrary to the facts. I cannot state the number of "perfect" marks my telegraph, or any of the others registered, as I was not informed, nor do I believe either of the others were; but I *can* state that Mr. How's telegraph (the fourth put up by him in the same ship) was condemned *without undergoing a trial*, as I was at Sheerness when it was taken down. Consequently the statement with regard to Mr. How's is entirely untrue. And Mr. Suffield's is still incomplete, although it has been in hand since last June; and he has made several alterations since the trial took place in December; that I commenced fixing mine in March last, completed it, and was tried, and reported upon the latter part of April, since which time I have not touched it, it being pronounced perfect. And I have sufficient proof that my telegraph was recommended to the Lords of the Admiralty as the most *effective* and *complete*, both as regards its performance and workmanship.

I trust to your sense of justice and truth to insert the above statement of facts, or a contradiction to your former statement, which is calculated to do me serious injury with those who do not know the real state of the case.

I am, Sir, your most obedient servant,

GEORGE HORNSEY.

Patentee of improved engine-room telegraphs.

Southampton, June 7th, 1859.

P.S.—I beg to refer you to Captain Halsted, who, I have no doubt, will certify to the truth of my statement if required.

[If Mr. Hornsey will favour us with anything more reliable than his own version of the "facts," we shall be happy to correct anything which may thus be proved to be wrong. But we possess such unquestionable authority for the statements made in our article that we cannot think of retracting any part of them without better grounds than the above letter furnishes. As to Mr. Hornsey's reference to Captain Halsted—which we fear must have been made without the authority of that able and judicious officer—we can only say that we certainly do not feel at liberty to trouble him upon the subject. —EDS. M.M.]

THE ARMSTRONG GUN.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—Although allusion has been made to my plans in your valuable Magazine, I have never written publicly on the subject.

My father has devoted half a century to naval and military improvements, and, while examining some of his plans in 1840, I invented among other forms of guns that known as the "Armstrong." I started from my own definition that "a *gun is a directing tube on a reactionary base*," and proceeded accordingly to close one end of my tube in various ways. I confine myself to the mode bearing on the question. My earliest plan was a solid screw; I then interposed a plate to prevent the screw from stripping, and soon perceived that time would be gained by continuing the chase through the screw. My built-up tube had a bore rifled to receive a compound projectile hooped with lead, and containing pellets travelling in hollow cylinders, to discharge it by the laws of motion; the new gun-carriages run on inclined planes, to check the recoil and facilitate running out.

For any one understanding the subject, this description is sufficiently minute to demonstrate the identity in principle and form. Some time since friends informed me my gun and shell were being adopted, and urged me to bestir myself. The first description I have seen is that lying before me in a London journal of May 12th, given by Sir William Armstrong himself at Newcastle, but my father not wishing to give me trouble, although he had been given the particulars of this gun in December, declined to describe it to me; although unknown to me at the time, he claimed the originality of the invention as mine, at the war department, and to His Royal Highness the Duke of Cambridge, with the request of the claim being duly recorded.

In the spring of 1854 my father and self appeared before the select committee of artillery officers at Woolwich; the strong objection to breech-loading and "built-up" guns completely paralyzed all further effort, and with unshaken confidence we fell back on the forms which have appeared in your publication.

If it is conventionally admitted that the first publisher is to be considered the inventor, the fact of our appearing before the committee by *official instructions* establishes my right to that title.

It may be asked why did we not patent? Because cannon and shell are not commodities in general demand, and if the Government arbiters would not adopt our plans, they were useless.

Sir William Armstrong will pardon my saying that, had we patented, his position would have been secondary.

As the original inventor (in 1840) I appeal to the public sense of "fair play," and have the honour to subscribe myself, Gentlemen,

Your most obedient servant,

H. H. DRAKE.

Sedrah House, St. Austell, June 1st, 1859.

The new members appointed to serve on the Royal Ordnance Select Committee assembled in their office, in Woolwich Arsenal, on Friday, and concluded their arrangements for transacting the business of the department, which is henceforth to be distinct from and unconnected with any other department, nor is it intended, according to present stipulations, that any of the members shall reside in the Arsenal. By a memorandum from the Horse Guards, dated June 2, the members composing the committee approved by the Secretary of State for War, on the recommendation of the General Commanding-in-Chief, are as follows:—President, Col. St. George, C.B., Royal Artillery; and the members, Lieut.-Col. and Brevet-Col. Robinson, Royal Engineers; Lieut.-Col. and Brevet-Col. Greathead, C.B., 8th Foot; and Lieut.-Col. W. J. Smythe, Royal Artillery. Col. Pickering, who has been attached for some years past to the committee as secretary, has received permission to retire, and, as stated, will be succeeded by Lieut.-Col. J. H. Lefroy, Royal Artillery.

NOTICES.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of insertions less than 13; for 13 insertions, 4d. per line; and or 52 insertions, 3d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

Our Weekly Gossip.

The following is a copy of the certificate of her Majesty's principal Secretary of State for the War Department, authorising the suppression of Sir William Armstrong's patent for his celebrated gun:—"In the matter of an Act to Amend the Law concerning Patents for Inventions with respect to Inventions for Improvements in Instruments and Munitions of War, 22nd Vic., cap. 14. And in the matter of William George Armstrong's patent, No. 2,564, I, the Right Honourable Jonathan Peel, Her Majesty's principal Secretary of State for the War Department, certify that William George Armstrong has made an assignment to Her Majesty's said principal Secretary of State of all benefit of his invention described in and by a provisional specification bearing date the fifteenth day of November, one thousand eight hundred and fifty-eight, and numbered 2,564, and of all letters patent to be obtained for the same. And I further certify that I think it for the benefit of the public service that the particulars of the invention, and of the manner in which the same is performed, should be kept secret. Dated this twelfth day of May, one thousand eight hundred and fifty-nine. (Signed) JONATHAN PEEL. (Witness) CHARLES M. CLODE, Solicitor to the War Department. To the Commissioners of Patents for Inventions."

By the end of July, or early in August, the different French navy yards will have completed, it is said, 120 flat-bottomed gunboats, small model, having fitted each with a 5-horse power steam engine and with one of the rifled four-pounders. They are intended to act on the Adda, the Mincio, and the Adige. By the same period will be completed 40 steam transports, capable of conveying 1,000 men each, besides the crew and baggage.

At the conclusion of the last screw-propeller trial on board the Doris the two systems of boat-lowering invented by Mr. Clifford and Captain Kynaston were displayed, the ship going about six knots. "Captain Kynaston's disengaging hooks appear to require four men for the operation," says the *Times* correspondent, "the success of which depends on the simultaneous working of the men. By Clifford's method the whole appeared to be more safely performed by one man, who by slacking off a rope insures the boat being lowered on an even keel." We do not understand why Captain Kynaston's apparatus should require four men to work it during the act of lowering. The gentleman who reported the trial of the Paramatta mail steamer for the *Times* says that at two different periods of the day Clifford's patent boat-lowering apparatus was put to the test. "The first time the steamer was going at 12 knots, when Captain Andrews, one of the Royal Mail Company's oldest commanders, now retired, volunteered; and on the second lowering she was going 14 knots, when Captain Andrews again volunteered, accompanied by Captain Mangles, Mr. Greenwood, and Mr. Alderman Rose, the boat descending to the water amid the loud cheers of the company on deck. Three or four ladies wished to accompany them, but it was not considered advisable. Each time the superiority of the invention was clearly demonstrated, and several gentlemen connected with the navy and mercantile marine who were present stated that they had always previously entertained great doubts about the system, but were now fully convinced of its safety and efficiency."

"Queer Astronomy" is the heading of a letter which Mr. J. Simon Holland, of Woolwich, sends us on a question of some importance. He says:—"If it be the purpose of the MECHANICS' MAGAZINE to prevent people being misinformed, as well as to inform them respecting mechanical laws, you will readily give a place to the following quotation from the article on astronomy in the Messrs. Chambers' 'Information for the People.' 'It might be supposed that, when the planet came to the part of its course where it is nearest to the sun, the attractive force

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would be greater, and that some derangement might take place. But this is not the case. At that part of the course the planet moves faster than elsewhere, and thus baffles the greater attractive force. This phenomenon is particularly apparent in comets which have so eccentric an orbit. These bodies move with inconceivably greater speed when near the sun than in the remote parts of their orbits. It was a discovery of the German astronomer Kepler, in the seventeenth century, that, *notwithstanding the increased speed, a revolving orb goes over exactly the same amount of its circuit as when it moves more slowly.* Suppose a multitude of lines radiating from the sun, at equal distances from each other, the orb would be found to cross from one to another of these in exactly the same time, when it was *farthest* from the sun as when it was *nearest*. In scientific language, it describes equal areas in equal times.' The first words in italics were not so in the original, the latter two were. It would be difficult indeed to find in the whole range of scientific literature anything more thoroughly absurd and contradictory than the above most abortive attempt to describe Kepler's second law, the beauty of which has been supposed to consist to a great extent in its simplicity. But it appears that after all, it is not so simple that it can be readily understood by all who read it. As nearly seventy thousand copies of the article were sold the first year, it might be that some of your readers have been mystified by it, and that a line or two of explanation may be acceptable. If we imagine a line to be drawn from the sun to a planet, and to accompany it during its revolution in its orbit, lengthening and shortening as the planet increases and diminishes its distance from the sun, then will that line sweep over equal areas in equal times. When the planet is farthest from the sun, and is therefore moving slowest, the increased length of the line compensates for the diminished velocity of the planet. This line is called the planet's 'radius vector.' It is astonishing how the writer of the article could fail to understand such a simple law, and still more astonishing that he should not have seen the contradictory nature of what he was writing. If the multitude of lines he speaks of were at an equal angular distance, then must the planet have moved fastest when farthest from the sun, which was contrary to what he had just written; and if their extremities were at an equal distance, measured along the orbit, then must the planet have moved at the same velocity in all parts of its orbit, which involved another contradiction. The sentence marked in italics is not only contradictory, but unmatchably absurd. In the life of Capt. Cook, published by the same respectable firm, we are told that Cook went to the southern hemisphere to observe the transit of Venus *because* it could only be observed in that hemisphere, which betrays a culpable ignorance of the A B C of astronomy in one who undertakes to be a public instructor. I send you these two examples because the Messrs. Chambers, who have been eminently useful in the cause of public instruction, are now publishing another encyclopædia, in which accuracy is much to be desired; and also because a private remonstrance has been thrown away upon them. Blunders by minor men are not of so much importance."

Captain Molyneux Shuldham, R.N., writes from the Manor House, Dursley, Gloucestershire, under date of 6th June, 1859, respecting Mr. Novello's "craft," as follows:—"Had I not obtained experimental proof of the worthlessness of any plans having for their object the realizing greater speed from the revolution of buoyant wheels upon the surface of the water than of bodies passing through it, I should not ask you to encumber your pages with a comment upon an invention which can never be brought to any practical useful purpose, although I, who say so, may perhaps be the father of it, as I invented what I termed a sea-coach as far back as the year 1815. It consisted of four large drums with their axles running in frames, leaving a clear passage amidships the entire length of the coach between the wheels; of course, segments of the circumference of the wheels were immersed. I tried her first with a large square sail right before the wind, having set a small jib at the extreme end of the bowsprit to keep her from "broaching to." I selected a suitable pond for the experiment, and when there was a fine breeze upon it, I launched her; but, to my surprise, and, I may add, my *then* disappointment, the wheels refused to revolve at all, notwithstanding she made good way, at least as much as a boat would do with equal immersion. Determined to make the obstinate wheels revolve, I fixed small paddle floats to their sides, but not deeper than the immersed segments, but enough to force them to revolve. I made a second experiment, which turned out a very funny one; for when she had finished her voyage across the pond, and reached the opposite shore, which happened to be very flat, she did not stop, but continued sailing on the land, until some obstacle brought her up; so the sea-coach did very well *pour rire*, and nothing else, for I never could discover its application to any practical use, with the solitary exception that a horse or a donkey might be taught to do the duty of a waterman by being placed in a large drum (fitted with paddles) to turn it like a squirrel in its cage, or like a dog turning a spit. The axis of the drum should turn in a frame, like that of a rolling stone, placed before the drum, at the extreme end of which should be a buoyant large rudder capable of supporting one or two persons; by the use of such an amphibious machine, a gentleman who could afford to keep a horse or donkey, but not a yacht, could convert either of them into a waterman, and be propelled from his own door to the waterside, and launched without any manual labour, and go a long distance up or down a river, or out to sea in fine weather without any trouble than that of steering the amphibious animal. Here is no question of speed but economy, and the saving of manual labour. I read with surprise the numbers to which you allude contained in the 59th Volume of your Magazine, in which the inventor writes so enthusiastically in favour of the rolling-on-water plan; ill health prevented me at the time from writing an article upon it for insertion in your valuable Magazine. As the late Admiral Sir Sidney Smith had been ordered by his late Majesty to superintend a public trial of my revolving masts at Brighton, I had the opportunity of the honour of making his acquaintance, and to be invited to pass a whole day with him at his lodgings at Brighton, and, by way of passing the time and affording some amusement, I showed him a little sketch-book which contained some original ideas of mine, good and bad, of various inventions, my sea-coach being amongst the latter number, to which, however, he took a great fancy, and wished to combine it with my revolving mast. I, therefore, made every endeavour to prove to him that my sea-coach was a mere toy, and unworthy of the slightest notice or encouragement whatever. However, Sir Sidney made some boat experiments, the object being superior speed, but I have never been able to learn the nature of them. If the ocean from Galway to New York were imagined to be of ice, or a hard level road, the experience which I have had in sailing upon land would fully prove to my mind that no body (the balloon excepted) propelled by wind would equal the velocity of a land-boat on a large scale, nor any that would surpass a locomotive. I hope that the experiment which I have explained has made it quite clear that the immersed segments of drum water-wheels are *dragged through the water*, whether they revolve or not, consequently that no advantage is gained by their revolutions; it is only when their weight, together with the machine to which they are attached, is prevented from sinking by rolling upon a hard level surface that would realize all the striking advantages claimed by the inventors of rolling-on-water machines."

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated April 30, 1859.

1088. A. McKechnie, of Carron, N.B., Engineer. Improvements in hammers and in apparatus for working the same.

Dated May 5, 1859.

1129. E. T. Hughes, of Chancery-lane. Improvements in the manufacture of sheet iron. A communication from D. A. Morris.

Dated May 6, 1859.

1142. T. Jones, of Liverpool, Slater. An improved apparatus and arrangement of flues for heating and ventilating buildings, ships, and other structures, and for causing draughts in chimneys.

Dated May 9, 1859.

1160. F. V. Hadlow, of Brighton, Engraver. An improved stamp for marking linen and other wearing apparel.

1162. A. V. Newton, of Chancery-lane. An improved construction of lamp. A communication from W. H. Racey.

1164. E. T. Hughes, of Chancery-lane. Improvements in obtaining motive power. A communication from A. F. Lapène.

1166. N. Barker, of Heyford, and J. A. Carter, of Blisworth. Improvements in apparatus for lubricating the pistons of steam-engines.

Dated May 10, 1859.

1168. R. J. Lees, of Woolley Bridge, near Hadfield, Derby. Improvements in steam generators or boilers.

1170. M. Defries, of Houndsditch, Manufacturer. Improved apparatus for regulating the pressure of gas.

1172. R. Thompson, of Glasgow, Manager. Improvements in shuttles.

1174. M. Henry, of Fleet-street. Improvements in heating and in supplying air, and in the apparatus employed therein, part of which improvements is also applicable to exhausting fluids. A communication from L. C. Bureau.

Dated May 11, 1859.

1178. A. Manbré, of Rathbone-place, Brewer. An improved method of extracting and purifying sugar, called glucose and "sirop de fecule," from potatoes or fecula, or starch or dextrine for the purposes and uses of brewers, distillers, vinegar makers, colouring makers, or otherwise.

1180. T. P. Bennett, of Gilnow Mills, near Bolton-le-Moors, Manager. Certain improvements in or applicable to carding engines.

1182. H. Clarke, of Wakefield, Corn Factor. Improvements in balancing millstones to the running as well as the standing state. A communication from T. Narburgh.

1184. C. F. Vasserot, of Essex-street, Strand. An improved musrol or noseband for horses' bridles. A communication from L. Marque.

1186. W. Salter, jun., of Lea, Wilts. Improvements in hay-making machines.

1188. J. B. Lyall, of Castle Frome, Hereford, Gentleman, and F. W. Campin, of the Strand. Improvements in the "Saloon" Omnibus and other omnibuses, the wheels and springs whereof, and mode of attaching them, being applicable to other carriages.

Dated May 12, 1859.

1190. J. Saxby, of Brighton, Engineer. Improvements in the mode of securing the rails on railways.

1191. R. A. Brooman, of 166 Fleet-st., London, Editor of the MECHANICS' MAGAZINE, and Patent Agent. Improvements in machinery for solidifying, pressing, and moulding. A communication from F. Dehaynin.

1192. A. P. Rochette, of Brighouse, York. An improvement in the manufacture of soft soap.

Dated May 13, 1859.

1196. T. Scott, of Rouen, Engineer. An improved surface condenser and refrigerator.

1198. J. F. Allender and J. Richards, jun., of Brierley-hill, Stafford, Managers of works. Improvements in furnaces for puddling iron.

1200. R. Gourlay, of Glasgow, Ironfounder. Improvements in making moulds for casting.

1202. R. A. Brooman, of 166 Fleet-st., London, Patent Agent. Improvements in cooking, preserving, and drying animal and vegetable substances. A communication from A. Bourdin.

1204. W. S. Thomson, of New York, Skirt Manufacturer. Improvements in the manufacture of hooped skirts. Partly a communication from W. Wilmot.

1206. G. R. Clover, of Liverpool, Ship Builder. Improvements in ships' night signals.

Dated May 14, 1859.

1208. M Leahy, of Hereford-road, Westbourne Park, Civil Engineer. Improvements in apparatus for facilitating the draught of carriages.

1210. D. Smith, of Glasgow, Civil Engineer. Improvements in projectiles for fire-arms.

1212. E. Maw, of the Doncaster Iron Works, York-shire. Improvements in the construction of buildings made of iron or other metals.

Dated May 16, 1859.

1214. S. C. Sheard, Engineer, of Smethwick, Stafford. Certain improvements in fire-bars, which bars are applicable to all furnaces where great heat and economy of fuel are required.

1216. W. Midworth, of Newark-on-Trent, Engineer. An improved iron for the use of laundries, tailors, or other purposes.

1218. J. Clark, of Glasgow, Wholesale Stationer. Improvements in envelopes, and in machinery or apparatus for gumming, embossing, folding, counting, and otherwise treating the same, and in part applicable in the treatment of note and other writing paper.

1220. W. E. Gedge, of Wellington-street, Strand. Improvements in mixing, combining, and otherwise treating certain matters and substances for the production of manure. A communication from L. Parent.

Dated May 17, 1859.

1222. L. D. Owen, of Tottenham-court-road, Engineer. An improved menstrual receiver or truss. A communication from H. W. Ladd.

1223. J. Brown, jun., of Rotherham, Ironfounder. Improvements in buffers, draw springs, and bearing-springs.

1224. A. R. Landre, P. Gras, and A. L. A. Boucherie, of Marseilles, Merchants. Distilling schist or bogheud coal and other minerals for lighting.

1225. H. Dolley, of Paris, Manufacturer. An improvement in the manufacture of hooped petticoats and in the metal ribs employed in the manufacture of hooped petticoats.

1226. A. E. C. J. Reynaud de Trets, of Marseilles, Gentleman. An improved composition for splitting rock.

1227. J. Nasmyth, of Surrey-street, Strand, Engineer. Improved apparatus for obtaining and applying motive power.

1228. C. Law, of Wolverhampton, Lockmaker. Improvements in the construction of locks.

Dated May 18, 1859.

1229. R. Romaine, of Chapel-st., Bedford-row, Gentleman. Improvements in the means of applying steam power to the cultivation of the soil.

1231. E. Charlesworth, of York. Counteracting the recoil of small fire-arms, and lessening the risk of injury arising from the bursting of the same.

1232. S. N. Evans, of Wolverhampton, Commission Agent. Improved mechanism for preventing accidents at mines from overwinding.

1233. J. Haslam, of Preston. An improved construction of healds or harness used in warp dressing and sizeing machines, and in looms for weaving.

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1235. J. Dean, Cotton Manufacturer, J. Parkinson, Manager, E. Riley, Overlooker, and W. Burton, Mechanic, all of Haslingden, Lancaster. Improvements in certain self-acting mules for spinning fibrous materials.

1236. W. Nicholls, of Truro, Millwright. Improvements in portable corn mills.

1237. J. H. Johnson, of Lincoln's-inn-fields. Improvements in lubricating certain portions of machinery. A communication from M. Bonière, jun.

1238. R. A. Brooman, of 166 Fleet-street, London, Patent Agent. Improvements in heating. A communication from S. Lebobe.

1239. J. Childs, of Putney. Improvements in hardening and vulcanizing compounds of sulphur with india-rubber and gutta-percha.

Dated May 20, 1859.

1240. J. Valda, of London. Improvements in stud-fastenings, and a system of ornamenting and adapting belts, cravats, ribbons, draperies, and other articles to stud-fastenings.

1241. G. Walker, of Shoreditch. Certain improvements in swing looking-glasses.

1242. R. Wilson, of Patricroft, Engineer. Improvements in hydraulic machinery.

1243. H. Newman, of Liverpool, Dentist. Improvements in the construction of artificial teeth, and in the mode or manner of affixing the same to the frame.

1245. R. V. Leach, of Taibach, Glamorgan, Tin Plate Manufacturer. Improvements in the manufacture of iron, and in the machinery connected therewith.

1246. D. Kirkaldy, of Glasgow, Engineer. Improvements in the manufacture or treatment of steel.

1247. J. H. Johnson, of Lincoln's-inn-fields. Improvements in the roasting or calcining of ores, applicable also to the oxidising of other substances. A communication from J. F. Persoz.

1248. W. Teasdel, of Great Yarmouth, Engineer. Improvements in coffer dams.

1250. J. P. Budd, of Ystalyfera, near Swansea. Improvements in the manufacture of tin and terne plates.

1251. W. C. Cambridge, of Bristol, Agricultural Implement Maker. Improvements in thrashing and winnowing machines.

Dated May 21, 1859.

1253. J. R. Scartliff, of Wolverhampton, Mechanic. Improvements in the construction of lubricating and other cans in order to regulate the discharge or flow of the liquids they contain.

1254. J. Thompson, of Witton, near Northwich, Cheshire, and J. Thompson, jun., of Northwich. The manufacture of salt by an improved and more economical mode.

1255. A. V. Newton, of Chancery-lane. An improved construction of cartridge. A communication from T. F. Henderson.

1256. W. P. Savage, of Roxham, Norfolk. Improvements in traction steam-engines and machinery for moving agricultural implements and machines.

1257. W. H. Perkin, of St. George-in-the-East, and M. Gray, of Bonhill, Dumbarton. Improvements in mordanting and dyeing fabrics of cotton and other vegetable fibres.

Dated May 23, 1859.

1261. J. Knowles, of Lower Broughton, near Manchester, Machinist. Certain improvements in power looms for weaving.

1263. W. Crum, of Thornliebank, Renfrew, Bleacher. Improvements in printing and dyeing textile fibres and fabrics.

1265. J. H. Mason, of Nottingham, Lace Manufacturer, and G. L. Baxter, of Nottingham, Dyer. Ornamenting lace or other twisted fabrics.

1267. J. L. Jullion, Paper Maker, of Aberdeen. Improvements in dressing and finishing textile fabrics.

1269. R. A. Brooman, of 166 Fleet-st., London, Editor of the MECHANICS' MAGAZINE, and Patent Agent. Improvements in axles, and in fitting wheels thereto. A communication from M. Masson.

1271. W. Clark, of Greenock, Marine Painter. Improvements in machinery or apparatus for propelling and manœuvring ships, vessels, and boats.

1273. A. Barclay, of Kilmarnock, Engineer. Improvements in steam hammers.

1275. A. V. Newton, of Chancery-lane. An improved construction of washing machine. A communication from D. Parker.

Dated May 24, 1859.

1277. G. Davies, of Serle-st., Lincoln's-inn. Atmospheric apparatus for the submarine transport of blocks of stone, and for raising sunken vessels. A communication from T. Bandier.

1279. G. D. Jones, of Clerkenwell, Engineer. Improvements in mills or machinery for grinding, reducing, and pulverizing.

1281. W. T. Denham, of Wilmington-sq., Trimming Manufacturer. Improvements in the manufacture of goffering machines.

1283. E. Page, of Bedford, Agricultural Implement Manufacturer. Improvements in horse drags or rakes.

1285. B. F. Greenough, of Boston, U.S. An electrical conductor for submarine telegraphs, which he denominates a hydro-electric conductor.

Dated May 25, 1859.

1287. J. Harmer, of St. James-st., Islington. Improvements in parts of dry gas-meters. Partly a communication from W. Sinderby.

1289. R. A. Glass, of Leadenhall-st., Submarine Telegraph Cable and Wire Rope Manufacturer. Improvements in submarine electric telegraph cables.

1291. A. Prince, of Trafalgar-sq. Improvements in the construction of ships and vessels. A communication from H. Hirsch.

1293. A. J. Davis, of George-st., Hanover-sq., Surgeon Dentist. Improvements in apparatus for protecting persons when employed in cleaning windows, painting, or working at the exterior of houses and ships' sides, and such like operations, applicable also for purposes of military and other observation.

1295. A. V. Newton, of Chancery-lane. Improved machinery applicable to the manufacture of rivets, bullets, and other like articles. A communication from C. B. Allen.

1297. C. E. Amos, of the Grove, Southwark, Engineer. Improved apparatus for raising vessels for repair, and for floating vessels in shallow water.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, June* 7, 1859.)

214. J. and W. H. Smith. Paper.
215. J. Savory. Bottles.
244. W. Ager. Cleaning rice.
245. T. Hartshorne. Metal.
246. E. Dixon and H. Whittaker. Weaving.
255. I. Zacheroni. Preventing smoke.
256. W. Robertson. Propelling boats.
259. P. Prince. Breech-loading gun.
272. T. P. Smith. Guiding the pen or pencil.
274. J. Raywood. Sewing machines.
276. J. Robertson. Motive force.
283. S. B. Everleigh. Hats.
297. E. Wilkins. Drain pipes and tiles.
301. S. Tearne. Ornamenting surfaces.
307. T. Storer. Funeral carriage.
330. W. Clark. Preserving grain, &c. A communication.
335. T. and B. C. Sykes. Separating oily and resinous substances from seeds, &c.
336. T. R. Ayerst. Fire-arms. A communication.
347. J. Wilson. Ventilating mines.
349. E. T. Hughes. Sorting threads. A communication.
359. T. S. Cressey. Casks.
431. W. E. Newton. Mowing machine. A communication.
499. J. Robinson. Spinning and doubling.
511. T. C. and G. J. Hinde. Coating iron.
556. W. E. Newton. Barometers. A communication.
702. J. Howden and A. Morton. Motive power.
896. T. Spencer. Treating refuse containing sulphur.
927. J. Apperly and W. Clissold. Fulling machine.
978. J. and H. S. Morton. Ash-pans.
998. J. Apperly and W. Clissold. Oiling wool.
1004. J. Davies. Ringing door bells.
1055. H. R. Fanshawe. Drawing-off liquids, &c.
1132. R. A. Brooman. Fire-arms, projectiles, wads, and cartridges. A communication.
1160. P. V. Hadlow. Stamp for marking linen.
1163. A. Morton. Weaving figured fabrics.
1171. J. Norman. Furnaces.
1172. R. Thomson. Shuttles.
1201. T. Vicars, sen., T. Vicars, jun., T. Ashmore, and J. Smith. Bread, biscuits, &c.
1216. W. Midworth. Iron for laundries.
1218. J. Clark. Envelopes and paper.
1226. A. E. C. J. Reynaud de Trets. Splitting rock.
1228. C. Law. Locks.
1249. G. R. Sampson. Propelling. A communication.
1265. J. H. Mason and G. L. Baxter. Ornamenting fabrics.
1273. A. Barclay. Steam hammers.
1289. R. A. Glass. Telegraph cables.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed June 2, 1859.

2556. D. Frodsham.
2774. J. B. and J. Fisher and J. Bird, jun.
2781. H. T. Yates.
2793. D. B. White.
2794. R. A. Brooman.
2808. J. Ferrabee and F. H. England.
2847. M. Schaffner.
2856. R. A. Brooman.
2858. J. Ferrabee.
2870. F. C. N. J. Viellard-Migeon.
2904. E. Weber.
2963. H. Lowe, W. Trueman, and J. L. Pitts.
59. W. E. Newton.
153. R. Garrett, jun., and J. Kerridge.
177. W. E. Newton.
463. S. Wheateroft.
654. B. Rider.
734. J. Macintosh and G. Rhodes.

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2797. J. E. Boyd.
2810. G. F. Chantrell.
2815. A. Lamb and W. A. Summers.
2819. R. L. Burrowes and J. Knowles, jun.
2820. J. Barrow, jun.
2822. J. Eccles.
2825. J. Elder.
2826. J. Stewart.
2827. T. Allen.
2829. H. Wilson.
2830. E. L. Pen-uetc.
2843. S. Dadgeon.
2869. H. Bridges.
13. W. Eccles.
104. C. N. May.
159. W. A. F. Powell.
647. T. Patstone.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1298. T. Wilson.
1314. G. J. Mackelcan.
1333. D. Morrison.
1363. C. W. Siemens.
1419. W. H. Barlow and W. H. Woodhouse.
1424. J. Davis.
1531. E. Rogers and H. Mackworth.

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ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement :—

STEAM ENGINES, &c., 2474, 2482.
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BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c., 2448, 2494, 2512.
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FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 2446, 2453, 2454, 2469, 2276, 2492, 2499, 2508.
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2442. R. C. SMITH. *A new or improved buoy or wreck intelligencer.* Dated November 2, 1858.

The patentee describes a buoy or wreck intelligencer constructed of a hollow sphere or other shaped vessel of copper or other material, which vessel may either separate in two parts or have an opening in the upper part, the opening being closed by a lid; the said buoy being surmounted by a reflecting sphere, or reflecting planes, or both, and so loaded that in floating that part of the buoy carrying the reflecting surfaces shall always be uppermost. *Patent completed.*

2443. J. LANCASTER. *A new or improved method of driving and curbing horses.* Dated November 2, 1858.

This consists of machinery fixed to the foot-board of carriages, &c., for holding the reins, and when pulled tight permanently keeping them so as required. *Patent abandoned.*

2444. M. L. J. LAVATER. *Improvements in cartridges for military and other purposes.* Dated Nov. 2, 1858.

Here the case of the cartridge is formed of vulcanized india-rubber, and is of a cylindrical form, closed at one end and open at the other. The closed end is made to a semi-circular, or other form, to fit the front part of the ball; and the mouth, or other end of the case, is contracted, or is of less diameter than the cylindrical portion of the case. In filling this case, its mouth is stretched over the end of a funnel so as to bring the opening to the same size as the interior of the cylinder, and the ball is then rammed in, and a wad rammed down over it; the measure of powder is then poured in on the top of the ball, or on the wad, and lastly, a plug of earthenware, wood, or metal is rammed in on the top of the powder, and when the mouth of the case is taken off the funnel it springs over the plug and holds it in its place; the cartridge is then hermetically sealed. In the top of this plug a hole is formed to receive the cap, which is thus held ready for use. In loading with this cartridge, the cap is first put on the nipple, the cartridge, as will be understood, serving as a handle for the cap during this operation; then by pinching the end of the cartridge the plug is forced out and the powder is poured into the barrel; lastly, the ball (or shot) is rammed down on to the powder together with the case, which serves as a wad. *Patent abandoned.*

2445. A. BARCLAY. *Certain improvements in electric and magnetic or electro-magnetic telegraphs applicable to submarine and land communication.* Dated Nov. 2, 1858.

This consists in laying conducting wires of different

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metals and of the same metal from both ends as poles of the galvanic batteries, so as to complete the circuit direct, and the said wires being made or not in one cable, but so insulated that the one cannot touch the other. It also consists in reversing the wires or poles of the batteries so as to give a reverse action to the current of electricity, and in the case of submarine telegraphs taking advantage of the sea to from part or whole of the batteries by making the conducting wires of different metals. And in the case of the present Atlantic cable, making use of the present outside covering wires as one of the said conducting wires or generating battery, and making use of positive and negative coils to strengthen the current of electricity on said wires. *Patent abandoned.*

2446. D. D. KYLE. *Improvements in boots and shoes.* Dated November 2, 1858.

This consists in adjusting boots to the instep by screws attached to, or inserted in the heels or soles, which screws are connected with the uppers or sides of the boots or shoes by thongs, straps, or wires, passing over or through pins, pulleys, or grooves in the heels or soles, thus communicating a tightening or loosening action or effect when the screws or apparatus are actuated or adjusted. *Patent abandoned.*

2447. J. SAMPSON, J. MACHON, and J. BARTHOLOMEW. *Improvements in railway carriage brakes.* Dated Nov. 2, 1858.

This consists in placing beneath the end of every carriage a horizontal steam cylinder with outlet at its upper end. This outlet communicates with a pipe running the entire length of the carriages, the connecting pipes between each carriage being made of any known elastic or pliable material. The piston rod is jointed to a connecting link which is also jointed to the end of a bell crank lever; this lever actuates the brake blocks. To put the brakes in action, the steam has to be turned on, when it will enter all the cylinders about the same time, driving the pistons back, by which means the brakes are applied to every carriage simultaneously. The train having come to a stand still, the guard can then blow off the steam by a cock at the outlet pipe, and allow the carriages to take a backward motion if necessary. *Patent abandoned.*

2448. A. MC DOUGALL. *Improvements in the construction of reservoirs, tanks, culverts, sea-walls, and other erections required to exclude water or damp.* Dated November 2, 1858.

This consists in the use of bricks or blocks made by combining asphalte or other bituminous matter with sand, gravel, or other grit. *Patent abandoned.*

2449. N. S. DODGE. *Improvements in treating waste vulcanised india-rubber.* A communication. Dated November 2, 1858.

This chiefly consists in restoring waste vulcanised india-rubber by submitting it to the action of heat, steam, or water; and in combining fibrous materials with such waste rubber. *Patent completed.*

2450. S. BOTTOMLEY. *Improvements in the manufacture of morcens and other fabrics of a similar character.* Dated November 3, 1858.

This consists in the use of weft composed of hemp, flax, linen, &c., in the manufacture of morcens. Also in the use of weft composed partly of wool and partly of hemp, flax, linen, &c. Also in the use of linen, flax, or hemp as weft threads in conjunction with worsted warp in the production of other fabrics wherein worsted wefts have hitherto been used. *Patent completed.*

2451. C. F. O. GLASSFORD. *Improvements in the manufacture of manure from the excreta of towns.* Dated Nov. 3, 1858.

This consists in applying sulphuric acid to neutralise the ammonial constituents of the collected excrementitious matters of towns, and in afterwards evaporating, pressing, and mixing, as may be required, the several products in any desired proportions to obtain different qualities of the same. *Patent abandoned.*

2452. H. TERTIAN-MORET. *The application of a mineral named Deterso, as a disinfecting, preserving, absorbing and curative power.* Dated Nov. 3, 1858.

The mode of preparing this powder is by placing it in a rather fierce furnace for a certain time, when it can be easily crushed into powder, after which it is passed through a fine sieve and is fit for use. *Patent abandoned.*

2453. V. BLUMBERG. *Improvements in the construction of slate billiard-tables, which improvements are also applicable for other useful purposes.* Dated Nov. 3, 1858.

The object here is to coat or veneer wood with slate so as to render the combination of slate and wood applicable for various purposes. The invention is primarily applied to billiard tables. *Patent completed.*

2454. J. TALL. *Improvements in brushes or brooms for sweeping floors, carpets, and other similar articles.* Dated Nov. 3, 1858.

This consists of a cylindrical brush, the shaft of which is connected by a band or by toothed gear with the action of a rolling cylinder, or pair of wheels, or rollers placed at its rear; a chamber with an opening in it is placed so that the opening is towards the brush; a pan or drawer is placed within this chamber, and the whole enclosed in a light cover leaving the bottom open; when urged forward by the handle the motion of the rollers is communicated to the brush. No dust, when using this brush, can fly about the room. *Patent abandoned.*

3455. D. FRYER, T. L. C. WATT, and W. HOLMES. *Improvements in tanning hides and skins.* Dated Nov. 3, 1858.

The patentees employ round upright tanks capable of bearing a pressure of from 10 pounds up to 120 pounds to the inch. These tanks are fitted internally with laths or hoops, upon which each skin is separately attached at its full length. A hydraulic pump is used for forcing the liquor into the tanks. The fitting with the skins should be moved about four times a day for the first three days; at the end of that time twice a day, and at the end of the fifth day once, when the tanning will be completed. *Patent completed.*

2456. P. A. MAWDSLEY. *Improved machinery or apparatus for drying yarns after being sized or stiffened, and the use or application of a certain substance or substances in the sizing, stiffening, or otherwise preparing yarns and woven fabrics, or either of them.* Dated Nov. 3, 1858.

This consists in furnishing one or more of the drying cylinders with projecting rods, bars, or blades of wood, iron, &c., placed longitudinally on the circumference of the cylinder, to prevent the yarn from coming in contact with such cylinder. Also in the use of alkaline aluminates, such as the aluminate of soda and the aluminate of potash for sizing, stiffening, or otherwise preparing yarns or woven fabrics. *Patent completed.*

2457. P. A. MAWDSLEY. *The use or application of a certain substance or substances in the manufacture, stiffening, or sizing of paper.* Dated Nov. 3, 1858.

This consists in employing for the sizeing of paper alkaline substances such as the aluminate of potash and the aluminate of soda, either separately or mixed with other preparations. *Patent completed.*

2458. J. FOWLER, jun., R. BURTON, and D. GRFIO. *Improvements in applying motive power to actuate ploughs and other agricultural implements.* Dated November 3, 1858.

This invention was described at page 321, No. 20 of the MECHANICS' MAGAZINE. (New Series.) *Patent completed*

2459. F. B. BUSSE. *Improvements in breech-loading fire-arms.* (A communication.) Dated Nov. 3, 1858.

The barrel of the arm is pivoted to the stock with a screw or bolt, which passes through a slot in a loop projecting from the under side of the barrel; this slot allows the barrel a slight longitudinal movement, at the same time that it oscillates a short distance vertically around the bolt. The breech-piece has a hole in its centre, and through this hole passes a pin by which the percussion cap in the cartridge is exploded. Attached to the breech-piece is a hollow conical thimble, which fits into a recess in the lower end of the barrel. When the barrel is in position for firing, this thimble is forced into the recess, the inner edge of which is turned down, so as to form a thin ring or cylinder that may expand against the thinner surface of the thimble by the force of the explosion, thus forming a tight joint and preventing the escape of gas. In the upper part of a tumbler, which is mounted on the hammer spindle, is a notch, which receives a pivot attached to the pin or needle bar; this bar, with the pin or needle, slides in a hollow guide bar, which is attached at one end to the breech-piece, and is slit lengthwise to accommodate the end of the tumbler. The rear end of the needle bar has also a slit in it, to accommodate the end of the tumbler, and a pivot passes through the needle bar across the slit, and fits in the notch in the tumbler. Thus, as the tumbler is thrown forward by the main spring when the trigger is pulled, it drives the needle bar in its guide bar in a line coincident with the axis of the barrel. The arrangement by which the rear end of the barrel is raised for loading, and by which it is returned to its place and there secured, and by which the gun is cocked is as follows:—The trigger guard is pivoted on the under side of the gun, and serves as a lever, and is moved laterally on its pivot. To the end of this lever is attached a pin, which passes up through the stock beneath the barrel, and secures at its end a disc or head. On the upper end of this disc rises an excentric cam, and near to it is a pivot, which stands up in the slot of the flat bar which slides in a recess in the stock beneath the barrel. The rear end of this bar passes through an opening in the breech-piece, and is bent up at right angles. When the lever or trigger guard is swung forwards, the disc is turned round, and the pivot forces back the flat bar, the bent portion of which presses against the front edge of the hammer tumbler, thereby forcing it back against the resistance of the main spring, and cocking the gun. As the movement of the lever or trigger guard is continued a little farther, a cam strikes against the corner of the notch of the barrel, and thus forces the barrel forward off from the thimble. When thus pushed forward, the weight of the muzzle overbalances that of the breech, and throws the barrel into the position ready for loading. When the cartridge has been inserted in the rear end of the barrel, and the trigger guard is brought into its place, the outer end of the flat bar strikes against a projection on the loop, and raises the muzzle of the barrel, and brings the breech down into the stock. When the trigger guard or lever is closed up to the stock, it is held in place by a stop attached to the stock, which fits into a notch near the end of the lever, and then the gun is ready for firing. Although the needle is intended to explode the cartridge by striking a percussion cap which is inserted into the conical ball of the cartridge, it is important to provide further means of explosion by the addition of a common nipple. This nipple may be used to advantage in the following instances:—1st, if the cap of the cartridge should miss it would be a loss of time to take the cartridge out again, a cap may be set on the nipple and the gun fired. 2nd, in cases of want of prepared ammunition with caps inserted in the balls, round balls and common ammunition may be used. 3rd, if any injury to the pin system should ever occur, the gun by the provision of the nipple will still be a useful gun. *Patent abandoned.*

2460. E. FIELDING. *An improved means of preserving the form of cops of yarn by the application of adhesive substances.* Dated November 4, 1858.

This consists in applying an adhesive substance to the lace spindle on which the yarn is wound, or in winding 3 or 4 layers of yarn on the bare spindle as usual, and then applying the adhesive substance which may be done by hand, or by self-acting machinery, while the spindles are revolving, and the machine continues its work until the cops are built. By the time the cops are complete the adhesive substance has become hard, thereby uniting the inner layers of yarn, forming the bottoms of the cops, the forms of which are thus preserved when the cops are doffed, and when putting them on to the skewers of the winding or doubling frame, or of the shuttles from which they are unwound with less waste than heretofore. *Patent completed.*

2461. J. OXLEY. *Improvements in carriages and wheel vehicles.* Dated Nov. 4, 1858.

This consists, 1, in constructing a two-wheeled carriage so that it may be used as a close or open carriage. 2. In introducing an elastic material between the shackles and other bearing, su-pending, and pulling parts of carriages between the body and under carriage of wheel vehicles. 3. In substituting for the ordinary kind of apparatus used for turning four-wheel carriages, a mechanical contrivance by which a vehicle may more easily than heretofore be turned in a much shorter space, whilst a greater angle may at the same time be made in less distance during the forward motion of a carriage allowing the centre or turning point to be brought much nearer to the hinder wheels than heretofore. *Patent completed.*

2462. C. F. VASSEROT. *Improved driving machinery applicable for thrashing grain and other agricultural purposes.* (A communication.) Dated Nov. 4, 1858.

This consists, 1, of a foundation plate of cast iron fixed upon a wooden frame 2. Of a large toothed wheel, the teeth of which are on its inner periphery Upon the wheel are fixed the shaft or poles by which the power is applied. 3. Of a pinion gearing with the main wheel above named. This pinion is cast of one piece with a toothed wheel to which it gives motion. This toothed wheel gears with a pinion placed upon a vertical axle passing through the centre of the foundation plate. A bevel wheel is placed at the lower end of the vertical axle, which gears with a pinion fixed upon a horizontal shaft, upon which is a rigger connected by an endless band to a small pulley placed upon the shaft of the thrashing cylinder or other machinery to be driven. *Patent abandoned.*

2463. G. P. EVELYN. *The improvement of the form of the stocks of rifles, carabines, and other fire-arms.* Dated Nov. 4, 1858.

Here, several advantages are attained by the peculiar form given to the but of the gun stock. The sole of this, when in position for taking aim, lies obliquely in respect to the man's shoulder, the toe passing underneath his armpit. It is called the "Under arm gun stock." *Patent completed.*

2464. J. R. NAPIER. *Improvements in obtaining motive power by means of heat.* Dated November 4, 1858.

This consists in the heating of the steam or other vapour or gas after it has been generated by subjecting it to the heating action of pipes through which currents of hot liquid circulate. *Patent abandoned.*

2465. C. MATHER. *Improvements in drying yarns while in the hank.* Dated Nov. 4, 1858.

Here hanks of yarn are made up into an endless chain, the hanks being attached end to end which, is done by using short rods of wood. The rods are held parallel to each other, and are attached at their ends in pairs by straps or loops, and in this form they are passed continuously through a stone, or over drying cylinders, &c. *Patent abandoned.*

2466. W. T. MARLEY. *Improvements in printing and dyeing woven fabrics.* (A communication.) Dated Nov. 4, 1858.

This relates to the "dunging" process, and consists in combining with the chemicals ordinarily used brewers' wort, or other saccharine matter; or an extract of Iceland moss, gum or other mucilaginous substance is employed. *Patent abandoned.*

2467. R. A. BROOMAN. *Improvements in treating air and gases, and the employment of the same for obtaining motive power.* (A communication.) Dated November 4, 1858.

The object here is to lessen the diameter of the pump of caloric engines by treating the air and other gas or gases so that its volume will be greatly increased when in contact with heated surfaces, over the same quantity when worked in its normal condition. The invention consists, 1, in saturating air or gas with water to its full capacity of retaining the fluid in a separate condition, previous to it contact with the heated surfaces. 2. In regulating the force developed by the admixture of dry air between the moistening apparatus and the air pump. 3. In constructing the heated surfaces in the form of a hollow ribbon concentrically coiled. 4. In overcoming the resistance arising from the lap of the valve employed in the pump by lever and cam motions. *Patent completed.*

2468. I. BAGGS. *Improvements in telegraphing by electricity.* Dated Nov. 4, 1858.

This consists in the use of a fixed microscope, telescope, or other optical power or instrument, in combination with an instrument or apparatus for indicating currents or effects produced in telegraphing by electricity; whether a needle instrument or an instrument in which movements are capable of being produced or exerted by electricity however obtained or applied, and whether the electricity be frictional, voltaic, or otherwise. The patentee prefers to use the chemical agency of electricity as acting upon particles of matter and not upon masses, and being thereby practically independent of the opposing forces of inertia and friction. The invention also consists in the generation of gas by electricity as aforesaid for telegraph purposes, under a vacuum or partial vacuum, with or without the application of the microscope, whereby the bubbles of gas are made to expand to two or three hundred times their ordinary size, and the indications are thus made more distinct. The invention further consists in the application of photography, conducted by any suitable means whatever, to impress upon paper, glass, or other material the required telegraphic communications. *Patent abandoned.*

2469. A. FRIEDMANN. *An improvement in bracelets, necklets, and rings.* Dated Nov. 4, 1858.

This consists of means of fastening and fixing the above mentioned articles on the wearer at the desired degree of tightness. The strap is first run through a slide or clip (one or more), from the centre of which there rises a threaded pin. A button or stud screws down upon the threaded pin and fixes the strap. *Patent abandoned.*

2470. W. H. TOOTH. *Improvements in the manufacture and construction of fire or furnace bars.* Dated Nov. 5, 1858.

The invehtor forms two or more longitudinal pieces similar in shape to an ordinary fire or furnace bar, and arranges them at suitable distances apart, having between them a number of cross pieces, so as to form a series of

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air spaces. The whole is cast in one piece, and when finished the upper surface of the bar resembles a grating. *Patent abandoned.*

2471. T. TILL. *Improvements in machinery for making nails, and for other analogous purposes where metal is compressed by dies or stamps.* Dated Nov. 5, 1858.

This consists in constructing a machine so that a cam upon, or a crank in, a driving shaft, acting in its revolution upon a bar, moves or slides it lengthwise to and fro, and thus causes two headers placed one in each end of the bar to work alternately in making the heads to nails, &c., by compression, and so that a similar device upon the same shaft acting upon a series of levers connected to the movable holding and pointing die, the other being stationary, holds and points the nail just before the action of the heading die. The material may also be fed in by a third similar crank or cam motion on the said shaft, so that enough of the end for the head or part to be compressed is projected the proper distance beyond the holding dies at the right time for the header. *Patent completed.*

2472. T. B. SMITH. *Preparing wood so as to be used as a substitute for curled hair in the manufacture of mattresses, and in the other purposes to which curled air and its substitutes are applied.* Dated Nov. 5, 1858.

This consists in cutting hickory, poplar, cedar and other wood into thin elastic shavings, and dividing the shavings longitudinally, and coiling them so as to form compound shavings, and subjecting the same to the action of steam. *Patent completed.*

2473. C. J. TJADER. *Improvements in gun carriages, and in apparatus for lessening recoil.* Dated November 5, 1858.

Here the trunnions of the gun are placed in cast iron blocks running in grooves. Before and behind each trunnion a conical spring receives its respective portion of the recoil or counter recoil. The springs are compressed against the upright ends of the frame. Before and behind the carriage pivot a spring receives the secondary recoil and counter recoil. An arrangement of screws acting one within the other is used for the elevation of the gun, which runs upon a wheel at the top of the innermost of the screws. The inventor proposes also to place springs at the parts of a ships side where the breeching tackle of the gun is usually fastened. *Patent abandoned.*

2474. E. ROWLAND and J. DEWHURST. *Certain improvements in steam engines, and in the valves connected therewith, which said improvements in valves are also applicable to safety valves.* Dated Nov. 5, 1858.

Here the piston of a steam engine consists of a hollow ram oscillating upon a hollow bearing at a point situated about the middle of its length, and each end of this double piston works in a cylinder, both cylinders being furnished with a steam-tight packing through which the piston works. The extreme ends of each cylinder are connected to a crank upon the shaft to be driven. The hollow shaft or bearing upon which the piston oscillates may either be made to form a valve itself, or be furnished with a disc valve, so that the oscillating motion of the hollow piston shall open and close the slide valve. The steam is exhausted after each stroke from the side opposite to the supply pipe. In the improved throttle valve the valve is mounted loosely upon a central vertical spindle, the top of which is connected to the governor of the engine, and is also secured to a receiver which rises and falls in a tank of mercury, a second and similar arrangement being placed beneath the valve, so that the whole weight of the valve and its spindle and receiver may float upon the mercury and form an equilibrium valve. The lower end of the central spindle projects beyond the case of the apparatus, so that when the engine exceeds a given speed, the action of the governor will force the spindle down and cause it to press against a lever and open a valve to allow the steam to escape. The diminishing valve is similar in principle, but only one receiver and tank is required, and the valve remains open whilst the steam continues at a given pressure, but is partially or quite closed when such pressure is exceeded. The safety valve is also constructed so as to balance the weight of the valve, and is supported or floated upon mercury. Should this valve be fixed in its seating, the steam will force the mercury out of the tank and effect its escape. *Patent abandoned.*

2475. D. MCCLURE. *An improvement in the machinery used for the drying of yarn, thread, cloth, or other wet fabrics.* Dated Nov. 5, 1858.

The inventor places bars of wood, &c., longitudinally over the heated cylinders, sufficiently near to each other to prevent the yarn, &c., when extended from bar to bar from touching the cylinder. *Patent abandoned.*

2476. C. MILLS. *Improvements in the action of pianofortes.* Dated Nov. 5, 1858.

Here the hopper is constructed as follows:—The fly is hinged at its lower end to a block fixed to a key, and there is fixed to the lower end of the fly a projection which descends below the upper surface of the block. The fly is constantly pressed back by a spring, and is stopped by the projection at the lower end thereof coming against a button or surface covered with felt, &c., carried by the block, and this button is adjusted by a screw passed through the block. The fly is therefore stopped below its hinge, by which the action is improved. *Patent abandoned.*

2477. L. S. KORF and F. C. PHILIPTSON. *Improvements in machinery for boring holes in rocks and minerals, for blasting and other similar purposes.* Dated Nov. 5, 1858.

Here a beam is placed in an inclined position, and upon this beam a block is mounted capable of sliding from end to end of the beam. Attached to this block is a cylinder to which steam or compressed air is admitted, and which gives motion to a piston in the cylinder. At each motion of the piston its rod strikes an instrument that is placed below it, and which carries a cutting tool, and the end of the tool is thus caused to penetrate the rock, &c. Between each stroke the tool-holder is lifted by springs, and is turned partly round by a ratchet apparatus actuated by the piston. *Patent completed.*

2478. S. DAVEY. *Improvements in blasting powder.* Dated November 5, 1858.

This consists, 1, in the use of flour, bran, starch, or other glutinous matter to replace a part of the charcoal now employed in the manufacture of powder. 2. In a new mode of graining the same. *Patent completed.*

2479. R. E. PINHEY, and J. WOOD. *Improvements in apparatus for ascertaining the variation of ship's compasses for local errors.* Dated Nov. 5, 1858.

Here the bowl containing the compass card and needle is arranged to fit into a ring of wood-mounted gimbles. This ring has jointed to it an instrument on the principle of a sun dial. This instrument is of the form of a cross, and the joint connecting it with the ring is at its lower end. A time scale is graduated on the two sides of the stem of the cross, and also on the upper side of the two arms, and the shadow is cast by one or other of the extremities of the two arms, or by the upper end of the stem, according to the time of day at which the observation is made. This instrument is set by elevating the stem of the cross to an angle corresponding with the complement of the latitude of the place by a scale marked on the joint connecting the stem of the cross with the ring, and by then turning the ringround until the shadow falls on to the scale, so as to mark the local time of the place (as indicated by a watch); when this is done the stem of the cross points along the meridian of the place, and a line formed on the ring in the same direction (called the meridian line) then corresponds in direction with this meridian, and the angle between it and the line forming the north and south points of the compass is the variation and local error of the compass. *Patent completed.*

2480. J. DE SAXE. *An improved folding joint for parasols.* Dated November 5, 1858.

By means of this invention the handle may be straightened or folded, and also locked or unlocked, by using one hand only. Two open metal cylinders are hinged together, the knuckle allowing them to fold over parallel to each other. One of the cylinders has a strip of metal fixed across the jointed end within it, and flush with the joint, and such strip (which the inventor calls the "catch") forms a projection which fits into the cut in the bolt or latch. The other cylinder contains a solid metal bolt, which fits it easy, and when the projecting pin is pressed to the right or to the left about a third of one revolution of the bolt it turns freely. The top of the bolt is bevilled off so as to form the latch, and to permit it to pass freely into the other cylinder. The bolt or latch has a slot cut in it on a level with the joint of the cylinder containing the bolt, and such slot is cut wide enough to admit and grip or embrace the catch in the other cylinder. A slot about one-third in length of the circumference of the cylinder is cut across the cylinder which contains the bolt, to admit the pin to pass freely through it, and into the bolt or latch into which it is fastened. The pin projects a little beyond the circumference of the cylinder, and may have either a plain head or knob, or any ornamental finish. By pressing the projecting pin to the right or to the bolt or latch turns it on its axis, and its slot slides over the catch, which it thus either locks or unlocks. *Patent abandoned.*

2481. H. N. PENRICE. *Improvements in machinery for tunnelling and driving galleries through rock and other strata.* Dated November 5, 1858.

This machinery is adapted for cutting a cylindrical gallery or tunnel, and it is furnished with a cutter holder or head which carries a number of steel points or chisels on radial arms, and is attached to the piston or plunger of a steam or other engine. There are several modifications included. *Patent completed.*

2482. A. FRYER. *An improved method of supplying the tenders of locomotive engines, and of supplying boilers with water.* Dated November 6, 1858.

This consists in the use of the steam generated in the boiler to be supplied, or the tender of which is to be supplied, or in a separate boiler, to act through suitable pipes or passages upon a float, or upon a piston placed in a tank or cylinder, which, by preference, is fitted under ground, so as to depress the float, and drive water previously contained in the tank up a tube, and through a conducting pipe into the tender or tank, in the case of locomotive engines, or into the boiler or reserveir for other engines. *Patent completed.*

2483. B. W. JONAS and R. JONES. *An improved ship's block.* Dated November 6, 1858.

This consists of an outer sheave or block furnished with a channel, in which two or more pulley wheels are so arranged as to admit of the rope or cable, impinging upon the peripheries, so as to increase or diminish the space between the same, through the medium of a concentric slot-bearing in which one of the less wheels revolves, the large or fixed wheel moving from a common centre as heretofore. *Patent abandoned.*

2484. W. GREEN. *An improved harness trace coupling.* (A communication.) Dated November 6, 1858.

Here a tubular socket or case is fitted on to each end of the whiffle tree or bar to which the traces are secured. This socket or case is closed at its outer end, with the exception of an oblong slot which is made through it, and which receives a correspondingly-shaped button carried on a plate fastened permanently to the end of the trace. This button projects sufficiently far from the inner side of the plate to enable such projecting portion to be introduced through the slot in the end of the tubular socket or case on the whiffle tree. The button having been introduced is turned round so as to effectually lock it inside the case. Small safety grooves are made crosswise or at right angles to the oblong opening in the inner side of the bottom of the case, in which slots the button is retained by the pressure of a helical spring inside the case acting upon an india-rubber plug, which bears upon the inner end of the button, and holds it in its place in the safety grooves, and obviates all chance of the button becoming accidentally turned and disengaged from its socket. *Patent abandoned.*

2485. J. CLIFF. *Improvements in the construction of kilns for burning stoneware, red-clay ware, porcelain, or all other kinds of earthenware.* Dated Nov. 6, 1858.

Within the lining proper of the kiln is built a second lining at a short distance from the former, which lining reaches up to a level with the commencement of the dome, leaving a circular opening at this height entirely round the inner lining. The bottom, which is hollow and communicates with the fire, has holes left in it at proper distances, and over each of these orifices is erected a column of hollow pillars of various lengths (to suit various sized articles), having collars of greater diameter (also with holes) placed upon and between each. These columns rise to the same height as the inner lining. Upon the ledges of the collars (thus left protruding) rest quarries of various shapes, according to the arrangement of the pillars, which quarries thus form so many floors or cupboards for setting the ware in. The top tier is permanently left entire (the hollow pillars finishing above its surface) and are also jointed, thus leaving the body of the kiln free from draughts through it. *Patent completed.*

2486. B. D. WEBSTER and J. HORSFALL. *An improvement in the manufacture of steel wire.* Dated November 6, 1858.

After the steel wire has been hardened in the usual manner, the patentees plunge it into a bath of fused metals. Every one hundred parts by weight of the said bath consists of forty parts by weight of lead, twelve parts by weight of zinc, twenty-six parts by weight of antimony, twenty-one parts by weight of tin, and one part by weight of bismuth. They allow the hardened steel to remain immersed in the bath until it has assumed the temperature of the bath. When it has been immersed sufficiently long it is withdrawn and immediately sprinkled with cold water. *Patent completed.*

2487. W. ZIERVOGEL. *Improvements in apparatus for distilling products from bituminous coal, schist, peat, and other like substances.* Dated November 6, 1858.

Here a series of upright retorts are used which are supplied at their upper ends with the coal, &c., and which discharge the coke, &c., at their lower ends. These retorts are set in an enclosed chamber heated by a suitable furnace. The products of combustion circulate around the lower parts of the retorts, thence into the upper part of the chamber, and away into the chimney. Above the chamber in which the retorts are set is another chamber into which the coal, &c., is fed by aid of feeders, which are closed and opened so as to prevent the escape of the distilled products or vapours. It is preferred that the lower part of each retort should be made of, or protected by, fireclay; the upper part of cast iron. On the inside of each retort is a tubular screw which is caused to rotate slowly therein. These tubular screws are perforated to allow the evolved products to pass into the interior, from whence they are conducted by branch pipes to a main pipe, thence by an exhausting apparatus to a condensor. There are also branch pipes leading from the upper closed chamber to the same main pipe. *Patent completed.*

2488. M. MATLEY, H. MILLER, and T. HALL. *Improvements in the construction and arrangement of steam boilers and furnaces for the purpose of consuming smoke, economizing fuel, and heating the feed water, and also improvements in certain valves connected with steam boilers.* Dated Nov. 6, 1858.

This relates, 1, to boilers and furnaces, and consists in connecting the flues in the boiler together at the end opposite the fires by a connecting flue, so that the smoke of the "green" fire may travel the length of both flues, and then pass over the bright fire. The furnaces are to be fired up alternately, and the draught reversed by dampers opened and closed by rods and levers actuated by the opening and closing of the fire doors. It relates, 2, to heating the feed-water, which is effected by pipes between the end of the boiler and the door frame; the water passes through these pipes, which become heated, and thus impart heat to the water before it passes to the boiler. It relates, 3, to the diminishing valve, and consists of a receiver closed at the top, which is furnished with orifices through which the steam escapes, and is supplied to the box in which the whole is enclosed. These orifices are covered by a sliding cylindrical cover (also closed at the top) fitting over the receiver, and connected at the top to a weighted lever. When the steam in the box and pipes connected thereto is below the pressure required (which pressure is regulated by the lever and weight) the weight is enabled to lift the cover, and thereby allows the steam from the boiler to escape through the orifice and supply the chamber, until the pressure required in the chamber and pipes is obtained, when the steam pressing upon the top of the cap will lift the weight and close the steam orifices until the pressure again becomes too low. It relates, 4, to the syphon valve, and consists of a vessel into which the water of condensation falls, and which is furnished with a valve at its lowest point. The apparatus is so constructed that when a sufficient quantity of water has accumulated to overcome an adjustable lever and weight, the vessel will sink, and thereby cause the opening of the valve, and discharge the water to any amount which may be regulated by the lever and weight. *Patent abandoned.*

2489. J. JACKSON, A. FISHER, and J. J. HARNEY. *Improvements in the manufacture of strips or bands of steel, and in the machinery or apparatus to be employed therein.* Dated Nov. 6, 1858.

This consists, 1, in rolling the steel to the required thinness when in a heated state. 2, in dividing steel into strips by a machine consisting of a slotted bed and a moveable jaw provided with projecting punches. The moveable jaw works in a slide, or in vertical grooves to ensure its accuracy in working, and the punches fit into corresponding slots made in the stationary bed. 3, in hardening and tempering steel by the use of furnaces constructed and heated so as to prevent the steel strips from being overheated. The invention is not fully described apart from the drawings. *Patent completed.*

2490. J. PLATT. *Improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous materials.* Dated November 6, 1858.

This relates to the mule or similar machine, and consists in a method of putting up the carriage, or putting up the spindles, when the arrangement renders the carriage sta-

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tionary. The invention is not described apart from the drawings. *Patent completed.*

2491. J. RICHMOND, J. QUICK, Jun., and A. FRASER. *Construction of a meter for measuring water, spirits, or any other fluids.* Dated November 8, 1858.

The patentees claim the application of a plunger or plungers or ram or rams, working in a cylinder or cylinders for the purpose of measuring water, spirits, &c.; also the application of a hollow disc as described for the purpose of passing the same alternately to either end of the cylinder or cylinders or for any other hydraulic purposes, but more especially in connection with water meters of any description. *Patent completed.*

2492. M. OSBORNE. *A new or improved method of ornamenting fenders, stoves, grates, tables, chairs, and couches made of cast-iron.* Dated November 8, 1858.

This consists in ornamenting the said articles when made of cast-iron by ornaments made of glass or china or other vitreous or semi-vitreous material attached to the articles by nuts and screws, cement, fused metal, or otherwise. *Patent abandoned.*

2493. E. ALCAN. *An improved method of treating or preparing materials to be manufactured into paper, applicable to lie-washings in general.* (A communication.) Dated November 8, 1858.

This consists, 1, in the use of a vacuum in the process of opening out the vegetable materials employed in the manufacture of paper, by placing the materials in a vessel in which a vacuum is formed, and connecting the said vessel with another vessel containing the eye or opening-out liquid, which liquid is exposed to the pressure of the atmosphere or of steam. 2. In the use of the same method n the eye washing of yarn and of woven fabrics in their manufacture, and in the washing of linen for domestic use. *Patent completed.*

2494. A. H. DENDY. *Improvements in the construction of breakwaters or wave screens, applicable also in constructing bridges, roadways, piers, jetties, landing stages, and other structures.* Dated November 8, 1858.

This consists in constructing breakwaters of a series of open tubes of a length considerably exceeding their diameter, or the height and breadth of their waterway, disposed in layers, and laid horizontally, and placed in such a position that they shall present a very inconsiderable facial re-istance to the direct action of the waves, as compared with the mass of the structure, and at the same time shall counteract to any desired extent as well the undulatory or oscillatory motion of the waves, as also their breaking or peruussive force, by causing them to pass through such tubes. *Patent completed.*

2495. J. WARDILL. *Improvements in purchases for the raising and lowering of weights by means of chains, especially applicable to ships' capstans and windlasses.* Dated November 8, 1858.

This invention was described and illustrated at page 316, No. 20, of the MECHANICS' MAGAZINE (New Series). *Patent completed.*

2496. T. MAC SWENEY. *Improvements in steering apparatus.* Dated November 8, 1858.

This consists in transmitting motion to the rudders of ships through cones, or conical friction rollers made to act upon and drive a disc or discs, or ring or rings, the surfaces of which are bevelled, or made conical at those parts where the rollers are to travel, and which are connected to the rudder head, the conical rollers being themselves set in motion by a shaft or spindle, on which the steering wheel is keyed, or otherwise fixed. *Patent completed.*

2497. W. HALE. *Improvements in rockets.* Dated November 8, 1858.

This consists in dispensing with the cast-iron plug at the after part, and instead of placing the tangential apertures at one end, arranging them in a plane as near as possible to the centre of gravity of the rocket, between the bored part of the composition and that part towards the head which is left solid, this being in the position of about the centre of gravity of the rocket; and, to give greater stability to the case, the inventor rivets in a cast iron piece, in which the tangential apertures are formed, whereby the burning of the solid composition supplies the tangential apertures for giving rotating motion about the rocket's axis on the side of the cast-iron piece, while on the other side the bored part of the composition is devoted only to giving the onward motion. By this arrangement, the rotation will be effected perfectly without any irregularity, and at the same time greater strength will be given to the case of the rocket. *Patent completed.*

2498. W. SMITH. *Improvements in apparatus for supporting the hauling-ropes when hauling ploughs and other agricultural implements by steam power.* Dated November 8, 1858.

The patentee employs pulleys placed at intervals, and these pulleys he mounts on frames so constructed as to be capable of being put together on the ground and of being taken to pieces. Each frame consists of two short planks or base-plates, having sockets formed in them to receive moveable standards, through the upper ends of which standards (having a head at one end and a screw-nut at the other) passes so as to connect the standards; and, between the two a pulley is mounted on the bolt, which serves as an axis for the pulleys, and is sufficiently long to allow it to traverse a distance so as to adjust its position to that of the rope. *Patent completed.*

2499. T. B. MARSHALL. *Improvements in drums.* Dated November 8, 1858.

This consists in combining with musical drums an apparatus by which they may be tuned at a single operation. In place of adopting the common method of drawing the cords tight, the inventor does this by interposing at one end of the drum between the hoop on which the skin is stretched, and the hoop to which the cords are attached another hoop, having inclines formed on its edge, which rest on similar inclines on the edge of the hoop above. By turning this additional hoop partly round, the hoop above it to which the cords are attached is forced further from the corresponding hoop at the other end of the drum, thus increasing the tension of the cords, and forcing the two skin towards each other. To turn the additional hoop rack teeth are formed on it, and a pinion which receives motion by hand takes into the se teeth. There are modifications included. *Patent abandoned.*

2500. W. C. CAMBRIDGE. *An improved manufacture of tubular iron applicable to the construction of whippletrees and to other uses.* Dated November 8, 1858.

This relates to an iron bar or rod having the property of the tube and the solid bar combined, whereby great strength with lightness is obtained. The inventor forms a tube of any given diameter, and causes to project radically therefrom a rib or flange for the whole or any portion of the length of the tube. This flange may be pierced with bolt holes to permit of hooks, &c., being secured thereto when the tubular bar is used as a whippletree. *Patent abandoned.*

2501. J. F. AMBLET and A. POLART. *Improvements in the manufacture of elastic fabrics.* Dated Nov. 8, 1858.

This relates to elastic fabrics for boots, shoes, gaiters, corsets, &c. The fabric is produced by introducing during the process of weaving threads of caoutchoue in the direction of the warp, the batten and reed being so formed as to receive these elastic threads, which are carried by a set of bobbins, arranged either above or below the fibrous warp threads, and are woven in therewith by the shoots of weft threads. *Patent abandoned.*

2502. E. E. ALLEN. *Inproved machinery or apparatuses for working the propellers of vessels.* Dated Nov. 9, 1858.

This consists in particular modes of arranging horizontal double cylinders for working the screw propellers of vessels. We cannot give space for the details of the invention, which are voluminous. *Patent completed.*

2503. J. S. DAWES. *A new or improved machine to be used for cultivating land, and which may be made applicable as a hoe, a skim, a turf or peat cutter; and a new or improved method of actuating the said machine and other machines used for like operations.* Dated Nov. 9, 1858.

This consists of a series of teeth, tines, forks, prongs, cutting blades, or diggers, supported upon frames, the said frames being carried by cranked axles, by the motion of which as the machine is drawn over the land, the said teeth, &c., are made to enter and rise again from the land in a nearly cycloidal motion. The machine is to be actuated by condensed air. *Patent completed.*

2504. J. F. DICKSON. *Improvements in the construction of railway chairs and other details connected with the permanent way of railways,* Dated November 9, 1858.

This consists, 1, of a modification of the chair at present in use, by the extension of that part of the chair upon which the rail rests, and also in constructing such chairs so as to give a bearing of wood to the bottom of the rail. 2, in an adaptation of wrought iron in the formation of railway chairs, whether such chairs form part of wrought iron sleepers, or are used as ordinary chairs upon wood or other bearers. 3, in causing the bottom of the rail to bear upon one of the wrought iron fishes resting upon the chair on either side of the joint. 4, in supporting the rail between blocks of wood or metal, the lower surface of such rail not resting upon the chair or sleeper. 5, in forming railway keys or wedges of metal so as to receive a block or packing of wood. *Patent completed.*

2505. J. L. JULLION. *Improvements in the manufacture of paper.* Dated November 9, 1858.

This consists in a method of filling up with a substance of light specific gravity the interstices of the fibres composing paper, so as to consolidate and harden the same. To effect this the patentee makes use of compounds of the metals aluminium, calcium, magnesium, and silicum, either in the metallic or oxydized state, and combines with these bases certain acids to produce a substance suitable to his purpose. These acids are commonly known as sulphuric, fluoric, fluosilicic, and silicic; but he employs only such combinations of these bodies as are nearly insoluble in water. *Patent completed.*

2506. M. HENRY. *Improvements in, and in the manufacture of locks and fastenings, and keys for the same.* (A communication.) Dated November 9, 1858.

Here the locks or fastenings are so constructed that their volume may be greatly reduced by causing the key to act on an intermediate piece moving in the curved recess of a piece or plate carrying the bolt, so as to bring this piece forward or backward to open or close the lock or fastening. *Patent abandoned.*

2507. A. HENDERSON. *Improvements in vessels, and in applying rudders thereto.* Dated November 9, 1858.

This consists in constructing a chamber at the bow and stern of the vessel, so that a rudder may be raised into it. The rudders are mounted on a spindle, which moves in suitable bearings, and the spindle has formed on it a male screw, on which there is applied a nut, which rests upon one of the bearings of the spindle, and by turning this nut the spindle may be raised or lowered, and the position of the rudder adjusted. *Patent completed.*

2508. J. FELIX. *Improvements in castors for furniture, and other similar purposes.* Dated November 9, 1858.

To the leg of the piece of furniture an inverted cup is fixed, and receives a ball, or globe of wood, &c., which projects below the edge of the cup, and rests directly on the floor. The ball or globe does not rest on the bottom of the cup, but upon a number of smaller balls so arranged as to be free to move in a horizontal direction. At the bottom of the cup and within it, there is fixed a short stem, from which a disc is suspended at such a distance below the bottom of the cup as just to allow space for the smaller balls to pass between the two. The under side of the disc is hollowed to correspond with the surface of the ball or globe, so that all the smaller balls between the disc and the globe may bear both on the one and the other. All round the edge of the disc is a passage of sufficient size to allow the balls between the disc and the globe to pass from time to time to the space above the disc, and to be replaced by others descending from this space. *Patent completed.*

2509. C. A. BUTLELIN. *Improvements in the apparatus for ginning and cleaning cotton.* (A communication.) Dated Nov. 9, 1858.

This consists in the substitution of a cylinder covered with teeth similar to those used in cylinder cards in lieu of the ordinary saw-toothed gin or cylinder, and in using a stripper running in combination with it by internal gear and pinion. The cotton in the ginning and cleaning operation is also submitted to the action of a brush blower. *Patent abandoned.*

2510. W. CLARK. *Improvements in signals for railways and in apparatus for actuating the same.* (A communication.) Dated November 9, 1858.

This consists of 3 parts:—1. A new arrangement of signal post. 2. An apparatus serving to change the signals of open line when a train passes in front of the signal post. 3. An apparatus for re-establishing the signal of open line after the train has passed a certain limit. These several parts are not described apart from the drawings. *Patent completed.*

2511. S. S. MARLINO and J. APPERLY. *Improvements in the construction of fulling machines.* Dated Nov. 9, 1858.

The object here is to reduce the friction created between the cloth and the fixed portions of the fulling machine. The inventors apply to all such parts of the machine as are exposed to the rubbing action of the passing cloth a surface of glass, in the form of rings to line the orifices, and in the form of plates where flat surfaces are to be protected. *Patent abandoned.*

2512. A. V NEWTON. *Improvements in the construction of stairs.* (A communication.) Dated Nov. 9, 1858.

This consists in arranging steps or stairs upon an inclined endless belt, or upon endless chains or ropes; or in jointing the steps together so as to form an endless inclined flight of steps, which work over rollers, and act as elevators when motion is transmitted to the rollers. *Patent abandoned.*

2513. A. V. NEWTON. *Improved apparatus for obtaining extracts or decoctions.* (A communication.) Dated November 9, 1858.

This relates to a mode of applying and arranging a steam pipe and syphon, in combination with a boiler and condensor, for condensing the vapours evolved in the boiling of coffee, &c., and returning the condensed vapours to the boiler, thus preserving the aroma, &c., of the substances. *Patent completed.*

2514. A. V. NEWTON. *Certain improvements in electric telegraphs.* (A communication.) Dated Nov. 9, 1858.

Here the conductor is made to form a portion of the battery used to generate the electricity for setting the telegraph in operation, the action being set up by the water surrounding the conductor, or by the moisture contained in the surrounding earth. *Patent abandoned.*

2515. R. A. BROOMAN. *Improvements in electric telegraphing.* (A communication.) Dated Nov. 9, 1858.

The objects here are twofold: 1, the so arranging of the battery force that electric currents can be transmitted to any required distance without limitation by the action of counter currents when the circuit is broken; 2, the causing of the transmitted currents to record a *fac-simile* of the written or printed message. *Patent completed.*

2516. R. M. ORDISH. *Improvements in constructing the permanent ways of railways.* Dated Nov. 9, 1858.

This consists, 1, in holding and supporting rails by metallic sleepers constructed somewhat in the form of hollow oblate spheroids, having their vertical less than their horizontal diameters. 2, in constructing chairs intended for attachment to wooden or other sleepers of such form as to be slightly elastic, and to permit the jaws formed thereon to be sprung asunder, and by their reaction to hold the rail either with or without the intervention of blocks, wedges, or keys. 3, in securing the ends of two adjacent rails where they abut by a metallic spring clip, forming a curve beneath the rail, and having its edges acting upon plates upon each side of the web of the rail. *Patent completed.*

2517. J. NORMAN and R. HANNAH. *Improvements in furnaces.* Dated November 10, 1858.

In a furnace embodying modifications of these improvements, the bridge at the inner or back end of the ordinary grate bars is formed with passages divided by vertically-disposed "quarries" or slabs of fire-brick, which are fronted with cast-iron bars, forming a grate surface by preference inclined up and back from the ordinary grate bars. An air passage or passages admitting air from the ashpit communicates with the passages formed through the bridge, and it is intended that the air entering from below shall mingle in these passages with the gases entering them from above the ordinary fire-bars. The gases on issuing from behind the bridge will mingle to a greater or less extent with the gases passing over the bridge, and will impinge against a second bridge formed with passages which are inclined in plan in various directions to induce a thorough mixing of the gases. This mixing is also further promoted by a third bridge placed immediately behind the second, and formed by preference with its top edge slightly projecting forward, but without passages through it. The details may be variously modified. *Patent abandoned.*

2518. J. CORNER. *Improvements in machinery for making metallic screw rivets, and for uniting with them parts of boots, shoes, portmanteaus, leather hose, buckets, harness, and other leathern articles.* Dated Nov. 10, 1858.

This consists in the use of a bobbin chuck, screw-tools, and shears of a peculiar construction, for carrying, advancing, and cutting the thread, securing the wire into the leathers, and cutting off the rivet when so screwed in. *Patent completed.*

2519. J. BUCHANAN. *Improvements in propelling vessels, ships, and boats.* Dated November 10, 1858.

This consists in propelling ships, boats, &c., by means of a rectangular float board, disposed in the centre or keel line of the vessel, and operated by a long vertical transversely vibrating arm driven by steam or other power. *Patent abandoned.*

2520. W. G. TAYLOR. *Improvements in removing the fur from skins, and preparing said skins for tanning.* Dated November 10, 1858.

The patentee moistens the flesh side of the skin, places it upon a curved top table or block and stretches it, then fastens it to the tenter hooks and removes the fur with scissors or shears. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, JUNE 17, 1859.

CAPTAIN FISHBOURNE ON NAVAL ARCHITECTURE

THOSE of our readers who followed us in the analysis of Captain Fishbourne's scientific pretensions which appeared in No. 4 of the present series of the MECHANICS' MAGAZINE, will not have supposed that the gallant Captain's recent paper has been reproduced in our columns* because we endorse his statements, or think his reasonings sound. Our object has been simply to afford to those persons who are capable of forming a judgment in such matters an opportunity of examining for themselves the grounds on which he condemns the English ships of war, and to remove from ourselves all suspicion of unfairness, in the somewhat severe remarks we are about to make upon his paper. This paper, which, as our readers will have observed, was read at the United Service Institution, contains, among others, the following statements:—"The present practice (of naval "architecture) for war purposes bears the re-"lation to what it ought to be that the service "ordnance does to Armstrong's guns. Not "that ships may be designed that shall sail or "steam fifty times faster than at present; but "they may be made some indefinitely large "quantity more valuable for war purposes—it "may be, in some cases, fifty times more so, "and at less cost." "Had we adhered to the "principles contained in these earlier forms we "should have more efficient ships than we now "possess." Speaking of the French "Gemappes," now in process of conversion into a shell-proof razée, he says, "It is very much to be doubted "that this ship will prove a good sea-going "ship, and yet, owing to her small breadth as "compared with her immersed depth, and the "large amount of ballast she carries, she will "be much more likely to yield a satisfactory "result than any in our service." "I have "stated my opinions decidedly, because I feel "assured that the whole subject of naval ar-"chitecture requires re-consideration, and that "our ships should be designed upon some more "definite and satisfactory principle than they "are."

It must be admitted that these are very serious statements, and that they ought not to be rashly made—indeed, no man has a right to make them at all, until he is prepared to show where the assumed error in principle lies, and to point out the true course.

Perhaps Captain Fishbourne thinks he has done this—for he asserts that our ships are unsteady because they are too broad—that "great "beam is an unmixed evil;" "the wider the "vessel and the less the depth in proportion the more violent will be her rolling;" or, as he said in the letter to Sir John Pakington, "to ob-"tain the steadiest platform the immersed body "must approximate to the volume (*sic*) and "form of a semi-cylinder." We showed in our notice of that letter that the premises of the reasoning by which he arrived at this conclusion were false and absurd. It is true that he now avoids that ground; he seems also to have discarded the remarkable formula for obtaining the amount and velocity of rolling; but as his reputation as an authority in naval architecture, and his apology for talking and writing on the subject hang by this sheet-anchor, he clings to it in the seeming consciousness that it is his last hope. In our former article we said, "Regardless of stability, *i.e.*, the power of resisting an inclining force, the writer directs his attention to the amount of the angle through which the ship rolls in a given time in a rough sea as the measure of her steadiness;" but in this paper we find him directing all his attention to the effect of form upon this "statical stability." His mode of treatment in this case is as original and his arguments as baseless as in the other.

We have not patience to follow him step by step to point out where he is wrong. We can really see nothing worth the trouble of stating which is right. In his attempt to show on page 333, "the influence of depth" on the stability of ships, he says what simply amounts to this, that if the volume of the immersed part of a ship were increased in the region of the keel while the ship is inclined, "the effect would be to float "the keel up, and diminish the stability." The monstrous absurdity of such a statement will be evident to every one if it be supposed, as it may fairly be, that the weight of the part added and of its contents made its specific gravity equal to that of a mass of iron or lead. Further on he says, "The common idea that when a vessel inclines she revolves round her centre of gravity cannot possibly hold, even approximately, in vessels of such a form." We need hardly tell any of our mechanical readers that every ship which revolves at all has a rotary motion about her centre of gravity as truly as she has about any other point from which that motion may be regarded—not certainly as *a fixed point*, that is no part of the "common idea"—it was left to Captain Fishbourne to discover that there is "some (one) "point on the other side of the centre of "gravity" about which the ship will rotate when the inclining force is applied on the side. After pointing out "the mistake" with regard to stability which has injuriously affected nearly all our modern ships, he boldly proceeds to describe the correct form, of which he also gives us a section. "In vessels of this form, "the points of pressure are all equally distant "from the centre," *i.e., the transverse sections below, and for some little distance above the water are circles swept from the centre of gravity as a centre.* There is not the least doubt that Captain Fishbourne has really discovered how to prevent *uneasy* rolling; a ship so constructed would not distress her crew by the obstinate resistance with which ordinary ships indicate their unwillingness to go over, and which we have been accustomed to call their stability—she would, in fact, have as little objection to float with her keel upwards as in any other position, and would be in that respect greatly to be preferred in Captain Fishbourne's opinion to those stiff and rebellious ships of war which will kick and plunge in the most violent manner rather than submit to be turned upside down. Captain Fishbourne's model ship would see no reason for preferring one position to another; and we defy him to show her, or us, why she should. The stability of floating bodies depends on the vertical motion of one or both of two points, viz., of the centres of gravity of the body, and of the water displaced by the body; the former of these is commonly known among naval architects as the "centre of gravity," and the latter as the "centre of buoyancy." If the form of the body and the position of the centre of gravity are such that this centre does not rise with regard to the surface of the water as the vessel is inclined, then there must be a vertical motion of the centre of buoyancy, or the vessel will turn over. A vessel constructed of the form proposed by Captain Fishbourne would have no vertical motion of the centre of gravity because it is in the load water-line, and the form between wind and water will not tend to raise it. Still, the vessel would resist an inclining force if it were broader than it is deep, so as to cause the centre of buoyancy to descend under the action of the force; but the circular form prohibits this, and the ship would therefore have no stability.

Secondly: A ship may receive her stability from the motion of the centre of gravity during the inclination, the centre of buoyancy remaining always at the same depth below the water's surface. The American cigar vessel is under these circumstances; the form below the water undergoes no change upon an inclination of the vessel, and therefore the centre of buoyancy is always at the same depth; and to obtain the stability the centre of gravity is placed—not as Captain Fishbourne has it, *in* the centre of figure—but some distance below it, so that a rolling motion causes a vertical oscillation of the centre of gravity.

Thirdly: Stability may be obtained by a vertical motion of both these centres, as is the case in all ordinary vessels. In men-of-war the centre of gravity is always near the load water-line, so that there will be no considerable motion of the centre of gravity unless the vessel widens suddenly just above the water-line; and it is therefore usual, as it is certainly best, to depend for the stability upon the vertical motion of the centre of buoyancy alone, which can only be obtained by making that great disproportion between breadth and depth about which Captain Fishbourne complains. It matters not how greatly the recoil of the guns may be reduced; this disproportion must continue so long as we require a distinction between the top and the bottom of a ship. Every naval architect knows that he cannot increase the breadth of his ship without sacrificing speed, and he has to determine by experience what the limit may safely be.

We shall not attempt to disprove Captain Fishbourne's alleged facts with regard to the errors of the Government architects in this matter, but simply give two illustrations of ships of war which have been proved by careful experiment to have reached the limit of safety. Neither of these ships is armed as a first-rate, yet in both the proportionate breadth greatly exceeds that which he appoints, viz., twice the mean depth. They are the Conqueror, length 240 feet, breadth 55 feet 6 inches, mean draft of water 25 feet 6 inches; and the Royal George (an old ship converted for a screw), length 205 feet, breadth 54 feet 6 inches, mean depth or draught of water 25 feet 6 inches. We can offer our personal testimony to the fact that this latter ship is so crank as to have inspired fears for her safety when only lying across a tideway in Sheerness Harbour.

We need hardly say that Captain Fishbourne has altogether misunderstood the nature of the motions which he affects to explain, and about which he says the constructors of all our modern ships have been in error; but in attempting to show how a vertical motion of the centre of gravity may be produced in broad, flat-floored ships, whatever may be their shape at the water-line, and wherever that centre may be situated, he makes some very amusing statements. It appears, according to him, that if a ship is flat-floored, the bilge will not go down when the opposite side is lifted by a wave. "The water becomes," he says, "as though it "were rigid." We have only therefore to make the lateral motions sufficiently rapid, to get such a ship quite out of the water. The starboard side is lifted, and the port bilge refuses to go down and recover the displacement—the port side then rises, and the starboard bilge finds the water to be "rigid." The ship would be,

* See MECHANICS' MAGAZINE for May 20, May 27, and June 3, 1859.

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in fact, in the position of the Sphinx or other Egyptian monster which Stephenson is said to have unearthed for the French *savant*, who had written home for further instructions when he found it impossible to raise the ponderous mass without expensive machinery. Stephenson, observing that it rested upon a firm bottom in a shallow vault, and that it was possible to give it a rocking motion, offered to land it for £10, and to put it down again for another £5. His aid being gratefully though doubtfully accepted, he directed sand to be shovelled into the vault beneath the base of the figure as it was rocked from side to side. The sand being like Captain Fishbourne's water, the sagacity of the English engineer was soon rewarded with success.

We have confined our attention to that part of the paper before us which treats of the forms of ships of war, because the main object of the lecturer has been, as he says in his opening sentence, "to show the necessity for a change "in the present practice of naval architecture, "in order that the country may obtain the full "benefit of Sir William Armstrong's admirable "invention." We think we have shown that however desirable it may be to endeavour to diminish the amount of rolling in ships of war —a fact which we suppose no one ever doubted —it has not been proved that our ships are built on false principles, or that "a change in the "present practice of naval architecture" is necessary. We should be sorry to have to prove that all the recent designs from the Admiralty are faultless. Naval architecture has always been a system of compromises—an attempt to secure as much as possible of directly opposite qualities. Nothing can certainly be of so much consequence in providing for the safety of the ship as to make her stable; but in doing this, as we have seen, we bring checks upon the ship which will not always act with the ease and regularity of a steel spring, or a steam "cushion." Perhaps we may one day know how to do this. Naval architects will certainly welcome with pleasure any real help towards its accomplishment. If Captain Fishbourne wishes to aid them, let him be assured that it is on the open sea, and not in the lecture-room; by careful experiment, intelligently made and honestly reported, and not by false criticism that he will improve the condition of the British Navy.

SCREW PROPELLERS.

IN his recent work on "Naval Warfare with Steam," Sir Howard Douglas, in the clearest and most forcible manner, urged the adoption of what he conceived would be a great improvement in the form of the screw propeller. This improvement consisted in removing the leading corners of the blades, and breaking the leading edge of each blade into its circumference by an easy curve.* The first object sought by Sir Howard in making this change was that of reducing the "shake" or vibration of the screw, and the consequent injury to the stern of the ship. These are produced, he argued, by the sudden and violent reactions of the disturbed water against the blades as they enter and emerge from the space between the two sternposts; the rectilinear edges of the ordinary screws being, in this respect, highly disadvantageous, since the whole of an edge enters and leaves at once the water on each side of the aperture. "But if "the leading edges of a screw-blade were curved, "they would slide obliquely and continuously "through the water, like a screw formed with "an entire feather, so that, at no moment, "would there be any shock or discontinuity of "action." Further advantages which Sir Howard considered the curved edges would possess were, that they would readily throw off any floating materials that might come in contact with them—that they would not be so liable to be broken by their oblique collision with large spars as straight edges are by their direct blow—that their rounded extremities would be less liable to be hitched by ropes than the angular extremities of the common screw—and, finally, that if the curved parts could be furnished with incorrodible sharp knife-edges they would divide, and disentangle the screw from, any rope, spar, or other floating matter with which it might become fouled. "The "author would not," said Sir Howard, "at the "sacrifice of speed, revert to a continuous "feather-screw; but the form here recommended would, to a considerable extent, gain "the proposed ends." Now, in justice to an able and veteran officer—an officer who, by his incomparable writings on naval and military science, has commanded the profound admiration and respect of both services—we revive these passages of his latest work, and couple with them a reference to those remarkable experiments the results of which were recorded in our last week's impression. Those experiments show—if the report which is before us may be trusted—that the improvement recommended by Sir Howard does actually accomplish his first and principal object by reducing the vibration or shake of the screw as he predicted. They also show that it has the further important effect of improving both the speed and the steerage of the ship. The reporter tells us that "the first trial with the Admiralty "screw was with a diameter of 18 feet, her "speed being 11·823 knots. On the second "trial, with the diameter increased to 20 feet, "the speed realised was 11·826 knots, with a "great increase of vibration. On the third trial "the leading corner of each blade was cut off, "and in this form the common screw attained "its greatest speed, giving a result of 12·032 "knots. On the fourth trial both the corners "of each blade were cut off, when, with a "greater number of revolutions, less speed was "made, being 12·012 knots. Its last trial, with "the 'following' corner of each blade cut off, "but the screw restored to its perfect form in "every other respect, gave a result of 11·815 "knots." The reporter also says, "the leading "edge of the screw is the part that mostly af-"fects the steerage of the ship, and also causes "the greater part of the vibration."

We direct attention to these facts solely from the desire to aid in reflecting upon the gallant author of "Naval Warfare with Steam" the credit that is justly his due. This may seem to some a romantic thing to give ourselves any trouble about; but romantic or not it affords us much pleasure. For we confess to feeling a peculiar interest in the reputation of a man like Sir Howard Douglas. Those of us who have to wade through the many volumes which mere pirates and charlatans compile and publish, acquire a reverence, aye, an affection, for works like "Naval Gunnery," "Military Bridges," and others of Sir Howard's, in which care, patience, industry, intelligence, masterly skill, and many other virtues and endowments, are stamped upon every page. There is something almost sacred to us in these fruits of human power and excellence, and still more so in the men by whom such fruits are produced.

In the particular instance of Sir Howard's judgment under notice in this article, we are the more anxious to do him justice, because in the review published by us on the 31st December last, we attached but little importance to it, if we mistake not. Nor do we now place anything like implicit confidence in the avowed results of the experiments with the Doris. Still, as we have only our theoretical opinion to bring against them, we are willing to confer the full benefit of the report upon him to whom it belongs.

* See the illustration on page 14 of the MECHANICS' MAGAZINE, No. 1, New Series, for December 31, 1858.

COINAGE DESIGNS.

A CITY correspondent, who has taken a special interest in our recent articles on the coinage of the realm, has favoured us with a suggestive letter on an important branch of the subject. The copper coinage of a full-sized halfpenny commenced, he says, in the reign of Charles the Second, and has been continued to the present time. At first the reverse was a Britannia, in rather old-fashioned costume, said to have been intended as a portrait of one of the king's favourite ladies. This figure of Britannia was partly taken from a Roman coin of Antoninus, for she was represented sitting on a globe, having a shield at her left side, a spear in her left hand, and an olive branch in her right hand; but she has no helmet upon her head, nor is there any ship near her. In 1771 the copper coinage of George the Third was much the same, and in 1797 and 1799 Britannia still appeared bareheaded, with her shield and olive branch; but she was seated on some rock-work, overlooking the sea, and instead of a spear she had a trident in her left hand. A three-masted ship was also seen on the water in the distance. These coins of 1797 and 1799 were struck at the Soho Mint, at Birmingham, and are fine specimens of engravings. The coins of 1806 followed and were similar on the reverse to those of 1797; but the size of the penny was decreased. The coinage of late years has been very indifferent, and the Britannia most slovenly arranged. Instead of a copy of the beautiful figure on the reverse of the penny piece of 1797, we have still a Britannia sitting on nothing, yet armed with a trident, wearing a helmet, and having her shield at her side; the ship and the water, the distinctive characters of Britannia, are passed away. We have before us, by the favour of our correspondent, a copper halfpenny of George the Third, 1771, when the mint was in the Tower of London. On this Britannia is seated on the globe. We have also the penny of 1806, where she sits on rock as before stated. On comparing it with a modern penny the falling off in the design is very manifest.

The subject is one of great interest, and as an issue of new copper coins is contemplated, we would earnestly press it upon the attention of the authorities. In this age of art-progress, it would be discreditable indeed to put an absurd, or even an imperfect, design upon those coins which the eyes of every man, woman, and child in the kingdom are certain to look upon. The Romans, by seating Britannia on a globe floating on the sea, with a shield by her side, a spear in one hand, and a Roman standard in the other, reminded the people with the utmost plainness that Britain was at once insular, warlike, and *subjugated*; why should we not repeat the tale of our present greatness and independence with equal force and clearness?

A correspondent, "A Mc. G.," writes:—"At page 363 of the present volume of the MECHANICS' MAGAZINE, &c., you describe a method of clearing drains and water-courses of extraneous solid matters by means of a grating of a peculiar construction, and patented by Messrs. Easton and Amos. Can this be any improvement on the simple and efficacious plan suggested by me, and which you were so kind as to insert at page 181 in the last volume of your work? In your leading article, page 374, of this week's number, you state, 'unhappily there is no prospect of deliverance from the curse of this foul stream'—the Thames; the simple plan I have suggested would no doubt mitigate the evil if adopted, and, in fact, almost annihilate it."

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MONEY-MAKING AT THE ROYAL MINT.

No. II.

As the visitor to the Mint, after having entered his name in a book kept for the purpose at the central office, passes with his guide through the folding-doors at the back of the office, he finds himself looking into a square, or rather quadrangular space, about 100 feet in length by 80 feet in width. The building on his left is the melting-house, that immediately facing him the great rolling-room, and that on his right the coining press-room. An iron tramway, passing down a stone inclined plane, and then branching to each of these buildings, connects them all with the central office. Down this tramway, in strong omnibus trunks, are passed the assayed ingots of gold or silver, and they are destined for the melting-house station. At the melting-house accordingly they are received, carefully weighed, and then charged into the crucibles in companies of six, together with the requisite amounts of copper alloy. As the ingots are eight inches long, three inches wide, and about one inch in thickness, and are worth about £800 each, it is clear that each crucible when loaded is worth, in round numbers, £4,800. There are seven furnaces for the receipt of potted gold, and 50 crucibles per day are frequently passed through this ordeal by *charcoal* fire, thus giving an aggregate value of £250,000. A short time suffices to reduce the rigid ingots and their companion of the baser sort to a state of fluidity, and by stirring them they become intimately blended. The moulds are in the meantime prepared to receive the precious contents of the crucible, being ranged in a strong frame, supported by wheels, bound together by iron bars, and holding their mouths vertically to catch the rich potion intended for their throats. These moulds are made of cast-iron, have been accurately planed from end to end, and being each put together in "two halves," are easily separated when the metal within them solidifies. The subsidence of the gold in the upper part of the moulds in cooling, and the inconvenience caused by it in the shape of "cracked coins" afterwards, have been spoken of in the MECHANICS' MAGAZINE in time past. These evils are in process of removal by improvements in pouring and in the subsequent treatment of the bars, and it is therefore unnecessary to go over that ground again.

We will suppose, then, that the moulds are ready, the metal fused, the workmen prepared, and all minor appointments made; crucible No. 1 is now—by the aid of a kind of iron pump-handle, suspended from the ceiling and having attached to it a ring of the same material, large enough to clasp the circumference of the crucible under its "lip"—removed from its fiery bed and guided by a workman to the mouth of the first mould. The weight of the crucible and its contents is partially taken off the hands of the pourer by means of a hook dependent from the roof, and he has little power to exert save that sufficient to direct the lip of the crucible to the mouth of the mould, and to pour a portion of the charge into it. Practice enables the pourer to judge with great accuracy as to the rate at which to deliver the molten gold, and his ear tells him when the mould is full. Just as a bottler of golden sherry can determine by ear when the wine reaches the neck of the bottle he is filling, so does the gold caster at the Mint know by the varying sound of the yet richer fluid with which he deals when his mould is full enough. The series of moulds in *one* frame being thus filled, that frame is pushed towards a cold-water cistern, and another frame is wheeled forward with its batch of empty moulds. The operation of filling these is a repetition of that which we have described, and one after another other series of moulds are filled until all the ingots are converted into bars. The moulds are now opened successively, and bar after bar is plunged into cold water, the plunger holding them—as a smith pieces of iron—in a pair of tongs, until they are quite cold.

Placed on an iron-faced bench, the bars are now trimmed on the edges, if haply they require that process, and are ready for the rolling department. The mode of casting bars for half-sovereigns is precisely similar to that of casting sovereign bars, and their respective dimensions are for—

	Length.	Breadth.	Thickness.
Sovereigns	21 in.	1¾ in.	1 in.
Half-sovereigns...	24 in.	1⅛ in.	1 in.

The silver-melting house or *room*—for both it and the gold-melting house are under the same roof—is much larger than that for gold, and its arrangement is different. It has to deal with metals in larger quantities, if of lesser value, and requires, therefore, more mechanical appliances.

It has been said that silver is purchased by the Queen, or for Her Majesty, in the market and it reaches the Mint in ingots. The silver ingot is gigantic in size as compared with the gold. It is 13 inches in length, 5 inches in width, and 4 inches in depth, its weight being 1,000 ounces, its value £250—a costly brick in truth. These are melted, three together, in wrought-iron pots of the finest quality, resting in furnaces of much larger dimensions than those of which we have spoken. There are eight silver-melting furnaces in the Mint, and in times of pressure they are all alight together, and produce from two to three tons weight of bars daily. We have said that the mechanical appliances are more numerous, and the foregoing statement will demonstrate the necessity for them. There are mould-frames and moulds of similar construction to the others; but there are also two pivot cranes whose sweeps embrace the whole range of furnaces, and these are used to deposit and remove the charged melting pots. A very excellent plan is adopted, too, for pouring the silver; supposing, as before, that all is right for casting, that the moulds are oiled, and each of the workmen—like sailors at a gun on board a man-of-war—at his post, a pot is next removed per crane and tongs from its hot seat. This is turned by means of the crane's steering gear until it is brought near to, and a little above, the mouths of the moulds; the pot is then dropped gently into a carriage placed to receive it. The metal has an incorporating stir given it at this stage, and the alloy — usually copper halfpence, or farthings, which have been spoilt in their manufacture—becomes diffused equally throughout the liquid mass. By means of a crank, a quadrant rack, and a pinion, the carriage, with its seated pot, is now under complete control of the caster. He gently turns the handle and the pot is gradually inclined until from its spout the purply-white mixture flows, and the mould beneath tells, as before, of its fulness by the gurgling variations of sound produced from within. The first mould filled to the surface, the caster waits till his assistant has pressed forward by rack and pinion the second mould. Again the pot is inclined till the notes of the gamut—and visitors are enjoined to silence at pouring-time—catch his ear and warn him to refrain from allowing more metal to pass into the mould than it will contain. As in the gold melting, pot after pot, and mould-frame after mould-frame, are advanced to their meeting places, and the transformation of fluids into solid rigid rectangular bars goes on until all the material of the day is used up. The bars are next trimmed—the trimmings being carefully preserved—the pots scraped, the room is swept, every precaution to prevent *waste* is taken—the whole proceeds of the day's work are passed through the scales, and the books are made to record the differences occurring by volatilization and evaporation to the greatest nicety. With this last matter we have, however, at present nothing to do, and it will be sufficient to give the dimensions of the bars produced, and then an account of their successive stages of advancement to the high honour of becoming current coin. The size of the bars are as follows:—

	Length.	Breadth.	Thickness.
Florin	21 in.	2½ in.	1 in.
Shilling	21 in.	1¾ in.	1 in.
Sixpenny	21 in.	1⅛ in.	⅛ in.
Fourpenny ...	21 in.	⅞ in.	¼ in.
Threepenny...	„	„	„

these sizes being, it is presumed, found by practice to be best adapted for the production of the sundry coins named. Crown and half-crown coinages may be said to be completely discontinued; whilst *medal* bars of fine silver are, we are told, cast in florin moulds.

It may be hoped that the reader has been enabled to follow us so far in our account of the progress of a sovereign from the crucible to the coining press, and that, "in his mind's eye," he has seen the melting process performed. The rectangular bars, whose dimensions we have just given, are now once more tested by the assayer, and, if approved, are forwarded to the central office. Here, again, the weighing operation is gone through, and this time in presence of a representative officer from the coining department, who, at the end of the total number of "drafts" from a particular melting, writes his receipt for the bars, and accompanies them down the inclined tramway to the great rolling-room. This noble room, which has an iron roof and is well ventilated and lofty, contains machinery of a very massive kind, and which, indeed, appears to be little the worse for the forty-nine years' wear and tear it has had. A thirty-horse engine at present gives motion to the whole of the apparatus in this apartment; but this power has recently proved inadequate to the duty required to be done by the rolling mills, and Messrs. Hall, of Dartford, are erecting a double cylinder forty-horse power engine to meet the pressure of work. In the old engine the fly-wheel is placed on the second motion shaft, and a great speed is given to it by means of a wheel on the crank-shaft working into a pinion on the fly-wheel shaft. Thus, though the engine makes, according to the old rule of Boulton and Watt, but 22 strokes per minute, the fly makes 70 revolutions in the same time. A thick wall separates the engine from the rolling-mills, but an arched space permits the fly-wheel shaft—of cast-iron, and nine inches square—to project into the rolling-room at a hoist of about two feet below the thick granite pavement, and on the end of this shaft is keyed another pinion. This pinion, with teeth about 12 inches broad and of 2½ inches pitch, gives motion to two wheels, one on either side of it, and these latter communicate motion to two ponderous lines of shafting, running longitudinally in trenches from end to end of the apartment. Upon these subterranean shafts, at proper intervals for the purpose, are placed spur wheels of great strength, and these give direct motion to the mills and other necessary appliances. The trenches are covered with stout iron plates, and these afford support to the heavily-laden trucks, which ever and anon pass over them. There are six pairs of rolls in the Mint rolling-room. The largest of these—and there are two pairs of such—are 14 inches in diameter, and 18 inches long in the barrel or bearing part. The second pair—and of them there are two pairs also—are 12 inches in diameter and 14 inches long. The third size, or adjusting rolls—and of these likewise there are two pairs—are 10 inches in diameter and 12 inches long. With the exception of one pair of rolls, and those for the "breaking down" of slab or tile copper, which is rolled hot, the rolls of the Royal Mint are what are called *chilled* castings, and their surfaces are accordingly as hard as steel, and as polished as the cuirass of a horse guardsman on a review day.

Besides the six pairs of rolls in their heavy standard frames, there are driven from the underground shafts two pairs of circular shears of about 20 inches in diameter, whose cutting edges "dip" to about the extent of an eighth of an inch. These are used for shearing copper only, and they make short and sharp work of the duty. When copper tiles of about 14 inches by 10 inches, and half an inch thick, have been reduced by compression at the mills to a guage something like that of the old "ring pence" of 1797, they are "offered" to these shears, and as their edges run in contrary directions to each other, the sheets of copper are accepted, and very speedily cut into strips wide enough to allow of two rows of pence, four of

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halfpence, or six of farthings to be punched from each—of course, the strips are further adjusted at the small mills before being perforated. Such, however, is the sole use of the *circular* shears. There is also a pair of boiler-plate shears—as they may be termed—though they deal with metal more costly, if not more valuable than boiler-plate. These are worked by means of an eccentric on the lower shaft, and may be readily engaged or disengaged. They are for cutting gold and silver bars after lamination into shorter lengths. Four annealing furnaces or ovens, with gauges, small portable crane for roll-shifting, &c., scales, annealing tubes, plunging cisterns, and gas-cooking stove, with table and forms, make up the furniture and fitments of the great rolling-room.

We have deemed it better to be thus careful in describing, by aid of letterpress, the interior arrangement of this place, because, an account of the operations performed therein will be the more readily understood.

We will now return to the truck load of golden bars which await our attention and that of the Queen's coiners. Again they have been weighed and are now passed over to the gold and silver breaking-down mill. The engine has been started, and the "couplings" of the various mills purposely made to fit loosely are clanking away with a regularity which makes the sound harmonious almost. The overman regulates the space between the rolls by means of two indexed adjusting screws passing through the mill standards and pressing on the bearing blocks of the upper roll. These fine-pitched and powerful screws are made to move simultaneously by the turning of a crank handle, and they force down the upper roll, or allow it to ascend by the force of counterpoise weights suspended ingeniously in the trench below, at the will of the roller. The index points out the distance between the upper and lower roll, which latter revolves on a fixed and solid bed or bearing. Supposing all to be ready, the bars are now taken singly by the overman and placed between the running rolls. One after another, as quickly as the speed of the mill will allow, they are passed through this compressing machine, and received by a workman stationed at the back of the mill, who places them on an iron wound table beside it. This is the first step in the progress of lamination, and the dimensions of the bars will have now materially changed—they are longer and thinner than when taken from the moulds. The rolls are now made to approach each other more nearly, and again the whole batch are made to undergo the squeezing ordeal. They are yet longer and more thin after it, and they have become considerably heated, too, by compression. The workmen put on their gloves—thicker than those worn at evening parties—and repeat the pinching. Now the bars are so attenuated that their identity is destroyed, and they have become very hard as well as very hot. The shears are next put into requisition, and the waste or ragged upper end of each bar being first removed, they are all cut into about 18 in. lengths. One bar will make five of these lengths, and in companies of five they are now placed in cylindrical copper annealing tubes, made air-tight with pot clay, and submitted on iron carriages to the annealing foreman. Twenty minutes' baking alters the tempers of the cut bars materially, and after a cold water bath they become perfectly pliable and soft. Now they are taken to smaller mills, and little by little they are "pinched"—such, we believe is the word used by the Tower-hill operatives—down to something near the thickness of the sovereign.

The wand of the harlequin is not much thinner than are now these wire-drawn strips, straps, or fillets of gold. Each 18-inch length of bar that *was*, is *now* about four feet long and wide enough to allow of two blank sovereigns being cut without unnecessary waste, side by side and from end to end; but before the perforations commence, something more must be done. The "fillets" are left purposely slightly thicker than the coin requires it to be by the officer in charge; but he has performed his task, and prepared them for the next stage of manipulation. A balancing up, therefore, takes place. The workpeople have not left the apartment during the rolling or annealing of the metal, the messenger and gas-cooking apparatus, together with access to a certain subscription cask of porter, having fortified them for the duty to be done; and they carefully return every particle of gold to the seat of justice—in this instance not blindfold—behind the scale table A pass-ticket is given to the men and boys—of whom, unitedly, there may be a dozen—in the rolling-room, whilst the accepted "fillets," duly ticketed, are passed on to the drag or drawing—or more properly stated, the adjusting-room, and the ends, &c., locked up for re-melting.

The adjusting-room has its subterranean shafting, too, giving motion to sundry machines, which briefly and in order we will attempt to describe. In the first instance, there is the "flatting-mill," and this is simply an adjunct to the drawbench. The flatting-mill consists of two steel rolls, of about four inches diameter and five inches in length, supported on bearings in a light cast-iron frame, and driven by a band passing over pulleys. There is a peculiarity about the upper of the two rolls, which constitutes the feature of the machine. It is not cylindrical, but has three flattened sides to it. The effect of this is, that when the fillets which have been weighed and given out to be operated upon are presented to the mill they get an extra compression at their ends, to the extent of about two inches of their lengths, and are then rejected by the rolls themselves. The workman enters them singly at the moment when the flattened surface in passing round allows of his doing so, and the two cylindrical portions of the rolls administer the necessary squeeze. This thinning of the fillet ends is for a purpose which will be presently explained. It is preparatory to their being drawn or adjusted. The drawbench is a contrivance about the value of which much controversy has existed in times past, and of which there are differences of opinion among scientific men now. It was invented in 1816 by Mr. Barton, and was intended to obviate some of the inequalities which were observed to exist in the metals after they had been acted upon in the rolling-mills. Messrs. Maudslay and Son were the constructors of it, and it is needless to say that the mechanical parts of the drawbench were well fitted. The "beds" of this machine, which is quadrupular in its action, are very solid, and are arranged for holding firmly, and without allowing them to revolve, four pairs of small steel cylinders, each about four inches in length and three-quarters of an inch in diameter. The distance between the surfaces of these beautifully turned, hardened, and polished cylinders is regulated by "set" screws to the greatest nicety, and each pair may be made applicable to fillets for any kind of coin. Supposing, then, that the batch of fillets—whose career we have so far followed, and which are *en route* for their sovereign destiny—supposing that these have arrived at the drawbench, and that one of the four pairs of cylinders are "set" for receiving them, the workman finds no difficulty in passing the thinned end of a fillet between those cylinders. It readily passes, indeed, to the extent of the two inches named.

Well, on the other side of the "beds" is the bench, about 12 feet in length; and longitudinally on its surface traverse four endless pitch chains with brass links. On wheels of small diameter, say three, in and above each of the chains runs a strong steel carriage. This carriage, technically called a "dog," is advanced by hand towards the thinned and projecting end of the fillet, and as the "dog" is provided with sharp steel teeth, it is made to bite the fillet. It is at the same moment attached to the pitch chain, and consequently pulls the fillet by main strength between the cylinders, and thus equalises it in thickness from end to end—or at least ought to do so. In order to test the accuracy of its working, blanks are now cut at intervals from the adjusted fillets by hand-cutting punches, and carefully weighed; if the blanks are found to be uniform in weight from whatever portion of the fillet cut, the work is pronounced "good," and is ready for the next operation.

Variations in the density of the metal dealt with, and other practical difficulties, combine to render the drawbench, perhaps, less satisfactory in its action than theoretically it might be expected to be, and in the new Calcutta Mint—in process of construction at Birmingham—it is intended to dispense with it altogether. Carefully dressed and scientifically arranged rolls will, it is expected, give as good results in the shape of gauged or adjusted "straps" of gold or silver as the Royal Mint drawbench, and we are inclined to believe that such will be the case.

Returning, however, to our task—the adjusted fillets are now cut into handy lengths, and a small pair of vibrating shears, worked by a penduluna and eccentric in the trench below, cut off the thinned ends, which, having played their parts, are doomed to the melting-pot. The dwarf fillets are now ready for the *cutting-room*.

THE NAVIES OF ENGLAND AND FRANCE.

(*Concluded from page* 378.)

ANOTHER feature in the establishment of this fleet is the enormous horse-power employed: 222 ships represent 82,044, an amount nearly equal to that required for the aggregate force of the English navy. Of late years, too, the increase has been very great in the larger classes of vessels, and all the new models have been furnished with engines of great power. This may be carried to excess, as there must be always a proportion betwixt the propelled and the propelling forces; and it has been rumoured that the Napoleon, and the ships of that type, strain and tear very much, and are driven deep into the water by the great propulsion. This, however, is a matter which may be safely left to the judgment of our engineers, as far as our relative efficiency is concerned: given the body to be propelled, and they may be surely trusted to adjust the propelling power. A still more important consideration in the estimate of this fleet is its cost. The proportion betwixt the expenditure and the result will much affect the comparisons of the ability possessed by the two nations in creating navies. If one can achieve the result aimed at by one-half the outlay which the other is necessitated to make, it must have a great advantage in the application of its resources. This is not a question of aggregate production, but of the relative worth of the work and the relative price at which it has been attained. France required not a fleet for dispersion, but for concentration; desired not a navy which might spread and diffuse its influence in remote seas, but one which would give it weight, perhaps supremacy, in the policies of Europe. A nation, however, so purely maritime as England, must be prepared for all exigences and circumstances, must be ready armed with every element of attack and defence which her position, her safety, the protection of her commerce, and the connection with her colonies, may demand. There was an outburst of indignation against the departments when the peculiarities of the Russian war showed the need for gunboats and small vessels, and there were none ready. They have since been raised in great numbers, and two-thirds of them have lain idle; still they are a necessary force; we should and must have them, though their maintenance during the period of their inutility drain the purse heavily. France was fortunate in the time and circumstances of the reconstruction of her navy, and has achieved it with an economy most wonderful for such rapid and efficient results. Much was, of course, due to the system. The same will which designed the steam navy, and proportioned its parts, directed the expenditure also in correspondence; nought was frittered away on alien objects, nought ventured on experiments; the whole available finance was centred on the fulfilment of the one purpose. Thus it comes that France during the seven years has

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been able to construct, to maintain, to repair, to arm her navy, to keep its dockyards and arsenals effective, to feed, pay, and clothe her seamen, to provide labour, material, and ordnance, to undertake new works and improvements at a cost little less than 39 millions; whilst we have expended for the same purposes upwards of 57 millions.* This gives to one nation an average of 5¼ millions per year—to the other of rather more than 8—a difference in cost certainly not commensurate with the difference of results. The ratio of these statistics may be explained, perhaps, without attributing recklessness, extravagance, or gross mismanagement to one system, or care, supervision, and arrangement to the other; yet still the excess on the side of England would be almost enough to balance the comparative resources of the two countries. In all the items of expenditure there is a difference in favour of France, but chiefly on those involved in construction and armament, amounting to more than a million and a quarter on the average of years. France is spared the small expenses, the repairs, the incidentals, which the dispersion of ships, the fitting and dismantling, the commission of different classes, naturally create, and has, therefore, her whole expenditure not only more limited, but more controlled and more defined by products.

A paterfamilias, whose genius had chosen house-keeping for its field, once revealed to us as a fact of his experience, that the butcher and the baker and the tailor were the least formidable of his difficulties; but that it was the cobbling, the mending, the extras, and the incidentals which made such a hole in the income. It is the same apparently with ship-building: the actual work of construction is a comparatively inconsiderable item, but the mending and the altering, the fitting and the unfitting, are so many maelstroms which suck in the supplies most unconsciously and ruthlessly. That France is exempt and England subject to this drain is the effect of national position. We must, therefore, bear our burden manfully, striving to lighten and alleviate it by method and system, and we shall do both probably with more wisdom now that we are informed of the causes which impose it.

The inquiry, however, into the relative power of the two navies, as it may affect the ultimate supremacy of one or the other, can never find its real solution in the discussion of present strength—it must depend also on the means and capacity of expansion. Let us see how the comparison stands in this respect. France, in her grand effort has almost exhausted the old convertible material, and can, therefore, no longer draw from that quarry, and must rely entirely on construction. She has ten sailing line-of-battle ships remaining, and of these two only are supposed to be capable of conversion. Of 32 frigates, nine or ten are considered worth transformation into transports. Thus, she will very soon have used up the old material, and will then find the strain on the finance heavier and more important. She is known now to have 5 liners building, and 8 screw frigates building; 4 liners, and 1 frigate converting. One of these liners has, however, been included in our list. In addition, there is a new element, the iron-sided ships.† Of these, the committee reports—"Their timbers are of the scantling of a three-decker; they are to have 36 heavy guns, most of them rifled 50-pounders, which will throw an 80 lb. hollow percussion shot; they will be cased with iron: and so convinced do naval men seem to be in France of the irresistible qualities of these ships, that they are of opinion that no more ships of the line will be laid down, and that in ten years that class of vessels will have become obsolete." Our own authorities, however, seem to consider the experiment as of doubtful issue, and apprehend that very serious difficulties will attend its practical adoption. It is also as yet a question as to the sufficiency of defence which iron plates would afford against the extraordinary development of projectiles. No plating will render a ship proof against solid wrought-iron shot; and, though the late trials did not satisfactorily establish the effectiveness of the Armstrong bolt against iron, yet it remains to be seen what may be the issue of experiments with larger and heavier shells. It is our own belief that projectile power will attain such a terrible expansion as to defy defence, and that the idea of protection or impregnability from shot or shell will shortly be an illusion; and we cannot, therefore, think that it is wise to sacrifice the great qualities of speed and manageableness for an uncertain resistance against attack. It would seem that, as with the old armour, the invulnerability of the shielded mass would be more than counterbalanced by its want of mobility. Nor can we accept these batteries as the fittest medium for the application of rifled cannon to the purposes of attack. These wonderful engines, to give effect to their long ranges, will require to be placed in ships which are under perfect command—which are mobile, and possess great speed. These qualities cannot, we think, be given to the iron-plated ships; they will ever be difficult to steer, will not probably move well under steam, and will not be handled with the ease and certainty necessary to insure correctness of aim and great effect for their long range projectiles. This, however, is a problem for practical men, and which experience only can solve. Meantime, France has four of this class building, two of which are nearly complete, and intends to construct two more. We shall doubtless follow in the wake of the experiment if the Armstrong gun do not settle at once the question of defence.

It is contemplated by the French Commission,* "that in 1860 she will have a steam fleet consisting of 40 steam line-of-battle ships, 6 iron-plated frigates, 30 screw frigates, 19 paddle-wheel frigates, and 26 steam transports;" and that this fleet would be capable of "carrying an army of 60,000 men, with all its horses, provisions, and *matériel* for one month." Nor is this the limit of the expansion. It is projected that the augmentation should progress until the steam navy number "150 vessels of war of all classes, in addition to 72 transports," and until the arsenals, the great military ports, be complete in respect of docks, factories, and buildings, "to meet the requirements of the fleet." A sum of nearly nine millions has been deemed adequate for this purpose, and it is purposed that "the expence shall be spread over the period from 1859 to 1871." Here, then, we arrive at a definition of the extent which the navy of France is destined to attain; and it is not such as to daunt or terrify us. It is one that, in the like time, we can easily exceed. The component parts are, however, significant. There will be 45 or 50 liners and 72 steam transports, and these forces would point at something more than the assertion by France of her rightful rank among naval Powers. It would suggest that the army of France is to become a power on the seas. Our own prospective increase would carry us much in advance of our rival. At the same period of 1860, it is expected that England may possess 56 steam liners by the farther conversion of 6 sailing vessels, and 34 frigates, with the possibility of converting 27 more, and razeeing 13 sailing line-of-battle ships. This, however, can only be achieved (and the whole result can scarcely be) by an extraordinary effort. According to the ordinary means and expenditure, the consummation could not be arrived at for many years to come. England has been roused to sudden energy and activity certainly, but the proportion betwixt the established strength and the purposed extension of the French navy, shows also that she, in her start, was compelled to resort to an unusual effort, and employ means and appliances which she did not intend to maintain permanently. When the plans here detailed shall be completed, both nations will have used up their old material; and, as the building of a ship costs about four times as much as its conversion, the future extension of each will be as much a question of finance and resources as of constructive capacity.

The building space and building means at the disposal of France are certainly very great. She has her five great ports, containing an aggregate of 73 building-slips, with three in progress, and 17 docks, with a proposed addition of seven; and these great establishments occupy altogether an area of 865 acres.

Altogether, in achievement and intent, in resource and expansion, we have here a most formidable product, but we see also its limit, its end; and notwithstanding a temporary loss of place, we must feel assured that it is within the scope of the energies and resources of our country far to surpass it, and that we have not lost, nor shall we lose, our supremacy in the art-power of production. * * * *

The policy which this fleet designates is, however, the question of the present time.

Mr. Reed, in summing up his comments, says: "The steady and enormous increase of the French steam navy in large ships appears to point to something very different from a sudden and unsupported descent on our coasts. Two-deck and three-deck steam-ships are by no means the most fitting vessels for effecting such an operation. They are intended, as their name implies, for the line-of-battle, and their production in large numbers by the French Emperor is equivalent to a declaration that, if we have to meet his forces at all, it will not be on our coast or in our harbours alone. He is manifestly preparing to meet us, if need be, or if occasion serve, on the open sea, and to contend there for a mastery of infinitely greater value to him than any mere momentary advantage."

This may be a true deduction from facts. Supremacy on the seas is doubtlessly the ultimate, the grand design of the French navy. Yet, what means the extraordinary expansion of its transport power? The French mercantile marine may afford in this respect insufficient means for the requirements of a great military nation; but the Imperial design is as much beyond as the national supply would be below the fair proportion of the transport to the military power and necessities of the State. The 72 steam-ships which are eventually to be an appendage to the navy of France, the 26 which are now in existence, or in instant preparation, what do they portend? Are they necessities? Are they required for the ordinary needs of the nation? If not, what other intent and purpose may they have? There can be only one—that of giving to France a place and a status for her armies on the ocean—of making the seas and channels the sites of floating camps, which should project her military force in any direction, and give to her might the impulse of a concentration capable of attempting a supremacy by land and sea—capable of annulling the advantages of geographical positions, and giving to a great military population a bridged passage for its ambitions and its aggressions.

History gives little encouragement to any such extended ideas of conquest or supremacy. Yet it may be well to consider what warnings this great line-of-battle and transport fleet may have for us, especially now that the great fallacy of "l'Empire c'est la paix" has denounced itself, and great political combinations are again looming ominously before us. It has one especial, one direct warning—preparation.

This has been already partly heeded. The neglect of former administrations, which had sunk our naval strength far below the standard of national efficiency, or even of national safety, has been redeemed by the energy of the present Government. The whole strength and resources of the nation are being applied to the assertion of our supremacy. All available means are employed—all possible agencies directed to the establishment of our old status as a naval power. For the first time, too, in our naval annals, the country has been informed of the actual strength and relative condition of its navy. First Lords do not usually condescend to such enlightenment. It knows now how weak it was, how much stronger it is, how strong it may become.

* Report of Committee. † Ibid.

* Report of Committee.

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We are assured of present equality with France, and are promised that ere the year end, we shall be superior to her in the material of naval war. It has been proposed that during this period nine liners should be converted and six new ships launched. Already four of the converted and two of the new berths are floating on our waters, and will be ready before the end of June as engines of war. This is a goodly instalment, and gives us confidence in our resources and in the men who direct them.

Is it, however, enough to be superior to France? Do not the shadows of coming events, the prospective combinations of the future, warn us to prepare for our old position, our old stand-point —England against the world? It was the position which former wars forced on us: it is one which future ones may render equally inevitable: it is one for which we should be prepared.

In the art-power, the resources for the creation of naval material, we have been, in spite of temporary lapse, and shall be, ever supreme. As builders of ships, and constructors of machinery, we may and shall challenge the world. Our present difficulty lies in a different source—the man-power.

"DELTA'S" PATENT AGRICULTURAL IMPLEMENTS.

IN a former number we illustrated a cheese-press and horse-rake, patented by a gentleman who for some reason prefers to keep his name *incog.*, and to be known as "Delta;" perhaps the success of "Sigma's" implements may have somewhat prompted this conceit, or it may happen that there are reasons why he may not wish it to be known at present that he has patented these implements. We have heard of claims being made to the ideas of employées, and other abuses of power; but we might surmise *ad libitum*—but now to facts.

The illustrations now to be given are the "swing" plough, "wheel" plough, and "double mould board" plough, called also "double tom," and "drill" plough, the last of which we presume to be the more correct, from the purposes for which it is made, viz., forming drills and earthing up the plants sown in drills.

The peculiarities of the Scotch ploughs, besides the almost universal use of the swing plough, is that the framing is all forged: but an explanation of the parts of a plough may render the description more easily understood. A plough generally may be said to consist of the beam, body, head, stilts, turnfurrow, share sole or slade, and sideplate, to which are afterwards added the coulter, and bridle or draught-rod.

In the Scotch plough the beam, body, and left stilt are generally forged together, the body being two pieces of flat iron welded to the beam and flanged at the bottom, to receive another part, the head. The head is pointed at one end, to receive and fit the share, and is a piece of flat iron about 1¾ wide, tapering from 1 to ¼ inch in thickness. The underside of the head is level and flat to receive the slade, and the two bolts attaching this to the frame have countersunk heads. The right stilt is screwed down at the end by one of these, and the turnfurrow, or mould board, or resist, is attached by snugs to the body and stilt.

In the English ploughs the stilt and beam are forged in one, and a cast-iron body is attached to the beam by two, three, four, or five bolts according to size. In some the head is cast on the body, in others there is an adjustable head, so as to elevate or depress the point of the share.

"DELTA'S" PATENT PLOUGHS.

The improvement in this plough, as effected by "Delta," comprises a modification of the two plans. He assumes that the body is the weakest place, there being a transverse strain in the line of draught, a twisting strain communicated by the turnfurrow, and a downward force exerted by the action of the share as a wedge acting against the resistance of the beam and wheels. It has been proved that cast-iron is strong enough for the body; he therefore takes cast-iron as the material from which he makes his beam and body in one piece, whether with the head or not being a matter of taste, as some prefer the adjusting piece. He proposes to make the beam of I section, very light, and to use either toughened or malleable cast-iron, thus uniting strength with cheapness. The cost of the Scotch plough is £4 15s. to £5 10s — the English wheel plough £4 7s. 6d., and the cost of these will be from £3 15s. to £4 5s.

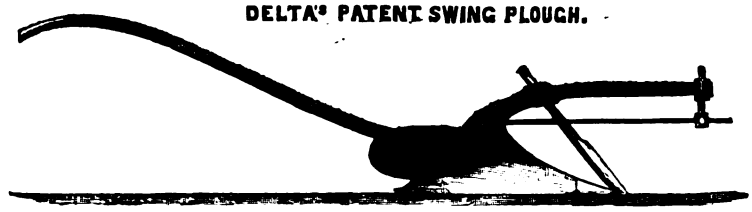
The drill plough is made in the same way, but with adjusting wings, or boards, to set up the earth turned out by the mole nose in front. This is a really good implement, not used for one day and then laid aside for a year, but useful, first in forming the drill, then in earthing up the plants, and may next be used in cleaning between rows, loosening the soil, &c., and lastly, for turning potatoes, &c., out of the drills.

The next implement to the plough is the harrow, and it would be useless to notice the several modifications for different purposes, all possessing the same features differently carried out, to suit their special requirements, analogous, for instance, to the French pough, subsoil plough, &c., &c.

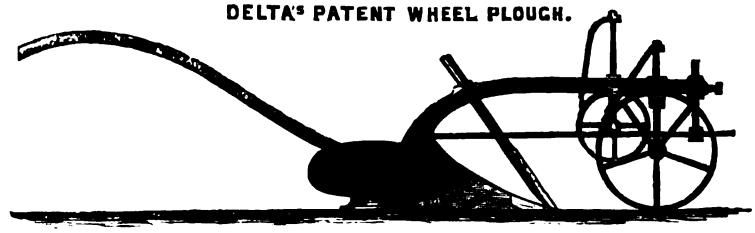
The requirement of the plough is to invert the soil for the purpose of aëration, and the approved form is a furrow slice. Nature having performed

DELTA'S PATENT AGRICULTURAL IMPLEMENTS.

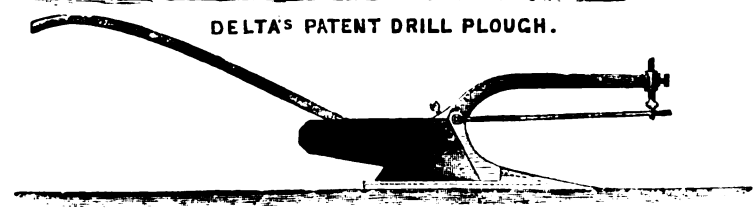
DELTA'S PATENT SWING PLOUGH.



DELTA'S PATENT WHEEL PLOUGH.



DELTA'S PATENT DRILL PLOUGH.



DELTA'S PATENT HARROW.

FOR TWO HORSES

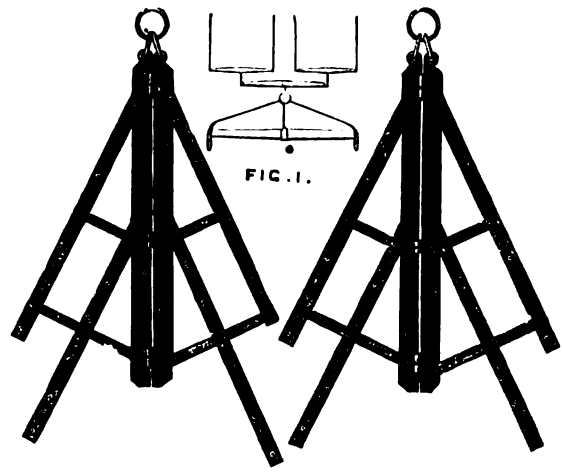


FIG. 1.

FOR ONE HORSE.

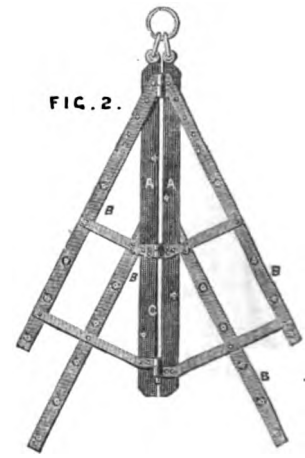


FIG. 2.

DELTA'S PATENT HARROW.

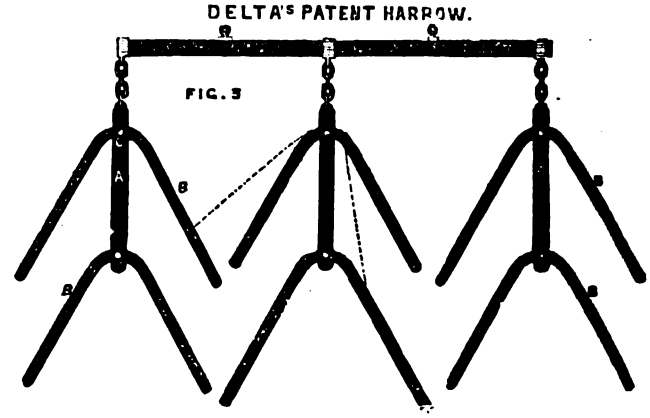


FIG. 3

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her part, man proceeds to utilize it, and the lumps or slices have to be pulverized. The tools used are large files, or graters, called "harrows," and these have all or nearly all the same characteristics—a number of straight spikes fixed in a rectangular or rhomboidal frame, or in iron bars bent or arranged so as to form a series of rigid lattices.

"DELTA'S" PATENT HARROW

follows more in the track of that invented by Smith of Deanston, who used a number of small quoits, or discs, running free—a plan copied and modified as chain harrows of all sorts, makes, and sizes since. But the idea which seems to have been followed out in this case was to make a harrow that should be perfectly steady and firm in the line of draught yet free to give to the undulations of surface, now working on the crest of the ridge, and now in the furrow; in both cases with perfect ease. Another object to the farmer is, that in this harrow he possesses two or more smaller harrows readily applicable for a single horse—a want hitherto felt.

Fig. 1 shows the two-horse harrow, and Fig. 2 the half, or a one-horse harrow. *A A* are two pieces of wood hinged together over the pin *C*, and forming the frame, from which branch the bulls, *B B*, in which are fixed the tines or teeth. The angle of the bulls with the centre frame is about 30 deg.; and the teeth form tracts every two inches in the one-horse harrow 4ft. 8in. in width—in the two-horse, 9½ft. Any one who has noticed the working of an ordinary harrow, must have observed the rolling pitching motion it has; this is thought to be desirable with some, and to suit them the harrow shown Fig. 3 has been designed.

The advantages of the harrow Figs. 1 and 2 are the readiness with which the teeth may be relieved in case of clogging, and the steadiness of working on uneven land. The wings may be raised singly, not being attached beyond the pair, and as they fold back upon one another, they pack into very small compass, either for exportation or for stowage. Again the angle of the teeth allows them to work quite free. Each harrow is attached to the "tree" or crossbar, and beyond this they are independent of one another.

The harrow shown at Fig. 3, in three parts, consists of the frame or draught pole *A*, and two angular bulls, *B B*, to each, the bulls carrying the tines or teeth, and connected to the frame by the pins *C C*; each bull is free to swing on its pin *C*, and thus in addition to its forward motion has also a free side motion to break any lump with which the teeth may come in contact, but when forced to one side the leverage of the side is increased, and so the harrow is self-righting to adjust itself by the resistance to its proper line. It covers 10 ft. 6 in. in 2-inch tracks at even distances.

These harrows have been severely tried, and are found to be quite clear of the tendency of the ordinary harrows to run in, or fall in front; they are of light draught, very simple, and the cost will not be more than that of the old kind. A new kind of tooth is used for the harrows, Fig. 2, giving less resistance and more evenness of working.

These implements were exhibited by Mr. R. Law, of Shettleston, the maker for the patentee, at the Ayr, Rothesay, Glasgow, and other meetings in Scotland, and met with great admiration and no small success, even allowing for the jealousy and distrust with which novelties are regarded by agriculturalists generally, and especially by our northern friends.

In illustrating these improvements or additions to the farming stock of implements, we consider that we are doing an act of justice to one who has spent much time and anxiety in their improvement, as well as conferring an obligation on our readers in showing them the doings of others, and the means employed to obtain the ends required.

We understand that our English friends will have an opportunity of seeing them at Warwick at the ensuing meeting of the Royal Agricultural Society, where they are entered for competition, and we are informed that "Delta" has entrusted his interest there to one who will do him every justice.

FOWLER'S STEAM PLOUGHING APPARATUS.

THE possibility of economically ploughing, or otherwise cultivating the land by steam power in lieu of that of horses, has been for several years past the belief of many scientific agriculturalists, as well as nearly all mechanical men; but public attention has only very recently been directed to the subject. Indeed, this may be said to have occurred for the first time at the public trials which took place at the Royal Agricultural Society's Show, at Chelmsford, in 1856; for although some few trials had previously been made, the public up to that time were almost wholly ignorant of what had been done. Upon this occasion, however, so great was the interest manifested that it was found impossible to work either the engine of Mr. Boydell or the apparatus of Mr. Fowler, and the trials were consequently adjourned to a more convenient place, viz., Boxted Lodge, near Colchester, where they were carried out on the 13th and 14th of the following month. The prize of £500 had been offered by the Society for a "Steam Cultivator that should in the most efficient manner turn over the soil, and be an economical substitute for the plough or the spade;" and Mr. Smith, of Woolston, and Mr. Fowler, were the two gentlemen who competed for it. It is not our intention to describe in detail the apparatuses then used by those competitors, but it may be well to state that Mr. Smith employed an ordinary seven-horse engine with separate stationary windlass, the wire rope passing over four anchored pulleys, two of these being fixed and two being moveable as the work proceeded. The cost of scarifying or "baulking" the soil by these means was stated to be about 8s. per acre, including every expense, and four acres were so treated in 12 hours. As, however, Mr. Smith's system of cultivation does not turn over the soil, which he considers unnecessary, but which was one of the conditions of the prize, the judges reported that his cultivators did not answer the requirements, although there could be no difficulty in attaching ploughs to his traction ropes instead of the implements he used. Mr. Fowler's cultivating apparatus, on the other hand, being a wooden frame with eight ploughs attached to it, four of them working at once, and balancing those out of use, did completely overturn the soil, and that at a cost of about 7s. per acre, according to a very careful calculation of Mr. Amos, the Society's Engineer. Mr. Fowler's apparatus then consisted of a double cylinder portable engine, driving a capstan by a short endless chain, these being stationed half way down one side of the field, the rope passing round two anchored pulleys and meeting at the implement. The anchored pulleys were very ingeniously constructed, consisting of trucks filled with earth, having sharp cutting discs for wheels, which were easily moved along through the ground, but presented much lateral resistance, which bore the strain of the implement. The cost of ploughing on this plan was so nearly equal to that of horses, being only 2½d.! per acre in excess, that it might have been supposed the judges would have at once recommended the council to award the prize offered by the Society. This, however, was not done, although they reported the ploughing admirably done, and fully equal in regularity and precision to anything which could be done by horses; and, moreover, that the cost of similar horse labour would be, *at least*, the 7s. per acre. The judges did, however, recommend Mr. Fowler's apparatus to the favourable notice of the council, in consideration of the skill he had displayed, the labour and expense he had incurred, and the degree of success he had so honourably achieved.

The next great trial of steam ploughing which the public had an opportunity of witnessing, was that which took place at the Salisbury Show in 1857, upon which occasion there were several additional competitors, including Mr. Collinson Hall and Mr. J. A. Williams. Although the judges had reported that steam ploughing apparatus should be able to convey itself from the farm-yard to the field, this was not attended to either in Mr. Fowler's engines or in some of the others exhibited, Mr. Boydell's engine being the only one that successfully climbed up the hills and turned round the several sharp angles on its way to the trial field. Mr. Collinson Hall's engine accomplished one wonder, but in trying to complete a second one, become disabled, and thus was unfortunately excluded from competing. Little more was done upon this occasion than to prove that steam ploughing had attained a degree of excellence comparable, in point of execution, with the very best horse work, and at a cost as nearly as possible that stated by Mr. Amos at the former trials. But a very important light appeared now, for the first time, to break in upon the view of those who witnessed the trials, namely, that the great advantages in steam ploughing might lie not altogether in cost, but also in *time*; at least *double* the quantity of work being capable of being performed in a day, when that work was pressing. Besides all this, it has now been proved that upon certain classes of clay soils most subject to injury by the tread of horses, the economy of steam culture receives its evidence, not simply in a well-turned furrow-slice, but rather in the quality and quantity of the produce, and that not of one year only but of several; the avoidance of the repeated "poaching" of horses bringing about a permanent and very favourable change in the condition of the soil.

The judges reported after the Salisbury trials that Mr. Fowler's ploughing was "very good," but arrived at the conclusion that considering the wording of the premium, they were not justified in awarding the prize while a *plough* was used. They, however, recommended a medal should be voted to him as "a reward for his strenuous endeavours in a good cause." The apparatus used on this occasion was similar in character to that employed at Chelmsford, but the details were considerably improved, and the anchors made by Ransome and Sims were highly spoken of.

The third great trial of steam ploughing took place in July, last year, at the Chester meeting of the Royal Agricultural Society, and terminated in a report of the judges "that Mr. Fowler was fully entitled to the prize of £500," their award being confirmed on the 4th August, at a meeting of the council of the Society. Five competitors entered at this trial, viz., Messrs. Howard, with Mr. Smith's apparatus, Messrs. Crowley and Sons, Mr. Ricketts, Mr. Boydell, and Mr. Fowler; Messrs. Fowler and Howard being alone, however, the final competitors. Upon this occasion, also Mr. Fowler had considerably simplified his apparatus since the previous meeting at Salisbury, and had greatly diminished the traction power required, and the wear and tear arising from friction. The engine and windlass, as well as the anchors, were also made self-acting. After a very careful inquiry, into the details of which we cannot now enter, the judges came to the unanimous conclusion that Mr. Fowler's machinery turned over the soil in an efficient manner, at a saving, as compared with horse labour, on light land of 2½ to 25 per cent., on heavy land 25 to 30 per cent., and in trenching of 80 to 85 per cent.; while the soil, in all cases, was left in a far more desirable condition, and better adapted for all the purposes of husbandry; and on these grounds they awarded him the prize as has been stated. The trials of Messrs. Howard's machinery induced them to recommend that a large gold medal should be given them "for the practical introduction of Smith's application of steam power to facilitate autumnal cultivation." Thus ended this great contest, after three years trials at the Royal Agricultural Society's Shows; but it would not be doing Mr. Fowler justice if we did not also here record his triumphs in other quarters, viz., at the trial at Stirling, in 1857, where he gained a prize of £200; at Northallerton, in 1858, £50; and also Lord

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FOWLER'S STEAM PLOUGHING APPARATUS.—FIG. 1.

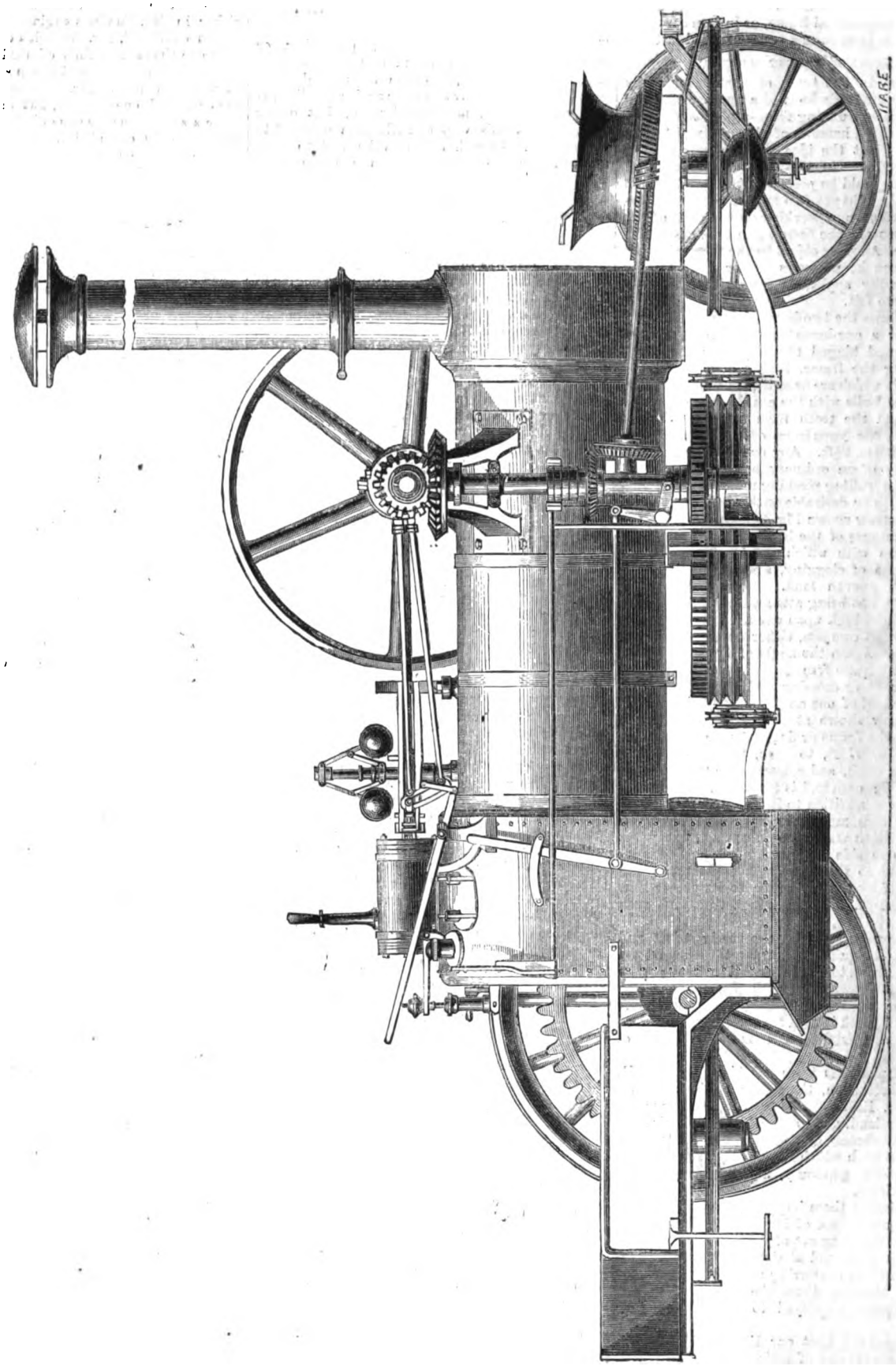

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FIG. 2.

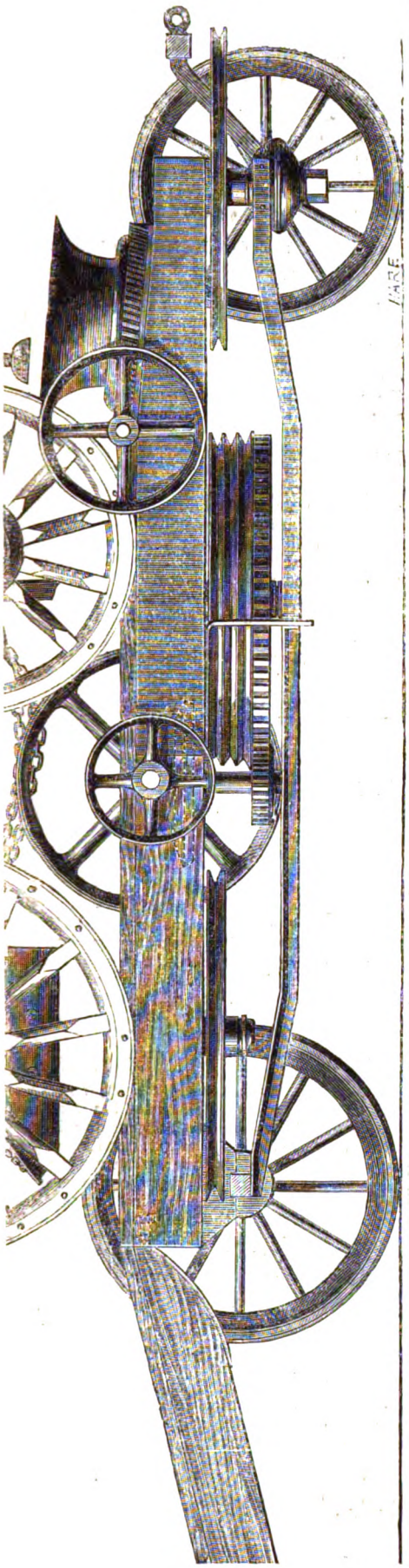
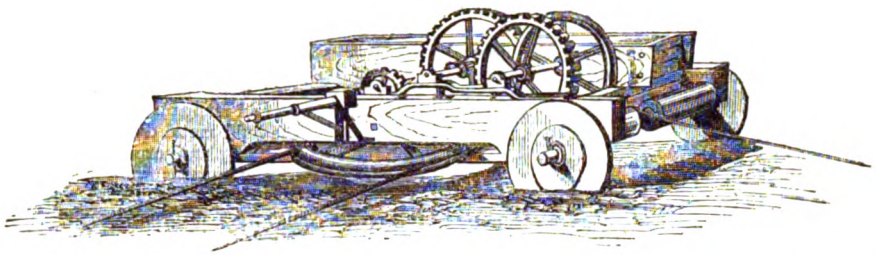
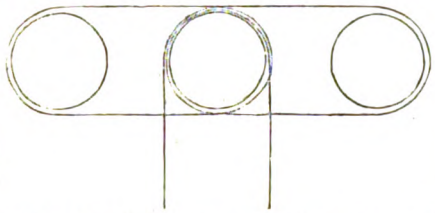


FIG. 3.



Bolton's prize of £25, at the same place; at Londonderry, in 1858, £50; and again at Stirling in the same year, another £50 prize.

We now come to that portion of our remarks which we had hoped to have reached earlier, viz., the present condition of Mr. Fowler's apparatus, which for simplicity and efficiency we fully believe greatly surpasses anything he has before exhibited. To those who recollect the apparatus shown at Chester, though admirable as a piece of workmanship (as it should have been, considering it was constructed at the works of Mr. Robert Stephenson, at Newcastle), yet presented a very complicated aspect. This fault cannot, however, be found with the machinery Mr. Fowler is now supplying, which from our illustration (Fig. 1) will be seen to be extremely simple, consisting merely of a driving drum attached to the centre of one of Clayton and Shuttleworth's ordinary portable engines, having pulleys at either end for the wire rope to pass round, as indicated in the accompanying diagram, and from which it will



appear that two three-quarter turns are made round the driving drum, which gives ample surface contact to prevent slipping. The drum in front of the smoke box is for working the engine along the headland, this drum being rotated by a shaft and worm shown in front of the drawing. The worm is thrown out of gear altogether when required by raising the drum upwards, so as to wind the rope up. Another important addition is now made of a pitch wheel and chain for assisting the engine into place by steam power, the guiding being left to be done by a horse placed in ordinary shafts. The water tank consists of a circular vessel on wheels, which is attached to the end of the engine, and is drawn along with it. The anchor is now constructed on the same general principle as formerly, only greatly improved, inasmuch as the metal work is entirely of wrought iron, the wheels being placed horizontally instead of vertically. We are prevented by an accident from giving a view of the latest mode of constructing the anchor in this week's number, but have shown one (Fig. 3) of very recent build, and one which well answers the purpose, though the details are inferior to those now adopted. The illustration Fig. 2 shows an adaptation to Mr. Fowler's apparatus of Mr. Eddington's mode of using a common portable engine for steam ploughing by placing such engine upon a truck or carriage upon which it is raised. The details of the arrangement are altogether different from those suggested by Mr. Eddington, the principle of his invention only being used by Mr. Fowler. The drums and pulleys, as well as the drum for advancing the engine, are precisely the same as in the more complete arrangement; and indeed the former plan is only recommended where the engines already possessed by farmers are either too small or too old to make it worth while to alter them in order to adapt them to steam ploughing. As regards the implements drawn by means of Mr. Fowler's apparatus, we need only say that any kind may be used, his own plough appearing the best as far as ploughing is concerned. As this implement was lately described in these pages, we need not further notice it, except to say that such improvements in its details have been made as to render it more completely under control, and less liable than ever to get deranged. Altogether, then, we may now confidently state that whatever may hereafter be done with rotary cultivators moved by engines travelling with them, steam ploughing by the means now adopted by Mr. Fowler is a veritable reality, and may be accomplished in so perfect a manner as to leave little to be desired; certainly nothing whatever which should make agriculturalists hesitate to at once adopt it, feeling assured as we do that the mechanical details if not absolutely perfect, are yet good and highly serviceable, unlikely to get out of order, and indeed we may almost say, as good as those of the engines themselves. If farmers, therefore, before adopting steam ploughing, wait with a view of seeing something more perfect than anything they can now have, we can assure them that they may wait a considerable time, during which they will lose far more in neglecting the advantages which steam ploughing will confer on their lands, than they are likely in all human probability to gain in the way of simpler, or more durable apparatus. Up to a certain point improvements in the details of machinery may be rapid, but when that which requires a wheel and a shaft to turn it, has nothing more than a wheel and shaft to perform the operation, then the utmost simplification has been attained; and waiting for something more will be like making up one's mind not to employ a steam-engine until either the boiler or cylinder is dispensed with.

MR. HENRY BESSEMER
ON THE MANUFACTURE OF MALLEABLE IRON AND STEEL.

THE following is an official abstract of a paper read at the Institution of Civil Engineers, by Henry Bessemer, Esq., May 24, 1859; Joseph Locke, Esq., M.P., President, in the chair:—

Attention was directed, in the early part of the paper, to the ordinary mode of manufacturing iron by the puddling process; in the course of which the iron, after it "came to nature," was gathered into balls, and was then removed as quickly as possible to the squeezer, where much of the fluid scoria, with other mechanically mixed impurities, was driven out, leaving a mass, or billet of iron, composed of thousands of separate fragments of metal, the entire surface of every one of which was, more or less, coated with dry oxide, or fluid silicate of the oxide of iron. The great pressure exerted by the squeezer sufficed to so far remove the fluid coating of the contiguous particles, as to bring their surfaces into actual contact, and consequently to effect a union at such parts. But the whole of the matter thus displaced could not find its way between the interstices of the mass, and therefore it became locked in its numerous cavities, producing points of weakness and separation in the metal. No amount of after working or rolling could wholly displace the portions of cinder, dry oxide of iron

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and of sand, which thus became mixed up with and were diffused throughout the mass, causing flaws and cracks in the iron, all more or less objectionable.

Now, if these imperfections were the natural and inevitable consequences of the conditions under which malleable iron was at present produced, it followed that defects of a similar character must also of necessity exist in steel produced by the puddling process. The granular condition of the metal and its exposure to heat and oxygen, could not fail, in both cases, to oxydise the entire surfaces of the numerous molecules to be united into one mass; the admixture of scoria and other matters from the furnace was equally certain to result; and also the difficulty of bringing each particle of the metal to the same degree of decarbonisation and refinement existed as in the making of iron, with the additional inconvenience arising from some portions of the metal becoming entirely decarbonised, and being converted into soft malleable iron.

Iron thus presented a most unfavourable contrast with the other malleable metals, all of which were free from sand or scoria; they had no hard and soft parts, and required no welding together of separate molecules, but they were perfectly homogeneous, and free from all mechanical admixture with foreign substances. Gold, silver, copper, zinc, tin, and lead owed this valuable exemption from the defects universally found in puddled iron, simply to the fact that they were purified and refined in a fluid state, and while still fluid were formed into ingots, whereby the cohesion of every particle in the mass was insured. If, then, the refining of other malleable metals, while in a fluid state, and their formation into cast ingots, rendered all such metals more sound and homogeneous than iron, while it did not lessen their extreme ductility, why should iron for ever remain an exception to the general rule? It might be truly answered, that hitherto the excessively high temperature required to fuse and to maintain pure iron in a fluid state, had interposed an insuperable barrier, for the highest heat of the furnaces only sufficed to show that fluidity was a possible condition of that metal.

It need not therefore be a matter of surprise, that when Mr. Bessemer first proposed to convert crude pig iron into malleable iron, while in a fluid state, and to retain the fluidity of the metal for a sufficient time to admit of its being cast into moulds, without the employment of any fuel in the process, his proposition was looked upon by many as a chimera, or as the mere day-dream of an enthusiast; but it was nevertheless fully recognised and supported by many of the scientific men of the day. The same deep conviction of the truth on which the new process was based, and which led Mr. Bessemer to bring it before the British Association in 1856, had since determined him (in spite of the opinions then pronounced against the process) to pursue one undeviating course, until the present time, and to remain silent for years, under the expressed doubts of those who predicted its failure, rather than again bring forward the invention until it had been practically and commercially worked, and there had been produced by it both iron and steel of a quality which could not be surpassed by any iron or steel made by the tedious and expensive processes now in general use. The want of success which attended some of the early experiments was erroneously attributed, by some persons, to the "burning" of the metal, and by others to the absence of cinder, and to the crystalline condition of cast metal. It was almost needless to say, that neither of the causes assigned had anything to do with the failure of the process in those cases where failure had occurred. Chemical investigation soon pointed out the real source of difficulty. It was found, that although the metal could be wholly decarbonised, and the silicum be removed, the quantity of sulphur and of phosphorus was but little affected; and as different samples were carefully analysed, it was ascertained that red shortness was always produced by sulphur, when present to the extent of 1-10th per cent., and that cold shortness resulted from the presence of a like quantity of phosphorus; it therefore became necessary to remove those substances. Steam and pure hydrogen gas were tried, with more or less success, in the removal of sulphur, and various fluxes, composed chiefly of silicates of the oxide of iron and manganese, were brought in contact with the fluid metal during the process, and the quantity of phosphorus was thereby reduced. Thus many months were consumed in laborious and expensive experiments; consecutive steps in advance were made, and many valuable facts were elicited. The successful working of some of the higher qualities of pig-iron caused a total change in the process, to which the efforts of Messrs. Bessemer and Longsdon were directed. It was determined to import some of the best Swedish pig-iron, from which steel of excellent quality was made, and tried for almost all the uses for which steel of the highest class was employed. It was then decided to discontinue, for a time, all further experiments, and to erect steel works at Sheffield, for the express purpose of fully developing and working the new process commercially, and thus to remove the erroneous impressions so generally entertained in reference to the Bessemer process.

In manufacturing tool steel of the highest quality, it was found preferable, for several reasons, to use the best Swedish pig-iron, and, when converted into steel by the Bessemer process, to pour the fluid steel into water, and afterwards to remelt the shotted metal in a crucible, as at present practised in making blister-steel, whereby the small ingots required for this particular article were more perfectly and more readily made.

It was satisfactory to know, that there existed in this country vast and apparently inexhaustible beds of the purest ores, fitted for the process. Of the Hematite alone, 970,000 tons were raised annually, and this quantity might be doubled, or trebled, whenever a demand arose. It was from the Hematite pig-iron, made at the Workington Iron Works, that most of the larger samples of iron and steel exhibited were made. About 1 ton 13 cwt. of ore, costing 10s. per ton, would yield 1 ton of pig metal, with 60 per cent. less lime, and 20 per cent. less fuel, than were generally consumed when working inferior ores; while the furnaces using this ore alone yielded from 220 to 240 tons per week, instead of say 160 to 180 tons per week, when working with common iron stone. The Cleator Moor, the Weardale, and the Forest of Dean Iron Works, also produced an excellent metal for this purpose.

The form of converting vessel which had been found most suitable, somewhat resembled the glass retort used by chemists for distillation. It was mounted on axes, and was lined with "Ganister" or road drift, which lasted during the conversion of thirty or forty charges of steel, and was then quickly and cheaply repaired, or renewed. The vessel was brought into an inclined position, to receive the charge of crude iron, during which time the tuyeres were above the surface of the metal. As soon as the whole charge was run in, the vessel was moved on its axes, so as to bring the tuyeres below the level of the metal, when the process was at once brought into full activity, and twenty small, though powerful, jets of air sprung upwards through the fluid mass; the air, expanding in volume, divided itself into globules, or burst violently upwards, carrying with it a large quantity of the fluid metal, which again fell back into the boiling mass below. The oxygen of the air appeared, in this process, first to produce the combustion of the carbon contained in the iron, and at the same time to oxydise the silicum, producing silicic acid, which, uniting with the oxide of iron, obtained by the combustion of a small quantity of metallic iron, thus produced a fluid silicate of the oxide of iron, or "cinder," which was retained in the vessel and assisted in purifying the metal. The increase of temperature which the metal underwent, and which seemed so disproportionate to the quantity of carbon and iron consumed, was doubtless owing to the favourable circumstances under which combustion took place. There was no intercepting material to absorb the heat generated, and to prevent its being taken up by the metal, for heat was evolved at thousands of points distributed throughout the fluid, and when the metal boiled, the whole mass rose far above its natural level, forming a sort of spongy froth, with an intensely vivid combustion going on in every one of its numberless, ever changing cavities. Thus by the mere action of the blast a temperature was attained, in the largest masses of metal, in ten or twelve minutes, that whole days of exposure in the most powerful furnace would fail to produce.

The amount of decarbonisation of the metal was regulated with great accuracy by a meter, which indicated on a dial the number of cubic feet of air that had passed through the metal; so that steel of any quality or temper could be obtained with the greatest certainty. As soon as the metal had reached the desired point (as indicated by the dial), the workmen moved the vessel, so as to pour out the fluid malleable iron, or steel, into a founder's ladle, which was attached to the arm of a hydraulic crane, so as to be brought readily over the moulds. The ladle was provided with a fire-clay plug at the bottom, the raising of which, by a suitable lever, allowed the fluid metal to descend in a clear vertical stream into the moulds. When the first mould was filled, the plug valve was depressed, and the metal was prevented from flowing until the casting ladle was moved over the next mould, when the raising of the plug allowed this to be filled in a similar manner and so on until all the moulds were filled.

(To be concluded in our next.)

LOWERING SHIPS' BOATS.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—By the tenor of a paragraph which appears in your "Weekly Gossip" for last week, I perceive that you are disposed to share my view of the case—that the opinion of the *Times* correspondent, when he lately drew an invidious comparison between Captain Kynaston's and Mr. Clifford's plans for lowering boats, was rather one-sided, and as it is your object to bring all inventions fairly before the public, I will ask you to insert the following remarks:—

The *Times* correspondent states, "Captain Kynaston's disengaging hooks appear to require *four* men for the operation, the success of which depends on the simultaneous working of the men. By Clifford's method the whole appears to be more safely performed by *one* man, who by slacking off a rope insures the boat being lowered on an even keel." True, Captain Kynaston still retains the only seamanlike way of suspending a boat, that is, by her usual tackles, and these tackles require the attendance of the usual men on board. The process of disengaging is performed by *one* man in the boat, is instantaneous, and completely in his power, whenever the time has arrived; moreover, whether the men on board lower *simultaneously* or not, directly the disengaging line is let go, the boat *must enter the water on an even keel.* Mr. Clifford's plan requires *one* man nominally, it is also true; this of itself might be of advantage, were it not for the great sacrifice entailed by the use of "single pendants," and the safety they compromise.

1st. The boat cannot be disengaged *ad libitum*, or until she has run her whole length of pendants off the roller. For a trial like the Paramatta's, the length of pendant is easily adjusted to the height of the boat's suspension from the water; but at sea not only does the ship's draught of water change with the consumption of coal, but there is such a thing as a *weather* and a *lee* side, which have the same effect. If the boat be lowered from the *weather* side, the chances are she will disengage herself before her time; if from the *lee*, she will necessarily have more pendant to get rid of; this sometimes leads to accidents.

2nd. If the pendants become saturated with

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moisture, and stiff, they either require the assistance of sundry of the crew to overhaul them, to ensure the boat descending on an even keel, or (as it has frequently happened with our large men-of-war) they break during the process, and throw their crew overboard. If a pendant hangs after the boat has entered the water, she becomes immediately swamped, and her crew probably drowned. I fear an instance of this even might be cited.

3rd. There is great vibration attached to lowering a boat with single ropes, and she is apt in a seaway to be stove against the ship's side; in this latter event Mr. Clifford's boat is helpless, and may be dashed to pieces before the proper tackles can be overhauled down for rehoisting her; on the other hand, Captain Kynaston, by retaining the usual tackles, has completely guarded against a similar evil.

4th. Mr. Clifford's plan of *lowering in the boat* is a great incentive to deserting a ship in time of difficulty—fatal facility indeed!

5th. There is as much danger attending the hoisting a boat in a seaway as in lowering, from the liability of one or other of the tackles to become unhooked—Mr. Clifford makes no provision for this, Captain Kynaston does.

6th. When hoisted at the davits, the single pendants are not sufficient for a boat's security. It is necessary to back them up with the tackles, or else with slip-stoppers. In either case the lowering must be retarded. Our best naval officers moreover agree that, in large ships more especially, Mr. Clifford's pendants, after a short use, are untrustworthy, through the use of the nip-sheaves.

I remain, Gentlemen, your obedient servant,

NAUTICUS.

NAVAL WARFARE.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN, — The improvements now being worked out in the destructive capabilities of war engines will, in all probability, induce not only a change in the construction, form, and size of ships of war, but a change also in the modes of naval warfare.

In the time of Queen Elizabeth, ships were armed with "built-up" cannon of rude fabrication, harmless in comparison with the "built-up" rifled gun of the present period. There were also, in the time of Elizabeth, fire-ships, which did good service in the defeat of the Spanish Armada. The fire-ships of the English were, on that occasion, towed by active row-galleys into contact with the slow and huge Spanish ships, which suffered greatly by that method of destruction. Something analogous to such mode of warfare would be the employment of submarine explosive shells, which do their work some feet under, instead of upon, the surface of the water. By steam-vessels, adapted to the service of these engines, they can with ease, and with destructive effect, be towed into contact with large ships armed with cannon and of inferior speed.

In the Museum at Canterbury is deposited, for public inspection, a submarine explosive shell, to which I would most earnestly direct the attention of engineers and mechanics; who, by taking the matter in hand, may gain such attention as to prevent a useless expenditure of labour and skill upon vessels armed with any kind of gun or projectile at present known, which would in combat at sea prove no match for vessels, of comparatively trifling cost, armed with submarine explosive shells.

I am, Gentlemen, yours obediently,

JN. HARVEY, Captain R. N.

Sandgate, 14th June, 1859.

APPLICATION OF BALLOONS TO WAR PURPOSES.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN, — Seeing in your number of the MECHANICS' MAGAZINE of the 27th of May an article on balloons and their application to war purposes, it has struck me that if a balloon was elevated to a suitable height, and there held by a rope to the earth, that this rope by having a wire in the core of it, and by the aëronaut having a galvanic battery and the other requisite apparatus in the balloon with him, a constant correspondence might be kept up between him and the people below. I throw out this hint for our electricians and aëronauts to improve upon if they see in it anything worth their attention.

I am, Gentlemen, yours truly,

E. FINCH.

Chepstow, June 10, 1859.

Proceedings of Societies.

ROYAL AGRICULTURAL OF ENGLAND.

June 8.—At a weekly Council held on this day, the Right Hon. Lord Berners, Trustee, in the chair. A letter from Mr. R. Wainwright was read relative to a compound that he stated he had discovered to be unusually fertilising. The Council expressed their willingness to receive any further particulars he might wish to communicate. Mr. H. Smythies, of Auckland, New Zealand, addressed an inquiry to the Council as to whether they were in possession of any remedy (poisonous or otherwise) against a small caterpiller, which he stated passes over the face of the country in swarms during hot dry summers and devours all vegetation. A communication from Mr. Greenwood, of Abermant, Brecon, was read relative to an insect that had destroyed his Mangel Wurzel corp. This insect is not seen during the day-time, and the specimens which were placed on the table had been collected very early in the morning. Lord Berners stated that his bailiff had found the Mangel plant on his lordship's estate eaten all over when about an inch high by a similar insect. Professor Simonds stated that his Mangel plants had been attacked by an underground grub. The Council directed the insects to be forwarded to Mr. Curtis, the entomologist, for examination, and also desired it to be stated in the reports of the proceedings of the meeting, that the Society would be obliged by any further information on this subject from the members or others whose Mangel crops had suffered in a similar manner to those above named, and in case any successful remedy had been discovered by an account of its nature and mode of application. Mr. Whitehead transmitted copies of the prospectus of the "Cottage Improvement Society," 18 Adam Street, Strand. Baron de Cetto, of the Bavarian Legation, transmitted copies of the Transactions and Almanac of the Agricultural Society of Bavaria. The thanks of the Council were ordered for the above communications, as also for the Journal of the Statistical Society, the Transactions of the Entomological Society and the American Geographical and Statistical Society, which were placed on the table. The Council then adjourned.

ROYAL GEOGRAPHICAL SOCIETY.

June 13.—A crowded meeting of the above Society took place at Burlington-house, the Earl of Ripon, President, in the chair.

Among those present were the Earls of Airlie and Sheffield, Lord Strangford, Sir Roderick Murchison, General d'Oxholm, Generals Sir G. Pollock, Portlock, Monteith, and Cannon; Admirals Sir G. Back and Gordon; Sir J. P. K. Shuttleworth, Sir H. Willoughby, Sir T. Fremantle, Sir C. Fellows, Mr. T. Bazley, M.P., Mr. H. A. Bruce, M.P., Mr. R. W. Grey, M.P., Mr. A. Russell, M. P., Mr. Danby Seymour, M.P., Mr. J. A. Warre, M.P., the Hon. G. Waldegrave, Captains the Hon. H. A. Murray, Collinson, and Craufurd, R.N.; Colonels Sykes, Everest, Lane Fox, Cocks, and Landon; Majors Stokes and Cooke; the Master of Clare College; Archdeacon Raymond; Messrs. Osborne Smith, C. White, Arrowsmith Findlay, &c.

ELECTIONS.—Lieutenant-General P. De la Motte, C.B., Captain R. F. Burton, Captain W. Fraser Tyler, Professor Hind (of Canada), John F. Bateman, C.E., A. Benson Dickson, Christian Hellmann, Henry Johnson, Coleridge Kennard, Daniel A. Lange, Walter D. Leslie, F. Butler Montgomerie, W. Moon, Stephen W. Silver, and Edward W. Stafford, Esqrs., were elected Fellows.

PROPOSALS.—The Duke of Newcastle, the Earl of Elgin, the Earl of Airlie, the Hon. Robert Marsham, Major Henry Cracroft, Captain Philip D. Margesson, R.A., George Barclay, Fred. W. Bigge, H. Austin Bruce, M.P., R. A. Osborn Dalyell (Consul at Erzeroum), George FitzRoy, William Fryer, Charles P. Grenfell, M.P., W. Vernon Harcourt, H. G. R. Robinson (Governor of Hong Kong), and William H. Smith, Esqrs., were proposed as candidates for election.

EXHIBITIONS.—Specimens of the weapons, manufactures, and natural productions, brought by Captains Burton and Speke from Eastern Africa, and likewise specimens of woods from the Zambesi brought home by Mr. Mc Leod, late Consul at Mozambique, and several maps of the seat of war, &c., were exhibited to the meeting.

The papers read were by Captain R. F. Burton, F.R.G.S., and Captain J. H. Speke, F.R.G.S., on "Explorations in Eastern Africa." A general résumé of the proceedings of the expedition having been given, the subject was divided under three heads—first, in explanation of the map of the country between Zanzibar and Lake Tanganyika, in the interior; secondly, description of the lake itself; and thirdly, discovery of the Lake Nyanza, or sources of the Nile.

An animated discussion followed the reading of the papers in which the President, Sir R. Murchison, Mr. Marqueen, Colonel Sykes, Mr. Danby Seymour, and Captains Burton and Speke took part; and the thanks of the society having been voted to the authors, the meeting adjourned to the 27th instant.

INSTITUTION OF CIVIL ENGINEERS.

May 10 *and* 17.—John Hawkshaw, Esq., Vice-President, in the chair. The discussion upon Mr. Kingsbury's Paper "On the Victoria (London) Docks," and upon Mr. Harrison's Paper "On the Tyne Docks," occupied both evenings. As the papers and the discussion would shortly be published *in extenso* in the "Minutes of Proceedings," it was considered unnecessary to print an abstract of the discussion.

Law Cases.

VICE-CHANCELLOR'S COURT, June 9.—(*Before Vice-Chancellor Sir W. Page Wood.*)

BETTS *v.* MENZIES.

Mr. Rolt, Mr. Hindmarch, and Mr. W. Morris moved on behalf of the defendants that the injunction awarded against them on the 21st of March, 1857, by this Court, to restrain them from importing and selling metallic capsules of the same or the like material as that described in the specification of the plaintiff's patent might be dissolved, and that an inquiry might be directed as to the damages sustained by the defendants by reason of the injunction, and that the amount might be paid to them by the plaintiff.

The patent claimed by the plaintiff in respect of metallic capsules for securing the corks of bottles has been the subject of much protracted litigation, both at common law and in equity, and it will be sufficient to state that upon a recent application to the Court of Queen's Bench for leave to enter the verdict recorded in the second trial for the defendant, the application was on the 30th of May last unanimously granted, on the ground that the plaintiff's patent was bad for want of originality, and was in effect defeated by a patent for a similar invention taken out by one Dobbs as far back as 1804. Under these circumstances the defendants moved to dissolve the injunction.

Mr. Willcock, Mr. T. H. Terrell, and Mr. Webster, for the plaintiff, opposed the motion, and contended that matters ought at least to be left *in statu quo* until the plaintiff's appeal from the Court of Queen's Bench to the Exchequer Chamber had been decided. They also contended that the legal question had been left undetermined by the Court of Queen's Bench, the defendants having raised an extraneous issue upon the construction of the rival specifications of Dobbs and Betts, upon which question alone that Court had given judgment, without adverting to the more material issues in the cause which had been decided by a jury in favour of the plaintiff.

Mr. Hindmarsh replied.

The Vice-Chancellor said that *primâ facie* there were the strongest possible grounds for dissolving the injunction, but the question in reality was whether, until the decision of the appeal from the Court of Queen's Bench, which would be heard in December next, there was such a case on the part of the defendant as would induce the Court to dissolve the injunction in the meantime. The plaintiff, by the concurrent decision of judge and jury, was admitted to be plainly and clearly the inventor of the process. He had also enjoyed for a long time an undisputed possession, until one of his own servants found his way to Belgium, and there described the process. It subsequently appeared that some 45 years before a patent for a similar invention had been taken out by one Dobbs, but everybody supposed that it was the patent of the plaintiff which was being invaded, and the defendant, it would seem, thought so too. There was considerable contest as to whether Dobbs ever did make any use of the invention which he wrote down on paper. It was said that he nor any one else could avail himself of the invention, as he had de-

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scribed it, until Betts took out his patent. There was evidence on both sides; but, at any rate, the issue was very distinctly raised as to whether Dobbs ever invented it all, and the jury found that he had not. His Honour, after adverting to the proceedings upon the various trials at law, said that, with respect to the recent judgment of the Court of Queen's Bench, it was a matter that weighed greatly with him. He was not sitting to review that decision, nor even to express any opinion upon it. But was there such a *bona fide* ground for an appeal that he ought to allow things to remain *in statu quo* rather than dissolve the injunction? Unless there were strong grounds for showing that the appeal was frivolous and merely interposed for purposes of delay, the Court must uphold the injunction until the trial at law was concluded, and that it was finally concluded could not be said until the appeal was determined. If the case were to be appealed to the House of Lords the question would be different, as there would then be a delay of two years. He was not in the slightest degree saying that the judgment of the Court of Queen's Bench might not be followed by the Exchequer Chamber; but it was to be observed that Lord Campbell stated that it was "after great doubt and deliberation" that he had come to his decision. Then, he confessed, he was unable to follow his Lordship's language in a part of what he stated as a matter of fact upon the specification. He should at once submit to his Lordship's judment as a matter of law, but he could not but think that there had been some misappropriation of facts, or error in the notes of the judgment, and further, that the attention of the judges had been directed to the question of construction of the specifications and that only. As the matter would merely remain undecided for some six months longer, while the plaintiff was confessedly the inventor, and had had the sole enjoyment for a long period, he should not dissolve the injunction. His Honour, after adverting to the circumstance that the defendant was residence abroad, and that with the exception of Clifford, who employed the process for the ornamentation of collins, there was no one else to be found who was infringing the patents, directed the motion to stand over until the hearing of the appeal in the Exchequer Chamber.

COURT OF EXCHEQUER, June 9.—*(Sittings in Banco, before the Lord Chief Baron, Mr. Baron Martin, Mr. Baron Bramwell, and Mr. Baron Watson.)*

HILLS *v.* THE LONDON GAS LIGHT COMPANY.

THIS was an action for infringing a patent, tried before Mr. Baron Bramwell at Guildford during the Summer Assizes last year, when a verdict was found for the plaintiff.

The patent was obtained for certain improvements in the manufacture of gas by taking the subsulphates, the oxychlorides, or the hydrated or precipitated oxides of iron, either by themselves or mixed with sulphate of lime, or sulphate of muriate of magnesia, baryta, strontia, potash, or soda, and absorbing them into or mixing them with sawdust, or peat charcoal, or breeze, or other porous or absorbent material, so as to make a very porous substance easily permeable by the gas. The material was to be put into a purifier and the gas passed through it, depriving it of its sulphuretted hydrogen, cyanogen, and a part of its ammonia, which would be absorbed into the porous material, water being at the same time formed by the union of the oxygen of the oxide and the hydrogen of the sulphuretted hydrogen absorbed. The patent also claimed renovating the material, after it had ceased to purify the gas, by exposure to air.

Mr. Bovill moved for and obtained a rule upon several grounds—1. That the plaintiff's invention was not new, by reason of Croll's and Laming's patents, and the disclosures made by their respective specifications. 2. That the plaintiff was not the inventor on similar grounds. 3. That the plaintiff's specification was insufficient and bad, for not specifying which hydrated oxides of iron would answer the purpose, or for claiming all hydrated oxides of iron, though some would not purify gas. 4. That the mere application of hydrated oxide of iron to absorb sulphuretted hydrogen from gas was not the subject of a patent, its properties and effects with reference to sulphuretted hydrogen being previously well known. 5. That the renovation of hydrated oxide of iron by exposure to air being previously well known, its application to purifying gas was not the subject of a patent.

At the trial several points were raised by the learned counsel for the defendants, and the most important was, that the subject-matter of the plaintiff's patent was not new, it having been disclosed to the world by Mr. Croll, who in the year 1840 took out a [for the purification of gas by the use of black oxide of manganese, or the oxide of zinc and the oxides of iron; and also by Mr. Laming, who in 1847 took out a patent for arriving at the same result by chloride of calcium.

The Attorney-General, Mr. Montagu Chambers, Q.C., Mr. Grove, Q.C., Mr. Hindmarch, and Mr. Charles Pollock now showed cause against the rule; Mr. Bovill, Q.C., Mr. Lush, Q.C., Mr. Webster, and the Hon. G. Denman appeared to support it.

After the Attorney-General and Mr. Chambers had been heard the Court adjourned the further hearing of the arguments until next morning.

JUNE 11.

The arguments for the plaintiff were necessarily very long, and we are compelled to give the substance of them only.

To invalidate a patent on the ground of a prior publication in a specification it was contended that the prior specification must so disclose the invention that the public (that is, that portion of it acquainted with the subject) would be able to practise it without an experiment. If it included, in general terms, matters or processes some of which would succeed and others which would not, then it was not such a publication as would avoid a subsequent patent for the material or process which would have succeeded. In the present case Croll had used the term oxides of iron. Admittedly some of them would succeed, but others would not—that was not disclosing to the public which of the oxides would succeed, and, therefore, if there were no public uses, the public were thrown upon experiment. The plaintiff had discovered the particular oxide that would succeed, and was, therefore, an inventor and entitled to letters patent for his invention. If it were otherwise a person by the widest claim or mere assertion might stop any future inventor from patenting anything within the generality of the assertion. The second specification relied on by the defendants (Laming's) did not indicate that precipitated oxide of iron would purify coal gas; he gave and claimed a mixture as such in which, if taken to operate in the liquid way, precipitated oxide of iron was one of the ingredients; but although he might be entitled to the mixture he had not given to the public the knowledge that precipitated oxides alone would succeed, or were, indeed, the active ingredients, and, therefore, he could not go beyond the mixture he claimed. The plaintiff made the discovery of what really would succeed, and disclaimed Laming's mixture. The plaintiff had really invented and first published an invention which had not been indicated to the public by Laming. That both Croll's and Laming's specifications, when read as a whole, indicated the preparations by the dry way, and, therefore, anhydrous oxides—that was contradicted by the defendants' witnesses at the trial, but the question was one entirely for the jury to decide, therefore the Court ought not to enter a verdict for the defendants or direct a non-suit.

When Mr. Grove had concluded his arguments,

The Lord Chief Baron said that it had made a great impression upon the minds of the Court.

Mr. Bovill and Mr. Lush were heard in support of the rule, when the Court adjourned.

The case will be resumed at 11 o'clock on Monday morning next.

Baron Martin intimated that notice had better be given for sittings in Banco, after term.

COURT OF COMMON PLEAS, Westminster, June 14.—*(Sittings at Nisi Prius, at Guildhall, before Mr. Justice Crowder and a Common Jury.)*

BROWN *v.* OXLEY AND OTHERS.

Mr. Knowles, Q.C., and Mr. Beasley were for the plaintiff; and Mr Hawkins, Q.C., Mr. Karslake, and Mr. Brandt for the defendants.

This was an action brought by an architect to recover a large sum of money from the defendants, who are the patantees of a peculiar kind of wheel for the manufacturing of which they had taken premises at King's-cross.

Mr. Knowles having opened the case to the jury, it became clear that the case would be more efficiently disposed of by an arbitrator. It was accordingly, after some discussion, referred to Mr. Serjeant Hayes, with full powers to state a case for the opinion of the Court on any points of law which might arise, if he should think fit.

SECONDARY OFFICE, Basinghall-street,—*(Before Mr. Potter.)*

CARTER *v.* COCKHEAD.

Counsel, Mr. Powell; Solicitors, Messrs. Langley and Gibbon. In this case it was decided that the user of a patent was liable to the patentee in the shape of royalty if he persisted in using the invention after receiving notice of its being an infringement of a patent. The alleged infringement was "The surrounding a gas light with cut glass drops." The jury gave a verdict for £21, being £1 per annum per light royalty; the defendant having used seven lights thus surrounded for three years.

Our Weekly Gossip.

WE understand that in order to have an authoritative investigation into the whole question of lighting public galleries with gas, the Lord President of the Council has named a commission of inquiry, consisting of Professors Faraday, Hofmann, and Tyndall, with Mr. Redgrave, R.A., and Captain Fowke, R.E., who will commence their investigations immediately.

Our recent article urging the laying down of a direct Mediterannean line of submarine telegraph has had, we are happy to say, its legitimate effect. The *Daily News* of Tuesday last, in its City article, says:—"The existing war on the Continent places in so striking a light the importance of securing a means of telegraphic communication with the British possessions in the Mediterranean, totally independent of any continental medium, that we have much satisfaction in stating that Government have entered into arrangements for laying down, as speedily as possible, a telegraphic cable direct from Falmouth to Gibraltar—a distance of 1,100 nautical miles. Tenders will shortly be invited for the manufacture of the requisite length of cable. Meanwhile, the Gutta Percha Company are already engaged in preparing the covering for it. The engineers charged with the carrying out of this important Government undertaking are Mr. Gisborne and his associates, and it is believed that by August next considerable progress will have been made. With regard to the motives of Government in thus departing from the ordinary practice of employing the agency of a public company, some curiosity will be felt. Messages on the service of the State will of course have priority over all others; but as the undertaking will be constructed with the money of the nation, a proper degree of attention must be paid to commercial requirements. It is surmised that the authorities may, perhaps, contemplate handing over the line, when completed, to be worked or leased by a public company or other parties. A decided defect is involved, however, in the existing arrangement that the cable shall contain only one wire, the more especially as, although the line is at present to be carried only to Gibraltar, its ultimate extension to Malta and Alexandria, there to form a junction with the wires to India, is certain and not remote. Until this comprehensive scheme is carried out, there will be no real security for interests of vast national importance, nor will Government be making a proper use of the invaluable appliances placed at their command by modern science."

Notwithstanding that the establishment of Woolwich Arsenal engaged in the various departments of war has for some time exceeded that of any former period, large additions have been made every day during the past week, consisting principally of men required for preparing guns, shot, shell, and cartridges, for use and for exportation, removing stocks of obsolete or doubtful stores to be examined and recast, and cleaning and burnishing arms and materials of every description which may possibly be brought into sudden requisition. The *Times* correspondent furnishes the following particulars:—The number of men, women, and lads who daily assemble within the Arsenal at the various working hours, including the contractor's labourers, are calculated at about 12,000 persons. The Royal carriage department and the laboratory employ 6,718 military and civil officers, managers, masters, foremen, artificers, labourers, and others; the gun factories, the military storekeepers, and the inspectors of machinery, about 2,000; the other departments each a proportionate number, and the contractors about 3,000. A large building is in course of erection at the terminus of the new railway junction in the Arsenal, to be used as a store reception room. The length of the building is stated to be 272 feet, and the breadth 72 feet. The contract has been granted to Mr. Myers, who recently built the pattern room attached to the carriage department. The new branch of Sir W. Armstrong's rifled ordnance department, under contract by Messrs. Lucas Brothers, is progressing rapidly; the tall chimney, intended to serve the machinery, and to be 100 feet high, is far advanced, and the exterior walls of the factory are ready to receive the iron girders to lay down the first floor. The old Lancaster shell factory, adjoining the building now in progress, is employing 180 smiths, hammermen, and others, and on Saturday commenced forging the coils to carry out the manufactory of the new rifled ordnance as far as the limits of the present establishment will admit.

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NOTICES.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

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All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of insertions less than 13; for 13 insertions, 4d. per line; and for 52 insertions, 3d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

The demand for Mr. E. J. REED's paper—

ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY, IN RESPECT OF DIMENSIONS, FORM, MEANS OF PROPULSION, AND POWER OF ATTACK AND DEFENCE,"

has been so great that the Journal of the Society of Arts, the MECHANICS' MAGAZINE, and all other Scientific Journals in which it appeared in December last, are now out of print. The demand still continuing, it has been deemed desirable to reprint it in a separate form. An 8vo. edition of it, in large type, and on fine paper, has, therefore, been prepared, and may now be had at the Office of this Magazine, price 1s.

THE SCREW STEAMER COLOMBO.

THE Colombo, one of the fine screw steamships belonging to the Peninsular and Oriental Company's fleet, left Southampton Docks on Wednesday, in charge of acting-captain J. Laing, for the measured mile in Stokes Bay, to undergo an official trial before resuming her place in connection with the mail service. This vessel, which is about four or five years old, was sent round to Liverpool in September last for the purpose of being lengthened at Mr. Laird's building yard at that place. She was cut asunder, and lengthened 42 feet midships, making her present length 335 feet over all. New boilers, on Lamb and Summers's patent, have been put in, and fitted with Mr. Andrew Lamb's patent superheating steam apparatus. Her fore cabin is lengthened, new iron fore and main masts erected, and several other improvements effected, making her one of the most convenient and comfortable vessels in the Company's service. By the alterations which have been made in the Colombo, she now has capacity for 200 tons of cargo, 200 tons of coal, and 50 passengers more than she before possessed, while the external appearance of the vessel is considerably improved. Several scientific and other gentlemen were on board to witness the trial. The first run at the mile was made in 5 min. 18½ sec.; second, 4 min. 24 sec.; third, 5 min. 9 sec.; fourth, 4 min. 33 sec. The mean speed was 12½ knots per hour, being a slight increase on her former rate before the alterations were made; steam pressure, 18lb.; vacuum, 25 in.; revolutions, 26. Her draught of water was 16 ft. 11 in. forward; 19 ft. 6 in. aft. Weight of coals on board, 789 tons; ditto water, 50 tons; other stores, 20 tons. The Colombo is propelled by a pair of balance beam engines (by Napier, of Glasgow), which drive a geared screw, and which revolves three times to every revolution of the engines. She is fitted with two steam winches, which are available for working the fire pumps, disposal of cargo, weighing anchor, or overcoming a leak; but this machinery can be worked either by hand or steam. The deck forms a magnificent promenade, and the whole of the internal arrangements are of the most perfect character. She is bark-rigged, and can carry a considerable spread of canvas. The Colombo will leave Southampton for Alexandria on Monday next, with the East India and China mails.

The Submarine Telegraph Company are about to submerge a cable from Weybourne, on the Norfolk coast, to Tonning, on the shores of Denmark. The cable, which will comprise three wires, will be 388 miles in length, and will be supplied by Messrs. Glasse, Elliott, and Co., who seem to be doing their utmost to "put a girdle round the earth," although the operation takes more than 40 minutes. The line is expected to be completed in the course of the ensuing month.

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated May 18, 1859.

1234. J. Brennand, of Manchester, Calico Printer. Certain improvements in the construction of carriages for the conveyance of passengers, goods, and minerals, and also in the apparatus for propelling the same.

Dated May 21, 1859.

1258. T. S. Cressey, of Burton-on-Trent. Improvements in machinery for cutting staves for casks.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, June* 14, 1859.)

287. R. Gormully. Piano-fortes.
296. E. E. Allen. Stereoscopic apparatuses.
305. G. Leach. Leashing and winding yarn.
311. J. Petrie, jun., and T. Wrigley. Paper.
316. W. Thompson. Printing telegraph.
321. R. A. Brooman. Shirts. A communication.
323. F. H. Maberly. Obtaining spring power.
327. W. R. J. Packer. Ploughshare.
331. F. H. Maberly. Corking, taps, bottles, &c.
338. G. F. Chantrell. Charcoal.
341. W. H. Crispin. Atmospheric and hydraulic engine.
343. J. Lee. Cranks.
356. J. B. Redman. Carriage ways.
361. E. Wilkins. Flower vases.
370. W. E. Newton. Refining sugar, &c. A communication.
371. E. Herring. Alcohol.
375. J. G. Taylor. Writing materials.
376. W. A. Covert. Railway switch. A communication.
378. G. L. Stocks. Steering apparatuses.
388. R. Cogan. Crushing and mixing.
393. G. Hadwen and J. Wadsworth. Jacquard apparatus.
395. T. Willis and G. Chell. Spinning, &c.
398. S. H. Huntly. Cooking apparatus.
399. T. White and G. Jenkins. Raising and lowering ships.
407. W. E. Newton. Sewing machines. A communication.
408. J. Parkinson. Coffins.
451. C. Garton. Treating cane sugar.
461. W. Clay. Beams and bars.
462. W. Basford. Bricks and tiles.
520. J. H. Johnson. Stopping horses. A communication.
547. P. Currie. Spindles for locks, &c.
617. A. V. Newton. Rolling horse shoe iron. A communication.
742. G. Neal. Gas apparatus.
741. J. H. Johnson. Sheet tin. A communication.
833. T. Richardson and G. W. Jaffrey. Harbours of refuge, &c.
848. A. Shanks. Forging metals.
851. L. Brierley and H. Geering. Ornamenting furniture.
1030. J. Higgin. Treating madder.
1035. W. Bayliss. Iron-hurdles and fencing.
1200. R. Gourlay. Moulds for casting.
1250. J. P. Budd. Tin and terne plates.
1263. W. Cram. Printing and dyeing.
1275. A. V. Newton. Washing machine. A communication.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed June 10, 1859.

2836. A. Barclay.
2837. C. Hodgson.
2849. A. Rollason.
2850. J. A. Carruthers and T. Blackburn.
2851. R. Whittam.
2854. J. E. Boyd.
2855. R. A. Brooman.
2864. R. A. Brooman.
2866. F. Jossa.
2867. J. Pendlebury.
2870. J. Wardill.
2880. R. Wilson, sen., and R. Wilson, jun.
2882. A. and F. J. Stokes.
2886. J. W. Friend.
2929. F. Ransome.
2937. A. Barclay.
2946. J. Railton and S. Lang.
2956. J. Smethurst.
3003. J. Lees and W. Heap.
55. G. K. Geyelin.
242. J. Kerr.
434. W. H. Horstmann.
651. G. B. Galloway.
701. G. Haseltine.
858. F. M. Crichton.
916. P. Hill and J. Moore.
919. J. Crossdale.

Sealed June 14, 1859.

2874. C. F. Vasserot.
2884. J. H. Selwyn.
2885. J. W. Edge.
2888. J. J. Marçais.
2890. R. A. Brooman.
2893. W. B. Johnson.
2975. W. Taylor and W. D. Grimshaw.
3001. M. D. Wyatt.
101. R. Mushet
121. T. Sampson.
133. W. Betts.
141. W. E. Newton.
961. J. Sidebottom.
997. L. P. Porter.
1017. J. Gillies.
1023. W. Gibson.
1047. W. Marshall.
1111. L. R. Blake.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1358. W. E. Wiley.
1373. T. Skaife
1375. R. A. Brooman.
1381. A. V. Newton.
1387. J. Combe.
1388. A. V. Newton.
1390. J. Eives.
1392. P. and J. Unwin.
1399. W. Massey.
1400. C. J. Dumery.
1425. H. Holland.
1427. A. G. Baylis.

LIST OF SPECIFICATIONS, &c.,

Published during the week ending June 10, 1859.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s d		s d		s d		s d		s d		s d
2258	1 1	2465	0 3	2476	0 3	2489	1 2	2500	0 3	2512	0 3
2429	2 9	2466	0 3	2477	0 10	2490	0 9	2501	0 3	2515	0 7
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2461	1 2	2472	0 6	2483	0 3	2496	0 6	2507	0 9	2523	0 5
2462	0 3	2473	0 3	2484	0 3	2497	0 7	2508	0 5	2525	0 3
2463	0 3	2474	0 3	2485	0 9	2498	0 6	2510	0 10	...	...
2464	0 3	2475	0 3	2488	0 3	2499	0 3	2511	0 3	...	...

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINES, &c., 2522, 2530, 2545, 2548.
BOILERS AND THEIR FURNACES, 2549, 2556, 2558.
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 2532, 2569, 2573, 2576.
SHIPS AND BOATS, including their fittings, 2524, 2531, 2537, 2575.
CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 2591.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals. *None.*
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 2534, 2539, 2543, 2544, 2557, 2562, 2579, 2581, 2589, 2590, 2592, 2593.
BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c., 2535, 2585, 2591.
LIGHTING, HEATING, AND VENTILATING, 2523, 2527, 2559, 2578.
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 2541, 2545, 2553, 2560, 2587.
METALS, including apparatus for their manufacture, 2525, 2540, 2547, 2565.
CHEMISTRY AND PHOTOGRAPHY, 2554, 2561.
ELECTRICAL APPARATUS, 2580, 2584.
WARFARE, 2564, 2577.
LETTER PRESS PRINTING &c. *None.*
MISCELLANEOUS, 2521, 2523, 2528, 2529, 2533, 2536, 2538, 2542, 2546, 2550, 2551, 2552, 2555, 2563, 2566, 2567, 2568, 2570, 2571, 2572, 2574, 2582, 2583, 2585, 2586, 2595.

2521. G. SCHMIDT. *Improvements in the construction of core bars.* Dated NOV. 10, 1858.

This consists in combining together the several sections into which a core bar is divided longitudinally, by hinging them each at one extremity to an end piece or plate, so that each section can move inwards on its hinge towards the central line or axis of the bar. *Patent abandoned.*

2522. E. HUMPHRYS. *Improvements in steam-engines and boilers.* Dated NOV. 10, 1858.

In arranging steam-engines for propelling vessels by screw propellers the patentee combines with ordinary low pressure cylinders fixed in a horizontal or inverted position, other cylinders of smaller size, which are to work at a higher pressure than the low pressure cylinder, and in connection with it in the manner known as Woolf's system. The piston rods of the low and of the high pressure cylinders are so coupled together as to convey the power to a single shaft through a single connecting rod, and they are enclosed together in a steam jacket. Before the steam is admitted to the high pressure cylinder it is superheated by passing it through heating apparatus. *Patent completed.*

2523. G. SCHMIDT. *Improvements in the manufacture of cast iron pipes.* Dated November 10, 1858.

In constructing the moulds a hollow iron pattern is employed, and this is laid on a table and secured to it by bolts; the top of this table is hollowed out to allow just one half of the pattern to descend below its upper surface. If the hollow formed in the table is wider than the diameter of the pattern, the extra space is filled by strips of wood put in on each side; on to the table and over the pattern a rectangular frame is placed, the ends of which are arched to pass over the ends of the pattern; the width and length of the opening in this frame are about one inch greater than the diameter and the length respectively of the pipe to be made. The portion of the pattern above the surface of the table is then covered all over with a suitable thickness of loam, the loam being brought to a uniform thickness by a bar or template moving about the central axis of the pattern; this coating of loam is dried by turning steam into the interior of the pattern, which is closed at the end and connected with a steam-pipe. When the loam is sufficiently set the rectangular frame is to be lifted up so as to withdraw the half mould of loam from the pattern, but before this is done (and before the loam is

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dried) it is closed in at the two ends by arched plates or castings, which are fixed by bolts or keys to the curved ends, and also to the straight sides of the rectangular frame, and on these plates or castings are fixed bars connecting together the two end plates, and bearing on the surface of the loam. The bars are held against the loam at several points in the length of the pipe by semicircular pieces passing over the mould and attached to the two sides of the rectangular frame. After the half mould has been removed from the pattern and been dried, the interior surface is finished, blacked, and again dried, and then two of the half moulds, with their supporting frames, plates, and bars, are clamped together, and a core introduced between them; afterwards the casting is effected in the usual manner. *Patent abandoned.*

2524. A. J. BROOKS. *An improvement in screw propellers.* Dated November 10, 1858.

The object here is to prevent slip. The invention consists in adding to the face of an ordinary screw propeller blade one vane, or two or more vanes on each side of the axis. One vane is fixed at the outer extremity of each blade and is shaped and fitted so as to prevent the water flying off by centrifugal action from the ends of the blade. The peculiar feature of the invention consists in employing vanes in the form of segments of cylinders concentric with the axis of the propeller and included between the propelling face of the blade and a plane passing through the aftermost edge of the blade at right angles to the axis. *Patent completed.*

2525. G. SCHMIDT. *Improvements in ladles employed when casting metals.* Dated November 10, 1858.

This consists in so arranging the ladles as to prevent the scum or slag passing with the metal into the mould when pouring. This object is effected by placing a partition in the ladle, leaving a space between the lower edge of the partition and the bottom of the ladle. When the metal is tapped into the ladle it is allowed to run into one of the two divisions, and in pouring the metal from the ladle it is poured from the other division, the metal passing under the partition. *Patent abandoned.*

2526. E. LOCKE. *Improvements in the construction of gas meters.* Dated November 10, 1858.

Here the inventor mounts the measuring drum of wet gas meters in a swinging frame, and keeps it at a determinate height with respect to the water level, by supporting it by a float. The frame which carries the drum may be forked and jointed to the meter-case, and the float may be connected with the bearings or with the axle of the drum. The motion of the drum is communicated to the counting apparatus by means of a deep-toothed pinion, which allows for the rise and fall of the drum. At both the entrance and exit side of the meter he proposes to insert slips of glass into the case for showing the level of the water and to remove from the glass any deposit that might hide the water level. He applies a wiper (made of sponge) to the inner surface of the glass by a rod which passes through the case. Thus, when an inspection is required, the wiper may, from the outside of the meter, be drawn over and caused to clean the glass, so as sufficiently to exhibit the water level. *Patent abandoned.*

2527. C T. JUDKINS. *Improvements in gas regulators.* Dated November 10, 1858.

This relates to two previous patents of the patentee. He now fixes a bar across the regulator, and suspends to such bar a balance lever-rod at right angles therewith, and connects one end of such balance-rod with the disc or with the spindle of the valve, which is nearer the end of the regulator at which the outlet is situated than hitherto, and a weight or counterpoise slides or screws on or is otherwise connected with the other end of the balance-rod, so that, by moving such weight to or from the point of suspension of the balance-rod, the amount of pressure at which he intends the valve in the inlet chamber to be closed is regulated. *Patent completed.*

2528. J. BLETHYN. *Improvements in the manufacture of fuel.* Dated November 11, 1858.

This consists of an amalgamation of small anthracite coal or dust with small bituminous coal, and coal tar, pitch, and water in certain definite proportions. *Patent completed.*

2529. J. and W. LEES. *An improvement in the construction of oil cans.* Dated November 11, 1858.

This consists in constructing oil cans with an air tube, reaching from near the bottom thereof to within a short distance from the end of the spout through which the oil is delivered; both the air and delivery tubes are fixed to the lid, and they are surmounted by a case into which any oil that runs down the delivery spout is collected. Thus the oil cannot escape from the oil can when it is lying down, and the can may be filled until the oil nearly reaches the lid. *Patent completed.*

2530. R. WRIGHT and T. J. MERCER, jun. *A new or improved motive-power engine.* Dated Nov. 11, 1858.

This consists of an engine in which motive power is obtained by compressed air, which engine also effects the compression or condensation of the air, by the expansion of which the power is obtained. The engine consists of the following parts:—A series of condensing pumps communicate with a cistern or reservoir provided with a safety valve. The piston rods of the pumps are connected by rods and clips with a series of eccentrics situated on the main shaft of the engine. The eccentrics are so fixed on the shaft that the strokes of the pumps follow each other in regular succession, and a uniform density is maintained in the condensed air in the reservoir. The condensed air is conducted into a cylinder similar to the cylinders of a steam engine, where it acts upon a piston in the same way as steam. *Patent abandoned.*

2531. F. H. MABERLY. *Improvements in the construction of ships of war and other vessels, their machinery and appurtenances.* Dated November 11, 1858.

This invention is not described apart from the drawings. *Patent completed.*

2532. M. BENSON. *An improved manufacture of rails for railways.* (A communication.) Dated Nov. 11, 1858.

This relates, 1, to means for constructing the improved rail, and consists in furnishing rollers with a combination of grooves of certain proportions, so that a rail made by a portion of them will resemble a V-rail in shape in its transverse section; and the rail thus made, by being passed through other grooves, will be converted into the shape of a hollow T-rail. Other operations are then performed, but these, with other parts of the invention, are not described apart from the drawings. *Patent completed.*

2533. A. V. NEWTON. *Improved apparatus for securing doors of safes, closets, and apartments.* (A communication.) Dated November 11, 1858.

This relates to locking the doors of bank safes on the inside automatically by latching bars operated by a clock-work movement; and to the locking or unlocking the doors of rooms in hotels, &c., by combining an auxiliary bell-pulling wire with the ordinary bell-pulling wire of the room. *Patent completed.*

2534. T. GRAY. *An improvement in separating wool and animal fibres from vegetable fibres contained in mixed fabrics.* Dated November 11, 1858.

This consists in soaking such mixed fabrics in water, so that the animal fibres therein may be filled with water before subjecting the mixed materials to the action of acids. *Patent abandoned.*

2535. J. RAE. *Improvements in cisterns suitable for containing water for household uses.* Dated Nov. 11, 1858.

The patentee employs a four-sided cylindrical or other form of vessel, having a bottom which inclines in every direction towards a central point, and at this point an opening is formed from which a pipe leads to the closets of the house, and by this pipe any sediment is carried away. Within the cistern is arranged a filter, consisting of a vessel having an opening in the top which is filled by a sponge, to prevent the solid impurities of the water from entering. In the interior of the vessel is a perforated plate on which beds of filtering material rest, those employed being first a bed of sand, then one of charcoal, and afterwards another one of sand. From the lower part of the filter, under the perforated plate, a pipe passes to the exterior of the cistern and terminates in a tap, through which filtered water may be drawn. The cistern is also furnished with a tap for drawing unfiltered water. *Patent completed.*

2536. A. MICKELTHWATE. *Improvements in treating and manufacturing buffalo and other horn, so as to be used as a substitute for whalebone, and for other useful purposes.* Dated November 11, 1858.

The inventor first soaks the horne in urine, potash, or other alkaline leys, for several days. He then splits the horn in breadths, warms the outsides over a fire, and then places it in a press, so that the inside of the horn shall go against a metallic surface, the outside of the horn having a pad of leather or horn shaving put over it. This process is for straightening the length of horn before entering the cutting machine. The horn lengths are then boiled or steamed, and when sufficiently soft pass through rollers, which are hollow to admit iron heaters or steam, to keep the rollers hot. The horn then comes in contact with knives or cutters, and is cut into shreds or breadths of the required thickness. *Patent abandoned.*

2537. J. BUCHANAN. *Improvements in propelling vessels, ships, and boats.* Dated November 11, 1858.

This relates to former patents dated 18th September, 1856, and 6th July, 1858. A central enclosed paddle-wheel or propeller is contained in a channel or recess in the vessel's bottom, but no provision was heretofore made for securing a feathering action for the floats or actual propelling surfaces. This is provided for in the present invention by an automatic action, which causes each float to turn upon its vertical centre or joint. The feathering action is also intended for use in side or other paddle-wheels. *Patent abandoned.*

2538. T. F. COCKER. *Improvements in the manufacture of steel and iron wire, also of sheets and strips of steel.* Dated November 12, 1858.

This consists in immersing such wire, or strips, or sheets when in a heated state, as taken from the annealing pot or oven, in hot water, hot lime and water, or in oil, or other liquid in a heated state. *Patent completed.*

2539. J. OGDEN. *Improvements in shuttles for looms.* Dated November 12, 1858.

The inventor makes the shuttles totally of steel, homogenous metal, malleable iron, brass, copper, or like metal, instead of making them of wood and metal. *Patent abandoned.*

2540. J. G. MARTIEN. *Improvements in the manufacture of iron, and in the apparatus employed in such manufacture.* Dated Nov. 12, 1858.

The patentee according to this specification overcomes many difficulties in connection with the manufacture of iron, and keeps the puddling furnace supplied with the required quantity of deoxydized ore, so as to maintain a continuous working in the puddling furnace, 1. By a novel mode of constructing, arranging, and working the deoxydizing chambers. 2. By an arrangement of parts whereby the contents of the deoxydizing chambers may be discharged with greater facility than heretofore. 3. By an improved mode of supplying air to the combustible gases evolved from the puddling furnace, and whereby the oxydizing chambers are heated. 4. By a mode of arranging and operating the dampers in the flues so that the heat in the apparatus may be regulated with facility, so as to retain it in contact with the deoxydizing chambers when required, and prevent it from escaping when the puddling furnace is not at work. *Patent completed.*

2541. D. TURNER. *Improvements in the manufacture of wood soles for clogs, boots, and shoes.* Dated November 12, 1858.

This consists in cutting each block or piece of wood into two pieces so as to leave a projection in the under side of each piece to form a heel, and then to bend the part of each piece beyond the heel by dies, plates, &c. The wood before being subjected to pressure is steamed, and is held under pressure until it is set to the shape desired. *Patent abandoned*

2542. G. T. BOVEFIELD. *An improved apparatus for illustrating conic sections and the lines of the globe.* (A communication.) Dated November 13, 1858.

This consists in mounting the globe with an extended tubular horizon and moveable graduated meridians made of materials transparent, translucent, or opapue, capable of being written on with a pencil, and of having the writing or work easily wiped off. In connecting with the globe a surface divided into zones, &c., capable of being marked upon with a pencil, and of having the writing easily rubbed off. In having the hollow cone so constructed that the pole may be elevated, so as to mark the visible horizon for any latitude, or to mark the ecliptic. And when resting in a horizontal position to mark the meridians all by holding the globe steadily in its position, and drawing the pencil around on the edge of the extended horizon, and in that the pencil may rest on the proper point of that horizon. The globe is revolved to draw the equator and all circles parallel to it, and in having the segment of the cone cut into conic sections for illustrating the ellipse, the parabola, and the hyperbola. *Patent completed.*

2543. M. N. MILLS and N. SIDEBOTHAM. *Certain improvements in looms for weaving.* Dated Nov. 13, 1858.

This relates chiefly to looms for weaving fabrics, and consists, 1, in working the jacquard cylinder of the pattern card by an improved-shaped cam fixed to the cam or tappet-shaft. 2. In making the hooks of the jacquard to swivel on centres; these hooks may be taken down from the top by a lever or knife, or the shed may be divided in the centre by two levers, the said levers or knife for forming the shed being worked by a single or double tappet or eccentric. 3. In the application of elastic bands to the shafts or healds of looms for raising them after they have been drawn down by the shaft motion or otherwise. *Patent completed.*

2544. J. BENYON and J. W. B. BOWDEN. *Certain improvements in looms for weaving.* Dated Nov. 13, 1858.

This consists in working the healds from below by bottom jacks or tappet-levers of the usual construction, which are connected by rods to the lower side of the healds. The healds are secured in rigid frames guided at the sides or otherwise. *Patent completed.*

2545. J. WADSWORTH. *Improvements in the construction of moveable or adjustable heels for boots and shoes, and of spurs adapted thereto, and to be used therewith.* Dated November 13, 1858.

The patentee claims, 1, a method of uniting or joining the moveable to the fixed part of the heels by rings and discs with interlocking flanches. 2 A method of constructing spurs, and attaching the same to the moveable heels by hoops forming parts of the said spurs, and adapted to encircle the rings of the moveable heels. *Patent completed.*

2546. W. ASHTON and T. CARTMELL. *Improvements in air-pumps, part of which improvements is also applicable to the pistons of other pumps and of steam-engines.* Dated November 13, 1858.

This consists, 1, of a double acting air-pump for condensing steam-engines. The patentees employ two condensers, one connected to an exhaust pipe leading from the steam cylinder above the piston, and the other connected to a similar pipe leading from the said cylinder below the piston, and each furnished with a separate injection cock. A pipe from the lower part of one of these condensers communicates with the lower part of the air-pump cylinder below the bucket or piston, and a similar pipe from the lower part of the other condenser communicates with the upper part of the air-pump cylinder above the bucket or piston. Each of these pipes has a valve opening only towards the air-pump. The air-pump cylinder has two delivery pipes, one at or near the top, and one at or near the bottom thereof. These two delivery pipes each have a valve opening only from the cylinder. The air-pump is thus double acting. Each of the exhaust pipes leading from the cylinder to the condensers has a vacuum valve provided with a hand lever. This valve may be opened when required to let air into the exhaust pipe when the steam is cut off, and thus prevent the rising of the water into the steam cylinder. It relates, 2, to the packing of pistons. The packing consists of two outer slightly eccentric rings, which are divided at their thinnest part so as to give equal elasticity throughout their circumference, and are conical upon their inner surfaces, and two inner spring rings (also eccentric and divided) conical upon their outer surfaces. These inner rings have a constant tendency to expand, and are furnished (in the interior) near their ends or points of division with lugs or ears through which a screw bolt passes. When the piston is first put in the cylinder the ends of the spring rings are drawn close together by the nut, which is then slackened to allow the springs to exert their elasticity as much as required. There is a nut also on the screw between the lugs to keep the spring expanded. *Patent completed.*

2547. J. COURAGE and F. BENNETT. *Improvements in furnaces for reducing and smelting ores, scoria, slag, and waste.* Dated November 13, 1858.

The object here is to utilize the heat which is ordinarily allowed to pass off into the atmosphere from the slag hearth, or from the cupola furnace employed in the reduction or smelting of ores, scoria, and slag, by rendering it available for the reduction of the "waste" from ores. The invention consists, 1, in constructing, in connection with the hearth or furnace, a horizontal or nearly horizontal furnace or bed upon which the waste is laid, and over which the products of combustion from the hearth or furnace are conducted for partially or wholly reducing the waste. 2. In regulating the degree of heat applied to the said waste by a supplementary fire or furnace constructed with one or more of the improvements described in the specification of a patent granted to the said John Courage, dated 25 May, 1858. *Patent completed.*

2548. J. TAYLOR. *Improvements in portable steam-engines.* Dated Nov. 13, 1858.

This consists in constructing an engine with its boiler upon a framing which is mounted upon wheels of suitably large diameter and breadth of face. The patentee supports the fore end on wheels of smaller diameter, and when he

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employs six wheels he couples or connects the axles of the two leading wheels and the two trailing wheels together by suitably arranged connecting bars, braces or rods crossed longitudinally, the hind near wheel axle being connected to the fore off side axle, and *vice versâ*, so that the direction of motion of the leading wheels being changed, the trailing wheels follow in the two bearing or driving wheels, whilst the two leading wheels are suitably mounted to swivel or turn, to change the direction of the engine by a steering wheel. This and other features of the invention require reference to the drawings. *Patent completed.*

2549. D. AULD. *Improvements in furnaces and boilers, and in the generation and treatment of steam.* Dated Nov. 13, 1858.

This consists, 1, in an arrangement of water spaces and tubes in connection with the boiler and furnace, for supplying the air to the burning fuel in a heated state, and in a properly subdivided condition, so as to embrace the whole of the burning mass upon the furnace bars, whereby wasteful emission of smoke is prevented and combustion efficiently maintained. The invention consists, 2, in a mode of increasing the efficiency of steam, by passing it on its way from the boilers to the working cylinders of the engine, or other apparatus through an arrangement of pipes disposed in the discharge flues of the boiler. *Patent completed.*

2550. M. SWAN. *Improvements in the construction of floating docks and other floating structures.* Dated Nov. 13, 1858.

According to this invention, when applied to the construction of floating docks, it is proposed to construct the dock of two or more pontoons, connected at their lower or under ends by strong girders supporting a cradle, the space between the two pontoons being sufficient to receive a ship. The details of the invention may be variously modified. *Patent abandoned.*

2551. L. PETRE. *Improvements in the application of glass to ornamental and useful purposes.* Dated Nov. 13, 1858.

This consists in the use of glass having ornamental or other subjects prepared on the one side, the ornament or subject of such preparation being visible through the glass while the glass adheres to walls or other surfaces. *Patent completed.*

2552. I. LIVERMORE. *An improvement in the manufacture of shuttlecocks.* Dated November 13, 1858.

Here vulcanized india-rubber is applied to the under surfaces of a shuttlecock, in which the feathers are stuck. *Patent completed.*

2553. M. L. J. LAVATER. *Improvements in the manufacture of mats, coverings for floors and other surfaces, and other cellular articles when india-rubber compounds are used.* Dated November 13, 1858.

This consists in rolling out sheets of india-rubber compounds, each of the thickness desired for the depth of the cells of which the finished article is to consist. The patentee then, by suitable punchers or cutters, removes portions of such sheets, leaving other portions to form the walls or sides of the several cells of which the article is composed. There are modifications included. *Patent completed.*

2554. C. J., T., H., and C. THOMAS. *An improvement in the manufacture of caustic alkaline lees.* Dated Nov. 13, 1858.

This consists in pumping or running the ordinary black-ash liquor into a pan or vessel, to which is added the necessary quantity of lime for causticizing such black-ash liquor. The patentees then boil the liquor and lime, and at the same time force atmospheric air, by preference in finely divided streams, through and amongst the liquor, by which operation the liquor is purified and causticized. *Patent completed.*

2555. A. B. WOODCOCK and J. M. DUNLOP. *Improvements in covering rollers, shafts, and tubes of any figure or material with elastic shells or covers, with vulcanised india-rubber or other elastic substance, and in turning or grinding the surfaces of such elastic covers or shells.* Dated Nov. 13, 1858.

The elastic shell or cover is distended by forcing water or other fluid into it, and while so expanded the roller, &c., is introduced into the shell, or the shell or cover is drawn on to the roller, &c., by screws, &c., the fluid being allowed to exude as the roller, &c., enters by a valve or tap. Afterwards to finish the surface of the elastic shell, so as to reduce it truly to the desired form, the covered roller, &c., is (if circular in section) put into a lathe having a file or files, or other cutters or tools, which come in contact with the elastic surface. While the roller, &c., revolves, the files or tools are caused to traverse by a screw; or if the roller, &c., is square or flat-sided, the files, &c., are traversed over the surfaces, while the roller, &c., is fixed, the files, &c., being carried by a slide moved backwards and forwards, by a crank, &c.; or the tools may be stationary, and the elastic shells moveable. *Patent completed.*

2556. D. FRODSHAM. *Improvements in apparatus used in combination with fire-boxes of tubular steam-boilers in order to supply air and steam thereto.* Dated Nov. 13, 1858.

On the interior of the opening into the fire-box is a hinged plate which, when it hangs vertically, closes the said opening. This plate has angular plates at the sides to prevent the air passing sideways into the fire-box. A hinged door is also employed on the outside of the fire-box. Two bell-mouthed tubes passing under the fire-box and having their bell-mouths so placed as to catch the air, supply air to a perforated tube just below the feed opening; streams of air are thus introduced over the ignited fuel. Jets of steam are introduced in a similar manner by a perforated tube in connection with the steam chest. *Patent completed.*

2557. M. PULLAN. *Improvements in machinery for drying yarns and other materials.* Dated Nov. 13, 1858.

This relates to drying yarns, &c., in the form of hanks or endless bands, by heated cylinders, to which rotary motion is imparted. The yarn, &c., being placed over such cylinders and held at tension thereon, will be carried round by their revolution, and a continuous heating surface being thus presented to the travelling band or hank, the moisture will be quickly evaporated therefrom. *Patent completed.*

2558. J. A. HOPKINSON. *Improvements in steam-boilers.* Dated November 13, 1858.

This consists in the adaptation of curved pipes placed in the furnaces, flues, or chambers of steam-boilers, which effect a continued and uninterrupted circulation of water in the boiler, and through the tubes to the upper side of the flue or flues, so long as heat is applied, that circulation being applied independent of pumps or valves or other such means. Also in fastening pipes or tubes in boilers by an adjustable plain conical or threaded hoop, screwed on the outer end of the pipe, fitting a suitable hole in the boiler, and holding the pipe fast in place by a nut and screw. *Patent completed.*

2559. S. ST. C. MASSIA. *A new economical guard for candles and wax-lights.* Dated November 15, 1858.

This guard is made generally of tin, and must be of the same circumference as the light or candle to which it is to be adapted. The bottom part of the guard has the form of a saucer, which must vary in size according to the circumference of the candle for which it is to be used. The middle part of the saucer has a hole in it, in which rises a tube or chimney through which the wick passes. The tube or saucer are pressed out of one piece of metal. The invention is not fully described apart from the drawings. *Patent abandoned.*

2560. T. R. BUTCHER, F. STEVENS, W. T. JOHNSON, and T. JARVIS. *Improvements in the hammer-rails of pianofortes.* Dated November 15, 1858.

Instead of placing each butt between two of the metal prongs, as heretofore, the inventors construct them so as to work over or to embrace the prongs, that is to say, the butts are made of a greater width, slots being formed in the bottoms of the butts, instead of the ordinary back hole, so that each butt embraces one of the metal prongs, the series being connected in the ordinary manner by means of a wire passing through the whole length of the plate. They also construct the metal prongs themselves of a much greater width than has been previously done, thus giving increased firmness, while the construction and arrangement of the butts, as before described allow a greater amount of freedom of action as well as firmness to be attained, the result being that the touch is lighter, and that the hammers strike with greater precision and certainty. With respect to the metal of which the plate is constructed, they state that although brass or any other suitable metal may be employed, yet they prefer the use of zinc, the latter metal being much more economical than brass; but it must be distinctly understood that they do not claim the use of any particular metal for this purpose. *Patent completed.*

2561. A. DICK. *A new or improved manufacture of a yellow pigment.* Dated November 15, 1858.

This yellow pigment is manufactured from the dross or oxide produced in the process of softening lead, by heating the said dross or oxide in contact with air, whether the said dross or oxide be treated with common salt or any of the acids before enumerated, before, during, or after the heating, or be heated without the use of common salt or any of the said acids. *Patent completed.*

2562. G. DAVIES. *Improvements in the process of finishing piled fabrics, and in apparatus employed in such process.* (A communication.) Dated November 15, 1858.

This relates principally to finishing piled fabrics, whether woven or felted (called "astracan cloths"), and consists of two parts:—1, the machinery for friezing or curling the pile or nap; and, 2, the process of fixing and pressing the "curl," dyeing, embossing, and finishing the fabric. The construction of the friezing machine is as follows:—The main driving shaft carries a spur pinion, which, by gearing with a similar wheel, drives a shaft carrying a drum or band pulley, which actuates two sets of spindles by endless bavels. The end of the drum shaft carries a bevil wheel which, by a vertical shaft and other wheels, drives another drum or band pulley at the upper part of the machine, which being furnished also with endless bands, actuates a third set of spindles. The vertical shaft communicates motion by gearing to a transverse shaft carrying cams or eccentrics at its ends. Four of these cams are for giving an alternate oscillating motion to the spindle frames, and the fifth by a ratchet and ratchet wheel communicates an intermittent motion to a roller furnished with points which draws the fabric through the machine. Each of the spindles carries at one end a brush of metallic wire, which acts upon the pile or nap of the fabric, the back of the same being supported, and the fabric pressed against the spindles by a fixed brush with springs. The fabric passes from a vessel of water over guide rollers, and between the fixed brushes and the ends of the spindles which effect the friezing, &c., of the pile. The fixing of the curl is effected by rolling the fabric round a perforated cylinder into which steam is admitted, the roller and fabric being placed in a closed vessel for about an hour. The piece is then unrolled, dried, and pressed. *Patent completed.*

2563. B. PREDAVALLE. *Improvements in producing or obtaining motive power.* Dated Nov. 15, 1858.

Here a column of fluid is caused to exert vertical pressure on a body of fluid contained in a vessel of larger base than the diameter of the column, means being provided for alternately and instantaneously cutting off and restoring such pressure, for neutralising the pressure on the side opposite to that on which motion is to be primarily produced, and for returning the vessel after having been acted upon to its original position to receive a fresh impulse. *Patent abandoned.*

2564. W. G. ARMSTRONG. *Improvements in the manufacture of ordnance.* Dated Nov. 15, 1858.

This is the specification of the celebrated "Armstrong Gun" invention. If what we have already published is not sufficient, the reader must refer to General Peel, who has sealed the specification up. *Patent completed.*

2565. M. G. DESCHAMPS and J. QUINCHE. *A new compound metal which they term "Lutetia Metal."* Dated Nov. 15, 1858.

This consists of copper from Lake Superior in America, zinc, nickel, and silver, combined in the following proportions:—Of copper, 26½ lbs. troy; zinc, 4 lbs. troy; nickel, 12 oz. 16 dwt. troy; silver, 19½ dwt. troy. Having melted the copper and nickel together, the inventor then adds the silver, and lastly the zinc: after well stirring them together, he pours the mixture in ingots. *Patent abandoned.*

2566. W. CLARK. *Improvements in colouring, preserving, and desiccating wood and marble, and in apparatus for the same.* (A communication.) Dated Nov. 15, 1858.

Here wood is first submitted to an injection of silicate of zinc in solution in water, to render it homogeneous throughout. The silicate, which is insoluble in acids, and mineral salts serves to close the pores of the wood. This operation is completed when the pressure gauge indicates, for the softest woods, a pressure of 20 atmospheres, and for the hardest woods a pressure of 60 atmospheres. The second operation consists in removing the sap of the wood, and for this purpose the patentee employs caustic lye, which permeates the juices of the wood, the application of the lyes and the washing being repeated several times. To obtain delicate colours the wood is made to undergo a bleaching process, after which operation the wood being charged with colour acquires light tints and hardiness according to the presence of different salts. To preserve woods he removes the sap as above indicated before submitting them to an injection of sulphate of copper and sulphuret of sodium, the combination resulting from the action of these two substances being insoluble in water. Wood thus prepared is not susceptible of warping or shrinking, and is readily coloured. To assist the passage of the liquids injected into the wood, he employs at one end of the timber an air pump, which also assists the dessiccation. For colouring marble he employs the same apparatus, but modifies the parts which serve to hold the wood. The marble is submitted to an injection of citric acid diluted in water in order to open the pores. After this operation the marble may be coloured, and the pores filled up with crystals, which render them much more transparent. *Patent completed.*

2567. W. CLARK. *A new mode of advertising.* (A communication.) Dated Nov. 15, 1858.

On the side of railway tickets generally left blank, it is here proposed to establish a general system of advertisements. *Patent completed.*

2568. J. G. BUNTING. *A mechanical horse-tamer or brake.* Dated November 15, 1858.

Here a post is driven into the ground, having on its upper end a stout pin; from thence diverge in a horizontal direction two poles about 30 feet long, both of which have a hole in one end to drop on to the pin in the post, the other ends being kept apart from 12 to 15 feet by cross-pieces or shafts secured in any convenient way. Upon the outer extremities of the poles are attached axle-arms to carry heavy cart-wheels. The horse being fastened within this cradle by suitable straps, &c., is unable to plunge by the weight of the wheels, to lie down on account of the under-straps, and is prevented running backward by a prop fixed to the hind pole. *Patent completed.*

2569. J BRENNAND. *Improvements in the method of effecting the locomotion of carriages, which improvements are also applicable to other similar purposes.* Dated November 16, 1858.

This consists in combining the power of steam with that of horses, &c., so that the steam may assist in the locomotion of the carriage when the resistance exceeds the animal power employed. The animal power is to be so applied that, as the resistance to the wheels is increased, by the nature of the ground or otherwise, the efforts of the horse, &c., shall open the steam-valve of an auxiliary steam-engine, and thereby impart an extra-tructive power to the driving-wheels. *Patent completed.*

2570. J. H. JOHNSON. *Improvements in machinery or apparatus for kneading dough, or working and mixing plastic materials.* (A communication.) Dated November 16, 1858.

This apparatus consists of a suitable frame fitted with a kneading-trough, having a curved or semi-circular bottom, and within which works the kneader. This kneader consists of a metal frame, fitted with a trellis, which can be removed at pleasure. The kneader fills the transverse area of the trough, and is caused to pass to and fro along the bottom and upper surface of the trough by the aid of a long slotted arm, extending upwards from the upper edge of the kneader, and working over a fixed guide-pin in a portion of the framing of the machine. Motion is imparted to this kneader by a revolving crank or eccentric, the pin of which is secured to the slot in the arm. As the crank revolves, it causes the kneader to travel along the bottom of the trough until it reaches the end thereof, when it rises to the surface, bringing with it the paste which was below, and travels back again along the surface to the opposite end of the trough again. Spur gearing and a fly-wheel are employed for imparting and regulating the motion of the machine. *Patent completed.*

2571. J. C. BOISNEAU. *An improved horse-mill or gear.* Dated November 16, 1858.

In this mill or gear the power of the horse is applied to cause the rotation of a driving-wheel or drum fitted at the end of a shaft round the wheel-work of the machine. The wheel being fixed in the shaft causes the rotation thereof, as also that of a vertical bevil-wheel, which in turn gears into and drives a horizontal bevilled pinion, formed on the crown of a large mitre-wheel, the teeth of which are inverted and drive a vertical pinion on the shaft from which the power is to be taken or applied. By proportioning the various wheels in the train to the speed required, any desired number of revolutions can be communicated to this latter shaft. *Patent completed.*

2572. A. I. H. PARENT. *An improved manufacture of buttons, and the apparatus employed therein.* Dated Nov. 16, 1858.

The patentee first forms continuous bands of strips of

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metal of a suitable width by turning over the end of each strip into the form of a hook, and engaging the hook in the end of the next strip in it and then flattening the ends down. The continuous band being thus formed he takes it to a cutting and stamping machine in which he uses hollow concentric punches which are driven from eccentrics upon a shaft in such manner as at each stroke to cut a disc from the continuous band, depress the centre or body thereof into a matrix, and leave a raised edge or rim all round. By means of an eccentric upon the shaft already named one end of a lever is depressed, whereby a connecting rod is made to move a ratchet, which entering into a ratchet wheel connected with the feed rollers through which the continuous band is passed regulates the feed of the band in accordance with the stroke imparted to the punches. The same feed rollers may be used for different sized buttons by giving more or less advance to the ratchet wheel. The opposite end of the lever which is made to impart motion to the ratchet is fitted with a spring in order to raise that end of the lever depressed by the eccentric. The cupped discs produced as aforesaid have placed in them first a disc of metal which is of such size as just to fit in them. Thus prepared the partially-formed button is placed in recesses formed in an endless belt of gutta-percha or other like suitable material, and brought under first a punch which sets and fixes the blanks in movable shaped rings held in a revolving platform supported under the endless belt, while in these cups the blanks are brought between punches and matrices whereby the three surfaces are compressed, dished, and perforated with the required number of holes, and are then finally shaped between another punch and matrix, after which the buttons are pushed up into a cylinder from which they fall into any receptacle provided for them. Pins for clearing out the holes in the buttons may be fixed in this cylinder. The punches and matrices are fitted with springs. The whole of the motions in this second machine are derived from eccentrics on a shaft to which rotary motion is communicated. *Patent completed.*

2573. J. SAMUEL. *Improvements in sleepers or bearers for rails.* Dated Nov. 16, 1858.

This relates to a previous patent of the patentee dated 5th April, 1850, and consists in constructing the sleepers or bearers for the rails of railways of metal in a hollow semi-spherical, conical, semi-spheroidal, semi-ellipsoidal, or other like form, or with rectilinear sides in the form of a square or polygonol pyramid, or of a form partly rectilinear and partly curvilinear, such bearers or sleepers being provided on their upper surfaces with a trough, recess, or depression so that by blocks or wedges of wood placed at each side of the web of the rail, the rail may be held in the trough, recess, or depression clear of the bottom of the same. The sleepers or bearers may be either plain or corrugated, and are intended when laid to be packed or filled on the inside with ballast. To facilitate the packing of the sleepers or bearers they are each formed with a dovetail shaped aperture in the side thereof. *Patent completed.*

2574. S. TAYLOR. *Improvements in fountain pens.* Dated November 16, 1858.

Each pen here consists of a tube to contain the ink. This tube is at all times closed at the upper end. The lower end of the tube when supplied with ink, is closed by the introduction of a flexible elastic plug, by preference of vulcanized india-rubber. The pen is introduced between the elastic plug and the interior of the tube, so that when the writing points or nibs are pressed on in the act of writing, the plug will yield and ink will be allowed to flow to the writing points or nibs. *Patent abandoned.*

2575. C. J. C. PERRY. *An instrument to be used chiefly on board ship for approximating in certain cases the course of an approaching vessel either in the day or night, and the relative angle of both ships' courses, in order to avoid a collision; to be called Perry's Anti-collision Dial.* Dated November 16, 1858.

The great desideratum attending many cases of collision, and of vessels passing and crossing very near each other in the night time, appears to be an adequate knowledge of the direction in which each other ship is steering, or else, what is almost the same thing, the particular tack on which the approaching ship is sailing. The instrument is devised by the inventor for indicating this direction. *Patent completed.*

2576. J. B. JOHNSON and J. SHEPPARD. *Improvements in machinery or apparatus for adjusting the permanent way of railways.* Dated November 16, 1858.

This refers to ballasting the rails. This the inventors effect by apparatus upon the lever principle which consists in ramming the ballast. To an arm capable of being hooked on to the sleeper or rail they joint a lever which, being caused to turn thereon, forces the ballast forward. They employ a similar apparatus for twisting the rails into their correct position when displaced, the lower end of the lever being in this case caused to bear against the rail. *Patent abandoned.*

2577. T. KNAUTH. *Improvements in fire-arms and ordnance.* (A communication.) Dated Nov. 16, 1858.

This consists in providing the barrel of the piece with a smaller barrel fixed in it and projecting inward from the centre of the bottom or breach of the ordinary barrel, and not only opening at its exterior, and into the chamber of the piece, but at or towards its other end opening into the touch-hole or vent of the nipple so that the fire communicated through the nipple or touch-hole can enter the chamber of the piece only through the smaller barrel or tube. The smaller barrel or tube is to be so proportioned in length and diameter that the charge of powder shall lie a part of it within and a part of it around the small additional barrel, and so that the projectile or charge of shot rests upon and covers the exterior end of it, thus completely separating the powder into two parts, one being within the smaller barrel and the other outside and around it. The inner barrel is to be of a capacity to hold a quantity of powder sufficient when exploded to overcome the *vis inertiæ* of the projectile or the charge of shot, and put it in motion. It also relates to the touch-hole:—when the breech screw is in place in the main barrel, not only shall its touch-hole communicate with that of the main barrel, but the breech screw shall interrupt all communication of the touch-hole of the main barrel with the bore of the main barrel except the touch-hole of the secondary barrel. *Patent abandoned.*

2578. A. M. BERRE. *The novel application of hydrogen gas to various purposes in the arts.* Dated Nov. 16, 1858.

This consists in applying hydrogen gas in the presence of heat to various substances as a reducing agent or purifying agent while such substances are undergoing the process of distillation. *Patent abandoned.*

2579. F. A. GATTY. *Improvements in producing certain colours on cotton, linen, and silk fabrics.* Dated Nov. 17, 1858.

This consists in the use of acetic or pyroligneous acid as a means of fixing the colouring matter of madder in combination with a salt of alumina on cotton, linen, and silk fabrics for producing red and pink colours thereon by the steaming process. *Patent completed.*

2580. S. HOGA, W. P. PIGGOTT, and S. BEARDMORE. *Improvements in electric telegraphs.* Dated Nov. 17, 1858.

Here, in place of sending currents along the line wire, the patentees send the currents by the earth, and use the line wire only for the return current. *Patent completed.*

2581. M. A. MUIR and J. MCILWHAM. *Improvements in looms for weaving.* Dated Nov. 17, 1858.

This relates particularly to looms for weaving check and corded goods. The motion of the pattern-producing or figuring actions in these looms is wholly derived from a barrel or perforated figuring cylinder fitted up in connection with the drop-box for the shuttles, the take-up motion, and the heddles, so as to afford a wide range of figuring, and variable or differential action of the weaving details. *Patent completed.*

2582. C. F. VASSEROT. *A waterproof coating.* (A communication.) Dated Nov. 17, 1858.

This coating is obtained by dissolving in a water bath a certain quantity of gutta-percha with some essence of turpentine. After complete dissolution a sixth of its weight of re-in and a fifth of wax are added. The mixture should remain upon the fire while the application is made. It is applied by a brush. *Patent abandoned.*

2583. C. F. VASSEROT. *A flat clothes smoothing-iron, with moveable handles.* (A communication.) Dated Nov. 17, 1858.

This consists in forming the handles and the flat iron in separate parts. *Patent completed.*

2584. J. H. TUCK. *Improvements in the mode of laying and securing telegraphic cables, and in apparatus for the same, and for carrying on other operations under water.* Dated November 17, 1858.

This consists in forming a channel in the bed of the sea, &c., for the reception of the cable, the said channel to be covered by stones, half pipes, &c., as a protection for the cable. The apparatus consists of a carriage on which is mounted an engine (to be driven by water or air) and a set of rotary cutters driven by suitable gearing, the front bearing wheels of the carriage being also driven thereby. On the frame of the carriage there is a set of clearing tools for turning off the debris as left by the cutters. On the axle of the clearing tools are bearing wheels, to which axle is jointed the hinder part of the carriage in which is mounted a pair of wheels with broad flanges and a segmental guide through which the cable is passed, either from the surface of the water or from a drum, &c., under water, and laid in the channel as the carriage works forward. Diving bells are used in connection with the apparatus. *Patent completed.*

2585. D. W. HAYDEN. *Improvements in apparatus for heating water and other liquids.* Dated November 17, 1858.

The inventor has a boiler or reservoir of iron, &c., communicating by two pipes with a flue or grate of iron, having a hollow casing, and properly fitted with fire-bars, chimney, and door. He has in the furnace a helical coil of tubing of copper, and the ends of such tubing, open into the hollow case at points immediately opposite or nearly so, to the two pipes above mentioned. On the outside of the hollow casing which surrounds the fire grate are two taps opening into the top and bottom of the said hollow case; when water, &c., to be heated is introduced into the boiler, the tap at the bottom is closed, and the tap at the top is opened, and the liquid which is poured into the boiler passes down the lower of such two pipes into the hollow casing and coil, and the air contained in such casing escapes by the upper tap which is open. When the two pipes, the hollow case, and the coil are filled with the liquid, which will be known by its escaping by the open tap, the other is closed. The heat from the fire in the furnace is transmitted through the coil to the liquid contained therein, and also to the liquid in the hollow case which surrounds the fire grate. The heated liquid in the hollow case and coil being lighter than the colder liquid in the reservoir, descends through the lower pipe and displaces the heated liquor in the hollow case and coil, thus inducing a circulation until the whole of the liquid in the reservoir, coil, and case has attained the boiling point or other desired temperature. *Patent abandoned.*

2586. E. WELCH. *Improvements in the manufacture of tobacco, and in apparatus therefor.* Dated Nov. 17, 1858.

This consists in steaming spun tobacco and afterwards submitting it to hydraulic pressure. *Patent abandoned.*

2587. J. ROBERTSON. *Improvements in musical instruments.* Dated Nov. 17, 1858.

This relates to increasing the volume and richness of tone of musical instruments. As applied in the construction of a violin, &c., consists in working the sounding-board of increased thickness. The inner surface of the sounding-board is grooved out longitudinally in parallel lines. Similarly, the sounding boards, sounding board supports, and tracing bars of pianofortes may be grooved or channelled. *Patent completed.*

2588. M. SCOTT. *Improvements in the construction of breakwaters, parts of which are applicable in making other structures.* Dated Nov. 17, 1858.

Here a breakwater is formed by rows of piles driven so that those furthest seaward terminate at or below low water-mark, and the piles to the landward of these rise above low water-mark, until the largest piles rise considerably above high water-mark. These piles are connected by diagonal timbers, and on the tops of the piles an inclined platform is constructed, such platform being formed of transverse planking, the several planks having spaces left between them so that the water of a wave may freely pass through. *Patent completed.*

2589. E. MELLOR. *Improvements in mules and other machinery for spinning cotton and other fibrous substances, whereby the cop will be built much firmer, and prevent snarls in the yarn.* Dated Nov. 17, 1858.

This consists of a mechanical motion whereby the slide in spinning machinery (upon which the extra weight rests when the fallers are going down) is depressed or removed immediately the fallers have locked or are down in the place for winding on, so as to allow the whole weight to be brought to bear upon the lifters before the carriage begins to move inwards, and keeping the ends tight, instead of coming in, when the carriage has gone in to some extent, by sliding down the incline with slack ends. By these means the ends are stretched before the spindle begin to wind, the cop can be built much firmer and harder, and the snarls from slack ends are prevented to a very considerable extent. *Patent completed.*

2590. M. CATON. *Improvements in the treading motion of looms for weaving, and also in shuttle-boxes and wells connected therewith.* Dated Nov. 17, 1858.

This consists, 1, in placing upon the ordinary tappet shaft of the loom a plate wheel or cam having an eccentric groove in the face. In this groove works a pin or roller, which is fixed to a lever. One end of this lever works on a fulcrum, and to the other end the heddle or harness are attached or connected. The heddle may be connected to this lever in any convenient manner, so that the rising and falling of the end of the lever occasioned by the working of the pin or roller in the eccentric groove of the cam shall cause an alternate rising and falling of the heddle, one heddle rising as the other falls, and *vice versâ*, so as to produce the requisite opening or shedding of the warp threads. The second part of the invention is intended to lessen the wear and tear of the picker, and to dispense with the check strap as ordinarily employed in power looms for intercepting or lessening the force of the blow of the shuttle and picker against the end of the shuttle-box. *Patent completed.*

2591. J. BRENNAND. *An improvement in ploughs, and in other agricultural implements, and in the method of driving the same.* Dated Nov. 17, 1858.

This consists in the application of an Archimedian screw or screws, which may either be placed at each side or in front of the plough. These screws are employed for assisting the driving power, and are so arranged in connection with, and actuated by, the driving wheels of the plough as to cause the outer edges of the screw or screws to enter and "bite" the ground, and by their screwing motion to assist in drawing or propelling the plough according to the position they occupy. *Patent completed.*

2592. R. A. BROOMAN. *Improvements in apparatus for the manufacture of lace and net.* (A communication.) Dated Nov. 17, 1858.

The object here is to produce an apparatus which shall be capable of being applied to the manufacture of Brussels, Valenciennes, Mechlin, and all other descriptions of lace and of net, without any other change of form or mode of operation than that of varying the sizes of the parts according to the degrees of fineness required in the finished fabric, the said apparatus being adapted to be worked either manually or by steam or other power. The details of the invention are voluminous. *Patent completed.*

2593. S. WHEATCROFT. *Improved apparatus for uniting lace to blond and other fabrics.* Dated Nov. 17, 1858.

To connect the above-named fabrics together, so that the edge of one fabric shall lap over the edge of the other, the inventor passes these fabrics over a narrow roller, which is supplied with water by dipping into a trough containing the same. The fabrics in passing over this roller become wet on their edges, and the stiffening material with which they are dressed is thereby dissolved. The fabrics then pass between metal guides, which have a lateral adjustment to suit different widths of fabric, and after passing out from these guides they are led between one or more pairs of pressing rollers, which press the fabrics together, causing them to join with a width of lap that is determined by the adjustment of the guides. Beneath these pressing rollers, a heating box is provided, fitted with gas jets so that at the moment of pressing the fabrics together the rollers will also act as drying rollers and deliver the joined fabric fit for use. The rollers are actuated by a winch handle. *Patent abandoned.*

2594. J. PLATT and H. CHUBB. *Improvements in machinery or apparatus for making bricks or tiles.* (Partly a communication.) Dated November 17, 1858.

The patentees claim, 1, the application of india-rubber, &c., to the ram. 2. Constructing the cams or parts against which they act, or both, with pieces capable of being detached so as to be adjusted or renewed at pleasure. Also mounting the bowl or bowls or rollers upon which the cams acts for the top squeeze so as to be capable of adjustment; and lastly in the apparatus for supplying the material the use of an additional striker. The invention is not described apart from the drawings. *Patent completed.*

2595. W. CLARK. *A process of thickening, strengthening, and improving tanned hides.* (A communication.) Dated November 17, 1858.

This chiefly consists in subjecting hides to the alternate action of gelatinous and tanning liquor, by causing such liquids to filter through the hides by means of a vacuum on one side of the hide and the pressure due to a column of the liquid on the other. *Patent completed.*

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, JUNE 24, 1859.

MONEY-MAKING AT THE ROYAL MINT.

No. III.

ASSUMING that so far our explanations of the art of coining have been understood by those to whom they are addressed, some account of the operation immediately following that of the adjustment of the fillets of gold may be proceeded with. "It needs no spirit from the grave" to tell commercial men of the absolute necessity there is for gold coins to be of uniform weight. All are aware of its importance, and it is equally certain that this point is one which, if overlooked at the Mint, would lead to confusion inextricable. The adjusted strips of gold, then, are not considered "good work" unless they will yield blanks from any part of their surfaces which shall not vary in weight more than an eighth part of a grain. Rolling and drawing gold for the coinage, therefore, are highly important matters, and must be managed with extreme care. All this care, however, would be thrown away if the cutting or punching out of the blanks was not performed with much caution too. In testing the fillets, or "trying" them, as the professional term is, one cutting-punch only is employed, and it is worked by hand. This, of course, answers its purpose, and the tryer ascertains whether the character of his work is uniform by cutting a piece out here and there from the fillets passed through the drawbench, and weighing it in his trying scales. When, however, the bulk of the work has to be dealt with the case is different. From the quantity of fillets to be perforated it becomes necessary, then, to employ a number of cutting punches, and these must be of exactly equal dimensions, or all the advantages gained by former precautions would be at once sacrificed. The slightest variation ,indeed, in the diameters of these finely-turned, sharp, and well-tempered instruments would result in producing work of so irregular a nature as to predestine a very large per-centage of it to the melting pot again. It would avail little that the fillets were well adjusted if the punches, and the "beds" into which they penetrate, and through which the blank pieces fall, were not also mathematically true to each other.

There are twelve cutting-out presses at the Royal Mint, and these are very compactly placed on a circular platform of iron, in a circular room lighted from above. In the centre of this select circle revolves a heavy upright shaft driven by subterranean bevil wheels, and it supports a large fly-wheel running horizontally, and having twelve "cams" attached to its arms. Connected with each press, and passing over the heads of the workers, are horizontal rods of wrought iron. These pass also through the wall of the cutting-room. Behind that wall, in recesses made for them, are twelve vacuum pumps fitted with compound levers adjustable to the power required to be exercised in punching—and to these levers and pumps the press-rods are fastened. Supposing, now, that the mechanic has done his duty, and arranged his punches, "beds," and presses for fillet cutting, with the requisite nicety, certain boys who are to "feed" the machines with gold enter. These seat themselves on stools much resembling those of the milkmaids of "Merrie Englande," and prepare for action. Beside each boy, in a tray, is placed a batch of fillets, and now the young coiner, by placing his foot on a treadle, causes a friction roller to fall forward upon a cam of the fly-wheel; this brings up the press and with it the piston of the vacuum pump, which thus begets a forced vacuum beneath it—the piston. An instant after, the cam releases the friction roller, the atmospheric column acts on the piston—which is about 8 inches in diameter—the screw pin of the press with its punch is brought down with force, and a blank piece of gold falls into a drawer beneath. All the presses are put in motion in a similar manner, and so long as the boys keep each a foot on their treadles, and supply material for the purpose, showers of circular discs of metal—at the rate of 60 per minute, at each cutting-out press, indeed—will continue to drop into the drawers beneath. Samples are continually being taken through the day from these drawers to be tested by experienced workmen, who take care that neither wear nor tear nor accident shall interfere with the regularity of the work produced. It is not often that the twelve machines are engaged simultaneously, but from the variety of coins in use in the British dominions, it is necessary to have a sufficient number to obviate frequent changings and re-adjustments. Two hundred thousand sovereign blanks per day have, it is said, been of late obtained from the cutting-presses of the Mint, and this is perhaps the maximum rate of production of the Royal Mint itself in the shape of coin. Imagining that the whole of the fillets given out for a day's work in the cutting-room have been perforated, with the smallest possible amount of scrap, or "scissell," the latter is bound up in bundles for the melting-house, and the blanks are weighed up in bags of 720 ozs. in weight, or 2,804 in number, for the next process. Again, vigilance and excessive care are used in balancing the account of the day's duty, and careful note is taken of deficiency, if any, on the punching operations. Allowing all things to be satisfactory, the men and boys of the "drag" and cutting-rooms, of whom in all there may be fourteen, are permitted to depart, and the blanks await in the stronghold of the room their destiny. In forwarding the blanks, which at this stage very much resemble shankless brass buttons, without gilt upon them, a ticket of the weight of the contents of each individual bag is placed within it, and this the officer in charge of the next room, on receipt of the gold, examines and proves.

The weighing-room is that to which the dull-looking specimens of valuable metal are now to be removed, and this is one of the most interesting departments of the Mint. A few years back it was a lumber-room, a storehouse for tile copper, a "what-not," but at present, thanks to the energy of Captain (now Colonel) Harness, R.E., it contains some of the most beautiful machinery—on a small scale—in the kingdom. We have, indeed, had occasion to mention this noble room and its mechanical beauties before, but at the risk of a charge of repetition of information, more *must* be said about them now. It was in his desire to introduce reforms and improvements after the departure of the company of moneyers in 1851–2, that Captain Harness conceived the idea of introducing more scientific appliances for the accomplishment of the various duties of the coinage. In 1852 the first weighing machine, a copy of that which it will be remembered by some was shown at the Grand Exhibition of 1851, was placed in the Mint, and it excited the admiration of all who were unbiassed by prejudice. Naturally, some of the twenty men known in the establishment as "sizers," and whose duty it was to "size" or weigh, in small hand-balances, each of the blank pieces from the cutting-room, were averse to the introduction of these automaton weighers, which were infallible in their action. As in many other cases, however, machine labour was destined to supplant that of the hand, and in 1855 twelve automaton weighing machines were introduced, and the twenty sizing men dispensed with. It will easily be imagined that in so delicate a process as that of weighing sovereigns to the minute exactness of the 1-10th of a grain, complete freedom from irregularity of motion in the driving gear must be obtained. It is essential, too, that there should be complete freedom from vibration. In the weighing-room at the Royal Mint, these desiderata are completely effected. The machines are placed upon cast-iron stands, having four legs each, and with their surfaces planed. The feet of these stands rest upon brick-work foundations of great depth, and which serve to isolate the machines from the building, and to prevent the communication of any tremor which a movement of the weightier machinery might produce. A small atmospheric engine, placed in a corner of the apartment, gives motion to the machines. It is connected by means of a 2-inch pipe with a vacuum tube—of which we shall have to speak further bye and bye—and the air, admitted through an inverted trumpet alternately above and below a piston, acts upon the latter precisely in the same way that steam usually does. A pair of slides, governor, and fly-wheel go to make the engine resemble very much more a steam-engine. It will now be understood that there is an isolation of the power employed to work the weighing machines as well as an isolation of the machines themselves. No irregularity of motion, as regards the other mechanical contrivances, can affect the air engine of the weighing-room. It is separate and distinct from all. By means of a drum on the fly-wheel itself, and a strap, a line of bright and light wrought-iron shafting suspended by brackets from the ceiling of the lofty room, and running from end to end of it, is driven. On this shaft are placed a series of little brass pulleys — sufficient to give one for each machine—and over these pass fine gut bands to the pulleys of the machines themselves. Of course the actual power required to drive these delicate clockwork-like implements, and to feed blanks to their miniature scale-tables, is nominal. Perfect regularity of action is the only thing wanted. Well, *revenir à nos moutons*, the weighing machines are waiting, and the gold blanks are ready for distribution. A long brass spout placed at such an angle of inclination as shall cause the blanks to pass down of their own gravity, is attached to each machine, and in those spouts are now placed the golden food. At the foot of each spout, and immediately behind the scale table, a thin steel semicircular slide is made to advance and recede. Every time it advances now, it pushes forward a blank to the tiny scale; there it, the blank, rests for the space of three seconds, and the machine actually appears, at this crisis, to be endowed with the faculty of thought. It seems, like a solemn judge, to be taking into consideration all the facts in regard to a prisoner, and to be hesitating whether to acquit or condemn. Three seconds only are allowed for this trial, and the slider advancing with another prisoner very quietly pushes the first over a precipice, in order to make room for its successor. The three seconds have been sufficient for the ends of justice, however, and the fallen piece, if of the proper weight—that is, within 1-10th of a grain of the standard weight of a sovereign — will inevitably be found in the right, not the wrong, box, to which a flattened brass tube will have conducted it. Piece after piece is thus submitted to the infallible automatons, and approved or condemned on their own merits or defects. These quiet judges become eloquent at the close of the day. They tell then distinctly whether all previous operations, as rolling, drawing, and cutting, have been properly performed. If they *have*, 98 or 99 pieces of every 100 will have passed into the "medium" compartments of the machines. If they *have not*, the "light," and "heavy" boxes will contain evidence of the fact by being burdened with rejected or condemned work, destined for the crucible once more.

All silver pieces, down to the size of the sixpence, as well as all gold of whatever size, are tried by the weighing-room judges; and it may be stated that under judicious arrangements made at the instance of Dr. Graham, and carried out by certain officers in his confidence, the per-centage of good work has been wonderfully increased of late. Two and a-half years ago 70 or 80 per cent. of accepted blanks was considered all that could be obtained, *now* 98 and 99 are the usual things.

With respect to the conduct of business in this particular department of the Mint, it may be permitted us as part of the public, to say that we think it would be better—Heaven shield us from presumption in saying so!—it would be better if the weighing of piece by piece were the final instead of an intermediate operation. Other processes follow this weighing or sizeing—*for* instance, the pieces are *baked* and *pickled!* as we

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shall bye-and-bye see, and may therefore undergo changes which alter their weight *after* the righteous judges have pronounced them good. In our humble opinion, therefore, the weighing of single pieces should follow, not precede the baking and pickling operations. Stamping may not interfere with them in the way described, but the action of fire and acids *must*.

It has been intimated that small silver blanks, as those for groats—now obsolete—or threepences, are not passed through the automaton hands. It is not necessary, indeed, that they should be. The are merely "ounced"—that is, they are weighed in parcels of one ounce troy, and if each ounce is found to contain the proper number of pieces, that is all that can be required. Copper, less important still, is "*pounded*," that is, care is taken that each pound avoirdupoise shall contain the just number of blanks; individual variations may exist, but on the whole pound there must be a balance of differences, or the work is bad.

We are not certain that full justice has been done to the fitments of this council-chamber of the Mint; to be fully appreciated they *must* be seen. Of course great care is taken to preserve the weighing machines—which cost £220 each, and are not larger than west-end drawing-room clocks—from damp, and rust, and dust; they are covered by glass cases, and must not be breathed upon. There are in addition to the twelve balances certain hand-test scales, which the officer of the room assures visitors will weigh accurately to the thousandth part of a grain—a microscopic quantity which he perhaps comprehends the bulk of, but with which we had rather not deal.

Assuming that the magic balances have accomplished their task with respect to the batch of golden blanks, of which in imagination our readers have not lost sight—that the defective are consigned to the "burning fiery furnace," and the goods ticketed for the succeeding operation, we follow on to the "marking-room."

PROGRESS OF ELECTRO-TELEGRAPHY.

DURING the past week the details of the successful completion of the line from Suez to Aden have been received. On the 9th of May the laying of the first part of the cable was commenced, and finished on the 11th from Suez to Cosseir, the first intermediate station of the Red Sea Telegraph Company, where a relay will be fixed. The depth in this length does not exceed 350 fathoms in any part. Between Cosseir and Suakin, the next stage, which occupied four days in laying, the greatest depth was about 450 fathoms; from Suakin to Aden, a distance of about 630 nautical miles, the cable was laid without any intermediate station, but it was brought so near to the island of Perim that a station can readily be established there if necessary. The depth in this length does not exceed 250 fathoms, and the bottom is soft, so that the difficulties of cable-laying in the Red Sea have been the subject of a good deal of romancing.

The announcement of a proposed British Transatlantic Telegraph Company, as a rival to the old Atlantic Company in seeking funds from the public, has not been made in such a way as to claim our support, even if the present company had not earned the goodwill and sympathy of all unprejudiced observers by its courageous and persevering endeavours to accomplish the greatest feat of the age in which we live. The uncalled-for abuse of those who have led what was looked on by many as a forlorn hope, and have succeeded in mounting the breech even though the vantage ground could not be maintained, is a poor recommendation to our favour, and it is not difficult to distinguish in the *animus* which has been exhibited in the notices to which we refer, that jealousy and ill-feeling which we have before had occasion to censure on the part of the former electrician of the company, who was so fortunate as to escape the discomfits and risks shared in by those who were actually concerned in laying the Atlantic cable. Nor could such a spirit be shown with more bad taste than by one whose lack of practical knowledge was the greatest misfortune of his former employers; and whose neglect of, or unfitness for, his duties has been the cause of the present position of the Atlantic Company. An examination of the persons under whose names the new company is registered does not encourage us to look for much demand for the stock among capitalists or commercial men, nor are the names likely to obtain the regard of the public. One of them, we regret to see, is a young gentleman who was permitted by the Atlantic Company to go with the expedition as a reporter to the press, and who has now put down his name for a hundred shares in the projected company.

The gutta-percha and copper for the new cable to Gibraltar and Malta have been ordered by Government from the Gutta-percha Company; it is altogether half-an-inch in diameter, the copper being a strand weighing 400 lbs. to the mile.

Messrs. Glass and Elliott have nearly completed the new cable of three wires to be laid for the Submarine Telegraph Company from the coast of Norfolk to Heligoland, to join the length already laid thence to Tonning, and have also made great progress with the cable of six wires to be laid from Folkestone to Boulonge for the same company, in order to assist the south continental traffic, which has increased very much since the Dover and Calais cable, the first submarine line ever laid, was carried out in 1851 by the Submarine Company. A single-wire cable is also being made at the same works at Greenwich for the Isle of Man, and a two-wire cable for the line of the Mersey Board between Liverpool and Holyhead, to replace the old line of semaphore telegraph which has been allowed to exist up to the present time, to the disgrace of the Dock Committee, in whose hands the matter has been.

The British and Irish Magnetic Telegraph Company have nearly finished their additional wires to the north to accommodate the north of Europe traffic by the Hanoverian and Danish lines.

SEWING MACHINES.

THE following statistics regarding the sewing-machine trade in Great Britain and the United States (compiled from patent-office reports, from the *Scientific American*, and from the reports of persons intimately acquainted with the manufacturers and users of machines in both countries) are probably as near an approximation to the facts as can be obtained:—

	Great Britain.	United States.
No. of Patents granted ...	200	300
Manufacturers	5	25
Varieties of machines	6	30
" " Lock-stitch Machines	3	10
Machines sold weekly	100	1,500
Prices	£3 to £30	£1 to £30
Lowest price for a lock-stitch machine	£11	£10
Whole number in use	10,000	100,000

A considerable number of machines have been imported from the United States into England, but the parties using them do not wish the fact to be made public, lest they should be sued for an infringement of the patent dated December 1, 1846, granted to W. Thomas, of London. This patent extends only to England—hence a large number of American-made machines are used in Scotland and Ireland. In England, only one kind of lock-stitch machine is manufactured, and its lowest price is £22. In Scotland or Ireland a lock-stitch machine may be bought or imported from the United States for £11.

These are facts certainly far from gratifying to our national pride. Although the invention of the lock-stitch sewing machine was made in England by Fisher and Gibbons, the original patentees of the sewing machine, *two years before* it was patented in America by Elias Howe, jun., yet now there are ten times more machines used in the United States than in Great Britain. Why, then, has the progress of the sewing machine been so slow in this country? Chiefly for two reasons:—1st, There has been no competition among manufacturers; and, 2ndly, prices are far higher in England than in America. In the United States as good a machine can be bought for £10 as is sold in England for £22. Competition among manufacturers has improved, cheapened, and advertised American machines. And if the trade had been conducted in this country as it has been in the United States—if the public had been permitted to select from the best machines that could have been brought into the market—and if these machines had been offered for sale at a reasonable price, this trade would now be giving employment to 100,000 mechanics and operatives who are at present engaged in less lucrative employments, and for the past two or three years Great Britain would have been a gainer to the amount of, at the very lowest estimate, three million pounds annually.

MR. HENRY BESSEMER
ON THE MANUFACTURE OF MALLEABLE IRON AND STEEL.

(*Concluded from p.* 398.)

THE casting of large masses of a perfectly homogeneous malleable metal into any desired form, rendered unnecessary the tedious, expensive, and uncertain operation of welding, now employed wherever large masses were required. The extreme toughness and extensibility of the Bessemer iron was proved by the bending of cold bars of iron 3 inches square, under the hammer, into a close fold, without the smallest perceptible rupture of the metal at any part; the bar being extended on the outside of the bend from 12 inches to 16¼ inches, and being compressed, on the inside from 12 inches to 7½ inches, making a difference in length of 9¼ inches between what, before bending, were the two parallel sides of a bar 3 inches square. An iron cable, consisting of four strands of round iron 1½-inch diameter, was so closely twisted while cold as to cause the strands at the point of contact to be permanently imbedded into each other. Each of these strands had elongated 12½ inches in a length of 4 feet, and had diminished 1-10th of an inch in diameter throughout their whole length. There were also exhibited some steel bars 2 inches square and 2 feet 6 inches in length, twisted cold into a spiral, the angles of which were about 45 degrees; and some round steel bars 2 inches in diameter bent cold under the hammer into the form of an ordinary horse-shoe magnet, the outside of the bend measuring 5 inches more than the inside.

The steel and iron boiler plates left without shearing, and with their ends bent over cold, also afforded ample evidence of the extreme tenacity and toughness of the metal; while the clear, even surface of the railway axle and piece of malleable iron ordnance were examples of the perfect freedom from cracks, flaws, or hard veins, which formed so distinguishing a characteristic of the new metal. The tensile strength of this metal was not less remarkable, as the several samples of steel tested in the proving machine at Woolwich Arsenal bore, according to the reports of Colonel Eardley Wilmot, R.A., a strain varying from 150,000 lbs. to 162,900 lbs. on the square inch, and four samples of iron boiler plate from 68,314 lbs. to 73,100 lbs.; while according to the published experiments of Mr. W. Fairbain, Staffordshire plates bore a mean strain of 45,000 lbs., and Low Moor and Bowling plates a mean of 57,120 lbs. per square inch.

There was also another fact of great importance, in a commercial point of view. In the manufacture of plates for boilers and for ship-building, the cost of production increased considerably with the increase of weight in the plate; for instance, the Low Moor Iron Company demanded £22 per ton for plates weighing 2½ cwt. each, but if the weight exceeded 5 cwt., then the price rose from £22 to £37 per ton. Now with cast ingots, such as the one exhibited, and from which the sample plates were made, it was less troublesome, less expensive, and less wasteful of material, to make plates weighing from 10 to 20 cwt., than to produce smaller ones, and, indeed, there could be but little doubt that large plates would eventually be made in preference, and that those who wanted

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small plates would have to cut them from the large ones. A moment's reflection would, therefore, show the great economy of the new process in this respect, and when it was remembered that every riveted joint in a plate reduced the ultimate strength of each 100 lbs. to 70 lbs., the great value of long plates for girders and for shipbuilding would be fully appreciated.

At a time when the manufacture of ordnance occupied so large a share of public attention, it was interesting briefly to point out the great facility which the Bessemer process afforded of forming masses, both of malleable iron and of steel, of a size suitable for the heaviest ordnance, without any welding together of separate slabs, or the more costly mode of building up the gun with pieces accurately turned and fitted together. Many attempts had been made to produce wrought-iron ordnance, and this object had been successfully accomplished in the case of the large gun produced at the Mersey forge. But, however perfect this one gun might be, the time required to make it, and its immense cost, manifestly rendered it still a great desideratum to produce guns rapidly and cheaply, of a material equal to, or greater in tensile strength than wrought-iron, and if possible free from the liability which that material had to flaws and to deterioration during its long exposure to a welding heat. It was believed that the Bessemer process supplied this desideratum, as masses of cast malleable metal could be produced of 10 or 20 tons in weight in a single piece, and two or three such pieces might be conveniently made by the same apparatus in one day. The metal so made might be either soft malleable iron or soft steel. In order to prove the extreme toughness of such iron, and the strain to which it might be subjected without bursting, several cast and hammered cylinders were placed cold under the steam hammer and were crushed down without the least tearing of the metal, as was shown by the samples exhibited. These cylinders were drawn from a round cast-iron ingot of only two inches greater diameter than the finished cylinder, and in the precise way in which a gun would be treated; they might therefore be considered as short sections of an ordinary 9-pounder field-piece. The tensile strength of the samples, as tested at the Royal Arsenal, was 64,566lbs. per square inch, while the tensile strength of pieces cut from the Mersey gun gave a mean of 50,624lbs. longitudinally, and 43,339lbs. across the grain; thus showing a mean of 17,550lbs. per square inch in favour of the Bessemer iron.

If it was desired to produce ordnance by merely casting the metal the ordinary founding process might be employed, with the simple difference, that the iron instead of running direct from the melting furnace into the mould must first be run into the converting vessel, where in ten minutes it would become steel, or malleable iron, as was desired, and the casting might then take place in the ordinary manner. The small piece of ordnance exhibited served to illustrate this important manufacture; and it was interesting in consequence of its being the first gun that was ever made in malleable iron, without a weld or joint. The importance of this fact would be enhanced when it was known that conical masses of this pure tough metal, of from five to ten tons in weight, could be produced at Woolwich at a cost not exceeding £6 12s. per ton, inclusive of the cost of pig-iron, carriage, remelting, waste in the process, labour, and engine power. The conical ingots being cast in iron moulds, the great delay in moulding in loam would be avoided; and as the iron moulds employed might be removed from the casting pit within an hour after the metal had been poured into them the tedious interval of three days, now required by the cast-iron guns before removal, would be also avoided, thus immensely increasing the capabilities of the foundry. If it was assumed that these advantages were about equal to the cost of hammering the cast ingot, then, by this process, it would be practicable to produce guns of any size in hammered cast steel, or malleable iron, ready for the boring mill, at about the same cost as the cast-iron guns now in use; but if the weight of the guns could be reduced by 20 or 25 per cent., in consequence of their superior strength, then an actual saving in that proportion would be effected in the first cost of every gun so made. These important facts had been laid before the Government, and their advantages were stated to be fully appreciated by Colonel Eardley Wilmot, the superintendent of the Royal Gun Factories, who had evinced a great interest in the progress of the invention from its earliest date, and to whose kindness the author was indebted for the many valuable trials of the tensile strength of the various samples of metal that had been submitted for investigation.

It would be interesting to those who were watching the advancement of the new process, to know that it was already rapidly extending itself over Europe. The firm of Daniel Elfstrand and Co., of Edsken, who were the pioneers in Sweden, had now made several hundred tons of excellent steel by the Bessemer process. Another large manufactory had since been started in their immediate neighbourhood, and three other companies were also making arrangements to use the process. The authorities in Sweden had fully investigated the whole process, and had pronounced in favour of it. The large steel circular saw plate exhibited was made by Mr. Göranson, of Geffle, in Sweden, the ingot being cast direct from the fluid metal, within fifteen minutes of its leaving the blast furnace. In France, the process had been for some time carried on by the old established firm of James Jackson and Son, at their steel works, near Bordeaux. This firm was about to manufacture puddled steel on a large scale. They had already got a puddling furnace erected and in active operation, when their attention was directed to the Bessemer process, the apparatus for which was put upat their works last year; andthey were now extending their field of operations by putting up more powerful apparatus at the blast furnaces in the Landes. There were also four other blast furnaces in the south of France in course of erection, for the express purpose of carrying out the new process.

The irons of Algeria and Saxony had produced steel of the highest quality.

Belgium was not much behind her neighbours; the process was now being carried into operation at Liège, where excellent steel had been made from the native coke iron; while in Sardinia, preparations were also being made for working the system. Russia had sent to London an engineer and a professor of chemistry to report on the process; and Professor Müller of Vienna, and M. Dumas and others from Paris, had visited Sweden, to inspect and report on the working of the new system in that country.

The Bessemer process might therefore be now fairly considered an accomplished commercial fact; and in a country like England, where the manufacture of iron and steel formed so important a branch of the national industry, and was so necessary an element in all the great manufacturing operations, it must be admitted that an impartial examination of the new system was of the highest importance, not only to those immediately concerned in the production of malleable iron and steel, but to the country generally.

That the process admitted of further improvement, and of a vast extension beyond its present limits, the author had no doubt; but those steps in advance would, he imagined, result chiefly from the experience gained in the daily commercial working of the process, and would most probably be the contributions of the many practical men who might be engaged in carrying on the manufacture of iron and steel by this system. Hitherto the process had been brought into its present practical and commercial state without recourse to any of the numerous inventions which were supposed by the several authors to be essential to the success of the system; but any real improvement that might be brought forward would be cordially received and encouraged.

Parliamentary Proceedings.

HOUSE OF COMMONS.

JUNE 21.

THE SHIPBUILDING DEPARTMENT OF THE NAVY.

Mr. JACKSON asked the noble lord, the Secretary to the Admiralty, whether he intended to proceed with the motion for the appointment of a select committee to inquire into the management and expenditure of the shipbuilding department of the navy, notice of which stood on the paper in his name.

Lord C. PAGET was sure that his hon. friend would give him credit for an earnest desire that there should be an inquiry into the matters connected with the shipbuilding department of the Admiralty, and he was quite certain that the noble duke who now presided over the Admiralty had it equally at heart that this great branch of our naval service should be thoroughly looked into. If he now asked permission to withdraw the motion of which he had given notice it was not that he had at all desired to shirk the question, but that he thought that his hon. friend and those who, like him, were anxious for this inquiry should put some faith in the good intentions of the noble duke and in his own. He only asked them not to spur a willing horse, and under these circumstances he should not proceed with the motion which stood in his name.

Mr. JACKSON gave notice that in the next session of Parliament he should move for a select committee to inquire, not only into the shipbuilding department, but also into the general expenditure of the navy.

THE WAR DEPARTMENT.

Colonel DUNNE gave notice that on an early day he should move the appointment of a select committee to inquire into the organization of the civil portion of the war department, its expenditure, and the various branches into which it was divided.

VOLUNTEER RIFLE CORPS.

Mr. PALK gave notice that as Her Majesty had decided to promote the formation of volunteer rifle corps, as well as artillery corps in maritime towns, he should on Tuesday next move that the House should resolve itself into a committee to consider an address praying that she would give directions that the necessary arms, accoutrements, and ammunition should be furnished to them, and assuring her that the House would make good the same.

OUR NAVAL DEFENCES.

Sir C. NAPIER, in announcing his intention to postpone the motion for a select committee to inquire into the state of the Admiralty of which he had given notice, said that he had been made very uneasy by a statement which he had heard had that forenoon been made by Lord Derby. He had heard that Lord Derby had that morning, at a meeting of his friends, stated that he understood from Mr. Gladstone, the new Chancellor of the Exchequer, that he was quite shocked at our expenses, and that he was determined to reduce them. France had a fleet nearly as large as ours, and Russia had one much larger. With regard to Russia, he had read the following important statement in the *Times* of Saturday:—

"The shipments of machinery to Russia since the opening of the navigation are stated to have been on a scale which will go far to account for the necessity that has existed for the transmission of gold from St. Petersburg to London, especially as similar orders have been executed in America and elsewhere, many of which are paid for by draughts on this country. Within the last month the Hercules steamer has landed from St. Petersburg five complete sets of engines for first-rate men of war, and many of our engineering firms have still large commissions to execute. According to the last dates the utmost exertions were being made in all the naval departments, in preparation, it was said, for the return of the Grand Duke Constantine. The Neva division of the Russian fleet is now asserted to comprise 80 first-class gunboats, constructed on the best recent models, while the Baltic fleet consists of 35 sail of the line, 14 of which, at present at Cronstadt, are screw line-of-battle ships of from 80 to 120 guns each. It is affirmed that during the last month a continental contract has been in execution in this country for 60,000 bags of ships' bread. This would suffice for 30 sail of the line for six months. Looking, also, at the purchases of horses, coal, and other material, the flow of money to England, which has been one of the first consequences of the war, is easily explained."

LIST OF NEW BOOKS.

Archer's Guide, The, 1s.
Barne's Views of Labour and Gold, 3s.
Black's Drill-Book for Volunteer Riflemen, 1s.
Blackwell's Laws of Life: Physical Education of Girls, 3s. 6d.
Brightwell's Heroes of the Laboratory and Workshop, 2s. 6d.
Busk's Rifle Target Register, 1s.
Conquest's What is Homœopathy? 1s.
Cottage Gardener, by Johnson and Hogg, 8s. 6d.

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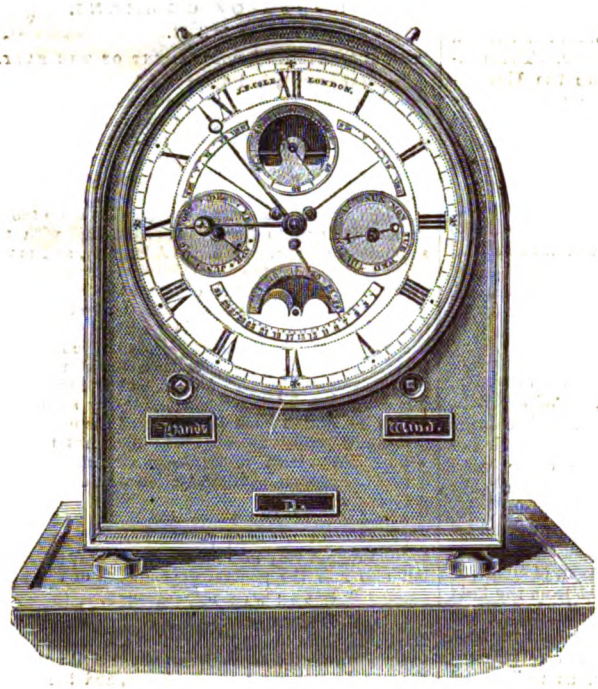
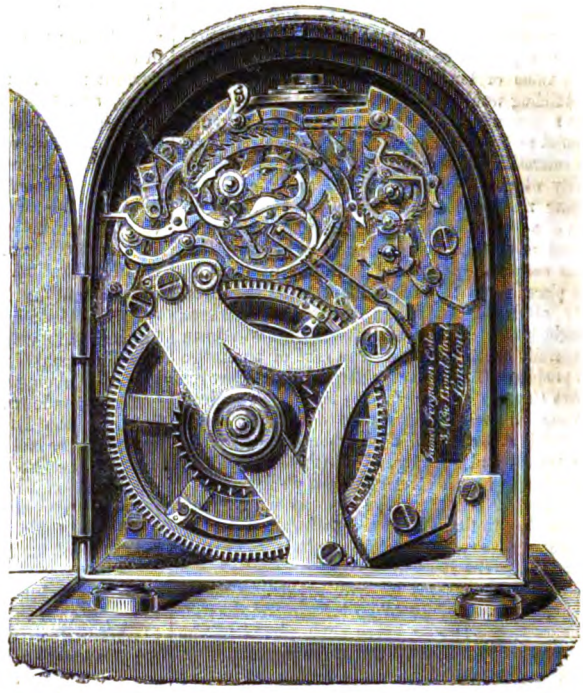
COLE'S PORTABLE ASTRONOMICAL CLOCK.





COLE'S PORTABLE ASTRONOMICAL CLOCK.

THE following description of a portable astronomical clock, designed and made by Mr. J. F. Cole, whose eminent ability as a practical horologist we some time since mentioned, is taken from the *Journal* of the Horological Institute :—

"The two engravings represent a front and back view of the clock, on a scale of proportion equal to half the dimensions of the original, which is contained in a silver case about six inches in height. The general design or calibre of the movement of this clock is an arrangement so disposed as to admit the largest amount of power in the smallest space, as shown by the unusually large diameter of the great wheels and double-acting barrel which drives the two trains of the going and striking parts, giving hours and quarters regularly on bell springs, by mechanism resembling in some particulars clocks of the justly celebrated M. Breguet. This clock also repeats the hours and quarters at pleasure, by touching a projectile stop at the top of the case. The dial plate, also of silver, is quite an original design as regards arrangement of the various indications on the several circles and scales of figures on segments drawn from three eccentric points surrounding the true centre of the hour circle. Hours, minutes, and seconds are shown by the principal steel hands, and the time is governed by a compensation balance and spring as usual; the escapement being a detached lever, with a flat steel wheel having the impulse angles formed wholly on the wheel teeth, in the manner of Graham's horizontal wheel, without columns; the pallets acted on by the planes of the teeth being two arms of equal length, with ruby pallets set to represent the edges of a ruby cylinder scaping over three teeth. The wheel in this is a tempered one, and has performed well for 30 years, without the slightest injury from action. On the dial plate, the small circle at the right shows the days of the week; the corresponding circle at the left shows the months; and the segment below shows the days of the month by a gold indicator hand, which is governed by the mechanism seen at the right of the back view given in the engraving. This particular mode of showing the perpetual day of the month is an original improvement, constructed to correct the unequal months of 30 and 31 days, for the 28th day of February, and the 29th day in leap year. Below the centre is a semicircular indication of the moon's age and phases; and above the centre is a similar aperture enclosed by the second's circle. Within the circle is a blued steel plate, carrying a disc of silver representing the apparant motion of the sun. This small disc will appear above and disappear below the moveable horizon daily, through all seasons of the year; the smaller segments at the left and right with gold indicator hands show the time of sun rising and setting.

"Outside the circular rim of the dial are two apertures—one where the key is inserted for winding the clock, and the other for setting the hands as marked on the gold tablets. The key applied at this one point commands all the motions, which are always correct, unless the clock is allowed to go down. On the side of the silver case is a sliding stop, which may be set to strike hours and quarters, or quarters only with the hour at the proper time; and if the stop is set to the lowest point, at the mark "silent," the power of the striking part is transferred to the going part, and by this the period of going will be prolonged to nearly a month. The editor of the journal before named states that seven similar clocks and pocket watches containing the above and other properties were constructed and made by Mr. Cole, about 30 years since, at prices varying from 100 to 300 guineas each."

It may be interesting, in connection with this subject, to state that we have before us a letter written by the Rev. W. B. Hawkins, M.A., F.R.S., in which reference is made to other improvements made by Mr. Cole in horological instruments. The writer mentions in particular a small carriage clock, and a small lever watch, which are particularly remarkable. "The carriage clock, which is of small size, strikes," he says, "the hours and quarters, and repeats them as well, and indicates on the dial the rising and setting of the sun, the phases of the moon, the perpetual day of the month of the year. It performs all these actions with much accuracy, and altogether displays singular talent and skill in its design and execution. The dial is an excellent example of combination and arrangement—a matter of no little difficulty where so much is required to be placed in a very small space. The lever watch is without a regulator, and although seven years have elapsed since it was last cleaned it still maintains a rate, in point of steadiness and accuracy, quite chronometrical."

LEETCH'S BREECH-LOADING RIFLED SMALL ARMS.

THE rifled fire-arms already adopted in our services, although superior to those of any other nation, are certainly not so perfect as the scientific resources of English mechanics can make them. The breech-loading principle must prevail before the wonderful precision, the enormous range, and the fearfully-destructive powers of the rifle are fully developed. We therefore continue to place before our readers the best information which can be obtained on rifled ordnance and small arms. This week we illustrate Leetch's breech loader. This arm takes either the regulation ammunition, any special form of cartridge, or even loose powder and ball, and has a range and penetration equal if not superior to the Enfield rifle.

By the accompanying engravings the detailed arrangements will be more clearly understood. Fig. 1 represents the side elevation of a military rifle. The breech is here represented as closed, and the hammer on full cock ready for the discharge of the rifle. *d* is a guard plate of metal, applied merely for the purpose of covering the hinge of the breech; *c*, a thumb piece projecting from the upper side of the breech *b*, in order to obtain a leverage for the purpose of opening and closing the breech. *e* is the locking bolt. Fig. 2 represents the same rifle with the breech opened to receive a fresh charge. *a'* is the opening left in the barrel through which the breech *b* opens and closes; *f*, a portion of the gun-stock hollowed out to admit of the cartridge or charge being introduced into the breech chamber. Fig. 3, a cross section at *B B*, Fig. 1, with the breech closed. Here the hinging of the breech to the barrel is more clearly seen. *g* is the hinge pin. Fig. 4 shows the same section, but with the breech *b* opened, the open end of the breech chamber, *b'*, being presented to view The Figures 3 and 4 are sections in front of the breech. Figs. 5 and 6 are similar sections, but taken at *A A*, and cutting through the breech. In Fig. 6, *e'* represents the hole in the butt end of the barrel *a*, through which the locking bolt is projected. Fig. 7 is a horizontal section through the centre of the breech when closed into the barrel, the letters of reference referring to the same parts as in all the other figures. Fig. 8, is a horizontal section through that portion of the butt end of the barrel and of the breech in which

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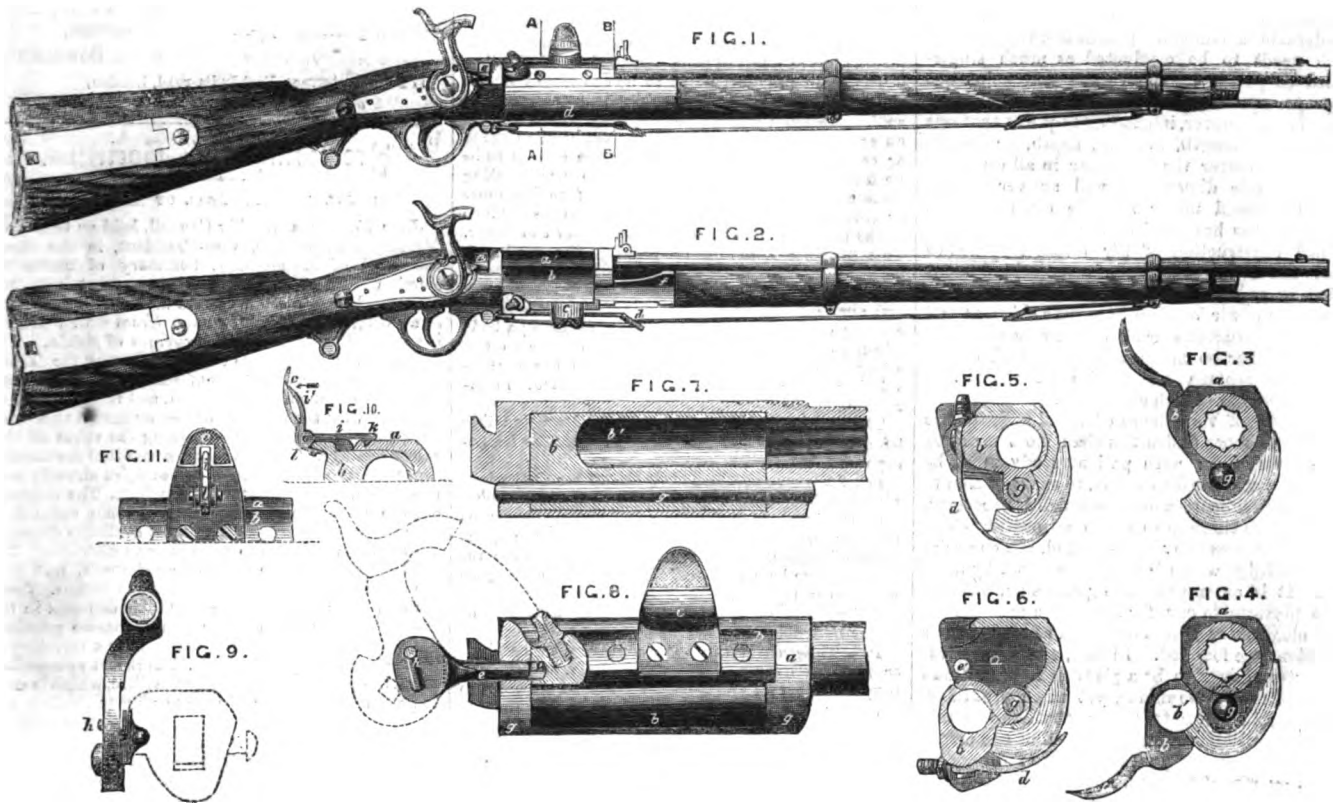
LEETCH'S BREECH-LOADING RIFLED SMALL ARMS.



the locking bolt *e* acts. The position of the hammer on full cock is here represented by dotted lines in order that the form of the locking bolt may be seen. The hole *e'* shows the extent of the traverse of the locking bolt during the fall of the hammer. *h* is a pin which secures the bolt to the hammer; it works in a slotted hole cut in the flattened end of the bolt *e*, to allow of the horizontal movement of the bolt during the curved travel of the pin when the hammer falls. Fig. 9 shows an edge or front view of the hammer, with the locking bolt *e* attached to it by the pin *h*. By the foregoing description it will be clearly seen that it is impossible for the gun to be accidentally discharged when the breech is imperfectly closed, or, in other words, when the chamber of the breech is not in line with the bore of the barrel, because in that case the locking bolt *e* would not be in line with the hole *e'* in the breech.

When this gun is discharged, the force of the gases evolved by the explosion of the gunpowder is sustained by the solid chamber hinged to the barrel, by which means the same strength for resistance is obtained as in the ordinary gun, while the difficulties arising from the ramming down, injury to the bore, irregularities on the surface of the bullet incidental to carriage, or faulty make of the ammunition, are avoided. The gun will not receive any charge or projectile which it is incapable of discharging. We consider these points well worth the consideration of the War Office before they again lay out large sums of money on useless foreign inventions for which no suitable military ammunition can be found. "The fine theories and assumed facts" laid down by the constituted authorities have had, in more than one instance, to give way before the practical common sense of our mechanics. When arms were actually wanted the English contractors were the only ones who produced them in time for positive use. This should be remembered now that immense orders are offered for contract.

The War Department ought again to give their serious attention to this subject of small arms. The Enfield rifle is an expensive weapon, and its use in India has proved that it is not quite up to the mark. But if they give practical men like Mr. Leetch (who rifled the first guns used in the Crimea, and whose carbine has been approved by two Cavalry Boards, in 1856-57, and two Commanders-in-Chief,) no encouragement or suitable remuneration for actual outlay, the authorities at Pall Mall cannot expect the assistance of the well-proved talent of such men. Now that the Volunteer Gentlemen of England are taking to the rifle it will soon arrive, we trust, at the same perfection as has been obtained in all articles used in our national sports.

CAPTAIN FISHBOURNE ON NAVAL ARCHITECTURE.*

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—By your published account of a lecture which was recently delivered at the United Service Institution by Captain Fishbourne, R.N., it appears that much has been said which is likely to cause many persons to believe that the science of naval architecture is imperfectly understood; and, if understood, that it is but little used by those who have constructed ships for the Royal Navy. The lecturer says:—"If the science of naval architecture is to be progressive—if, in fact, we are to elevate it to the rank of a science, which it is now only in part, whatever professional men may say to the contrary," &c. In making this bold assertion, it would have been well to have defined the rank of science. If, without a plan to copy from, a man constructing a ship to answer any possible and reasonable qualifications demanded, without a blunder, thereby entitles himself to the rank of a scientific man, most certainly the science exists. The lecturer also states that we condemned a fleet of ships, and does his best to make his hearers believe that the present fleet should be condemned, principally because they are wide in proportion to their draught of water; and that, in building such ships, we were steering vastly wide of the track which science dictated. Now, the simple fact is, these ships could not have been built less wide to have been so serviceable as they are; and no standard treatise, truth, or science dictated anything else. The ships of the experimental squadron of 1846 and 1847 most certainly sailed well, though some of them rolled a great deal. If the naval architects who constructed them had been the owners of so fine a fleet, they would not have been wise to have allowed the rolling ones to have enjoyed such a privilege on their next cruise. Naval architects do not assume that other persons cannot understand the science; they know but too well that it is easy to explain any part of it to an intelligent mind if they choose, although no one would be wise who did so without being paid the estimated price or market value of such knowledge.

The remarks in the lecture about the qualifications of differently-formed floating bodies must appear absurd to either the scientific or the practical man; neither can believe that a flat body will roll more than a round one. It is a notorious fact, among shipbuilders and naval architects, that, if any one will so study his profession as to be able to define what is required to enable a war-ship to do any possible duty, he will be able to obtain his wish by letting the architect alone in constructing the article which is wanted. I do not wish it to be understood that every one who claims to be a naval architect should be considered as such, for many assume the name who do not understand the elementary laws which govern that or any other science.* The remarks against building ships of great height out of the water will not alter the fact, that such ships have a great advantage over a low-built enemy either at a distance or at close quarters. It seems to be far more easy to censure the deeds of professional men than to point out the way to alter the present ships to make them more serviceable, or to construct ships in future to make them perfect. The elementary laws which govern a floating body under various circumstances have been well investigated and fully

* The above letter was received before the leading article which appeared in our last number was published.

* Naval architects certainly need improving. Perhaps some may be taught a little of the art of gunnery by Captain Fishbourne's description of the qualifications of smooth-bore and rifle guns. Since rifle guns have had an elongated shot to throw they have shamefully beaten our old friends the smooth-bore guns, which are not allowed such a privilege.

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defined by many scientific men in a clear and simple manner. The student, to make himself proficient, must accompany his studies with a considerable amount of practical investigation, which needs to be conducted as much single-handed as possible. The results will point out the proper course to be pursued in constructing a ship. It is, however, impossible to prove that one proportionate length, breadth, depth, or height will answer better than another in all cases, for any reasonable dimensions will answer if the vessel be placed under suitable circumstances. Much that has been said by the multitude about the bad construction of Sir William Symond's ships is not true; yet a want of practical judgment existed in regard to the use made of some of them. All of Sir William Symond's ships, as well as those constructed since his time, which Captain Fishbourne has so much to complain of, can be made what seamen call good sea-boats, if it is required, without much alteration.

The study of the science of naval architecture is subject to more difficulties than most men are willing to endure: with patient study must be combined a resolute disposition, to enable a man to obtain the practical knowledge which is necessary. Those who go through so rough an ordeal, which they usually must do single-handed, are choice of that knowledge which is sought so much by amateurs. It is an unprofitable profession, but still it is a pleasurable one, for it makes a man master of the elementary truths on which so many other professions are founded. In fact, as soon as naval architecture ceases to be a pleasure to him, a man mostly takes to some minor, yet more profitable, profession, in order to obtain that respectable position in society so much required as age creeps on, and the energy of youth begins to fail.

The remarks of Sir Wm. Armstrong at the conclusion of Captain Fishbourne's lecture, are such as were to be expected from a man of science and practical judgment. His description of his experience in the qualifications of projectiles no one can complain of. His remarks about the number of guns a ship should have do not affect the character of naval architects, whose business it is to construct ships to carry either a few or great number, as it may be demanded by those who use them; he appears to have been too wise to condemn the knowledge or ability of professional men, whose business he does not understand.

I am, Gentlemen, yours, &c.,

GEORGE SOLE, Jun.

North Shields, June 15, 1859.

SUBMARINE TELEGRAPHS.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE"

GENTLEMEN,—As everything relating to submarine Telegraphs possesses at this moment a public interest, I venture to send you a few facts on this important subject.

Assuming a cable to be safely submerged to a depth of three miles, and its electrical condition not impaired, we must now consider what mechanical effect such a pressure of water produces on the insulator. From practical tests I have made on portions of the Atlantic telegraph cable supplied with a potassium wire in lieu of copper, I discovered, by immersing it in water for a continuous period of twenty-three weeks, and subjecting it to a pressure of three tons per square inch, that it was perfectly insulated; but from this date the insulator appeared to deteriorate, and at the twenty-fifth week, I discovered that the moisture had reached the centre of the core, consequently decomposing the potassium. To obviate this difficulty I immersed fresh pieces of cable in bisulphuret of carbon and the chloride of sulphur, which had the effect of shrinking and closing up the pores and rendering the insulator thoroughly impervious; this, in fact, vulcanized the insulating core to about $\frac{1}{20}$th of its own thickness. Having proved by experiments that my system of preserving the insulating medium from moisture is effectual, I beg to bring such a valuable fact to your notice.

The result of these trials was brought foward at a meeting of the Institution of Civil Engineers *prior* to the laying down of the Atlantic Cable, and with the view of deterring the Atlantic Telegraph Company from sinking their cable in its then inefficient state. The subject was discussed at a meeting of the Company, but, unfortunately, it was over-ruled by Mr. Whitehouse, the company's electrician, although the fact of such inefficiency was apparent to all practical men. The result of applying such a cable for deep-sea purposes proves the accuracy of my experiments; but at a loss of from £400,000 to £500,000.

The main practical point to be considered in the construction of telegraphic cables is, combined with sufficient strength, *perpetual* isolation. It is not by outer coverings of tarred and greased hempen twine or such other soft materials that the core is to be perfectly insulated, but by applying to the insulating material, whether fillets or coverings of india-rubber or gutta-percha, a pressure of four to six tons per inch at the time it is encased round the copper conductor. This pressure I obtain by passing the conductor between a series of powerful double rollers; and to prevent both longitudinal strain upon the conductor and abrasion, fibres are incorporated in the outer coating of the insulating material, producing a body of such consistency and power of resistance to any alteration of form as is not inherent in the pure insulating substance, such as gutta-percha or india-rubber alone.

The adoption of the above means of constructing telegraphic cables will necessarily produce the following inevitable results:—

1st. As gutta-percha and india-rubber *decompose*, *absorb moisture*, and are *injured by heat*, which in long lengths of telegraphic cables greatly reduce their insulating properties, and which have been the great cause of failure, the cold vulcanizing renders the insulating core homogeneous, shrinking and closing up all pores and joints, besides rendering the insulator *proof* against moisture, decomposition, abrasion, or injury by tropical heats.

2nd. The great advantage of laying on the coatings or fillets of india-rubber longitudinally, and submitting them to cold vulcanization, must be apparent to all, over the expensive and ineffectual system of spirally winding them round the wire, making a join every quarter of an inch, or 253,440 joins in a mile, which are the elements of its own destruction.

3rd. The rapid rate at which these cables can be made will reduce the expense 25 per cent.

4th. From their lightness and great longitudinal strength there will be little or no strain upon the conductor, therefore the paying-out apparatus will be simple and inexpensive.

5th. Telegraphic wires insulated with india-rubber, and subjected to cold vulcanization, will resist 250° of heat, and may be punctured fifty times in the space of an inch without admitting any water to the wire, from its superior power of elastic contraction caused by vulcanization. To the public this is a matter of the utmost importance, inasmuch as one pin-hole in the Atlantic cable would render it unserviceable.

In conclusion, I believe that a cable constructed on these principles will eventually be the only one capable of permanently resisting the severe natural actions to which all submarine wires are subject, when submerged at great depths and lengths.

I may add, that I have met with the same difficulty in introducing the above system of constructing telegraphic cables that I did twenty years ago, in introducing powerful metallic rollers for the coating of cloth with india-rubber, and vulcanizing the surface, first employed by me at the Tottenham india-rubber mills (then known as the London Caoutchouc Company) and now universally adopted.

The coating of telegraphic wires with india-rubber is but a simple affair, compared to coating cloth two yards wide; suitable machinery (which is being constructed) will coat from 250 to 300 miles of perfect vulcanized cable per day.

I have the honour to be, gentlemen,
Your obedient servant,
J. MACINTOSH.

THE ADMIRALTY COMMITTEE ON DOCKYARDS.

TO THE EDITORS OF THE "MECHANICS' MAGAZINE."

GENTLEMEN,—In a late number of your Magazine you honoured the Committee on Dockyards with a notice, giving the names of all the members except one, whom you designate a "foreman" of Mr. Lindsay's. As I was the only member whose name did not appear, I consider myself the person referred to as Mr. Lindsay's foreman. I beg to acquaint you that I *am not* a foreman of Mr. Lindsay's, nor was I *ever* a foreman of Mr. Lindsay's. My profession is consulting engineer. In proof of my position as such, I am prepared to lay before you or any one, if necessary, the fact of my having prepared specifications and superintended the construction both of hull and machinery of 26,001 tons register of screw and paddle steamers during the four years previous to my joining this Committee, which was in July, 1858.—I am, gentlemen, your obedient servant,

ROBT. BOWMAN.

17 Paynton-terrace, East India-road, London,
June 18, 1859.

Proceedings of Societies.

ROYAL AGRICULTURAL OF ENGLAND.

June 15.—At a Weekly Council, held on this day, Mr. Raymond Barker, Vice-President, in the chair, the Earl of Malmesbury, Secretary of State for Foreign Affairs, transmitted the report of Mr. Morgan, Her Majesty's Consul at Bahia, respecting some original deposits of guano (from which nitrate is extracted) existing in the province of Bahia. The Lords of the Committee of Privy Council for Trade transmitted the three boxes of sample of the guano referred to in the above despatch, and requested to be favoured with the result of any experiments that may be made with a view to ascertaining the value of this substance. Mr. Morgan's report states that favourable accounts have been given of the samples already sent to London, Liverpool, and Birmingham. The deposits exist in beds of limestone, some of them extending over 20 square leagues. The most available deposits are found on the road to the diamond districts. The chief drawback is the want of good roads, but that the formation of a railroad is in contemplation. There are also other and almost exhaustible deposits in the neighbourhood of the River San Francesco province of Pianhy. These altogether extend over a territory of upwards of 200 square leagues. The report proceeds to detail the process of extracting the nitre, which is used to prepare gunpowder of a very ordinary quality, and to preserve meat and fish. The report concludes thus:—"From information received from several of the proprietors of those deposits lying in the intended line I believe, with the railroad, the primitive earth or manure could be replaced in England at £7 to £9 per ton. Should the trade in this article increase, either from competition or abundance, it is but natural to suppose it would be placed at a lower figure for the purposes of our commerce, inasmuch as the manure in question contains highly-organised matter with a large quantity of real ammonia and nitrogen, alkalies, magnesia, sulphate, and carbonate of lime." These communications were referred to the Chemical Committee with a view to the samples being analysed by Dr. Voelcker, the Society's consulting chemist.

A letter from Mr. Bullock Webster (dated from Athens) was read, in which he states that he has been devoting attention to the Vine disease, and that the application of sulphur has proved most successful in Greece, and that the same effect had been produced on blighted green crops. He can speak with confidence as to potatoes, beans, peas, fruit-trees, roses, trees, &c., and that he has no doubt of its efficacy as regards both turnips and hops. He also states that the sulphur ought to be applied in a very fine powder in the early stage of the growth of the plant, as soon as any blight shows itself; it is applied either by means of a large tin pepper-box or small bellows (of which he enclosed a sketch). A woman can dress an acre of vines per day. Scarcely any change will be observable in the crop for the first 10 days; after that it becomes healthy. Should rain fall within five days after the application of the sulphur the operation has to be repeated.

A letter was read from Mr. Curtis, the entomologist, respecting the insects forwarded by order of the Council, and by which Mr. Greenwood's mangel wurzel crop had been nearly destroyed. Mr. Curtis states them to be the larvæ of a beetle which has at various times injured the crops of mangel wurzel in Ireland and in France. The beetle is the Silpha opaca, fully described in the Society's journal (vol. viii., page 404, and plate 8, figures 12 to 24).

The Admiralty have issued contracts for eighteen new "gun-vessels"—not "gun-boats," as has been announced. They are understood to have been taken by six builders at the following prices:—Messrs. Green, two, at £24 15s. per ton; Mr. Wigram, four, at £21 10s.; Mr. Mare, three, at £21 10s.; Mr. J. Scott Russell, four, at £21 (not £20 10s. as was stated in the *Times'* City article); Mr. Miller (Liverpool), two, price not stated; Mr. Langley, one, at £24; Mr. Pitcher, one, at £25; and Mr. White (Cowes), one, at £25. These vessels will not differ materially in form, we believe, from existing gun-vessels, except in being lengthened several feet at the bows.

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NOTICES.

We have been compelled to defer the publication of several articles, and of letters from Captain Selwyn, R.N., Mr. Charles Clifford, and others, in consequence of the appearance of the title-page, preface, and index to this volume in the present number.

Scoto-American.—Your letter shall be taken into consideration.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance.* Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 5d. per line for any number of insertions less than 13; for 13 insertions, 4d. per line; and for 52 insertions, 3d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 5 o'clock on Thursday evening each week. None can be received after that time for the ensuing number.

Our Weekly Gossip.

SINCE the letter from Mr. Robert Bowman, which appears in another column, was put in type the following autobiographical narrative has been received from that gentleman:—"17 Paynton-terrace, East India-road, 20th June, 1859. Gentlemen,—I would not have troubled you with another communication at so early a date after mine of the 18th inst., but for an error which crept into that letter inadvertently, viz.,—I stated that a given tonnage of steam-ships had been built under my inspection during *four years* previous to my appointment on the Dock-yard Committee. I ought to have said *five years* previous to that time. I may now take occasion to observe that during the five years I did superintend the construction of five steam-ships for Mr. Lindsay, and no doubt owe principally to that gentleman my appointment on the committee. That you may have some knowledge of my standing in my profession, I beg to refer you to the Repository of Inventions for 1824, where, if I mistake not, you will find a patent taken out by me for an elastic "Stopper for Chain Cables." At that time I was manager at the engine works of Wm. Simson and Co., Aberdeen, which works were greatly enlarged under my management, and are now known as the "York Place Iron Works." I continued in the management of these works until the end of 1838, after which, under the firm of Bowman, Vernon, and Co., engineers and iron shipbuilders, I built several iron sailing ships and some small steamers. I left that firm and went into Staffordshire. If you refer to the July and August numbers of your Magazine for 1847, I think you will find a few experiments made by me on cast iron, chilled and unchilled. After leaving the crane foundry, where I was manager, I joined the firm of G. B. Thorneycroft and Co., as their superintending engineer. If you turn to the *Mining Journal* of June 8th, 1850, you will find a letter of Mr. Thorneycroft's to a railway official, in which Mr. T. makes mention of what my ability and character were in his estimation. I left that firm in the beginning of 1853, and in May of that year commenced my present practice of consulting engineer. I regret having occasion to trouble you with such lengthened and minute detail which cannot interest at all, but as I have to depend upon my professional knowledge and position for my living, I should not wish that either your mind or that of the public, into whose hands your publication falls, should have the impression that one of the members of the late Dock-yard Committee was only a foreman of Mr. Lindsay's. I am, gentlemen, yours respectfully, ROBERT BOWMAN."

A case occurred at the Guildhall Police Court this week which will interest our readers. Robert Marks, who is described by the newspaper reporters as "a shrewd, intelligent, middle-aged man, of gentlemanly exterior," and a publisher, residing at Brighton, was brought up on a warrant, charging him with obtaining large sums of money by means of false pretences. Among the witnesses examined was Mr. Richard Cort, of Barnsbury-park, Islington, the son of Henry Cort, the inventor of puddling and rolling bar-iron. He said: "I know the prisoner. I employed him to collect subscriptions to a testimonial fund which was being raised in acknowledgment of the services of my father to the British nation. That was in August, 1856, and I agreed to give him 50 per cent. on all he collected, and that was to cover all the expenses and to repay him for devoting the whole of his time to the object; but within a few weeks after I had some suspicion of him, and discharged him. The discharge was in writing, and I sent it through the post. I know he received it. During the time he was collecting under my authority I only received two subscriptions from him, and to my knowledge he has collected hundreds of pounds which I have not received. I discharged him on the 22nd of October, 1856." Mr. John Boyne, a merchant, of 2 East India-chambers, Leadenhall-street, said: "In December, 1856, I wrote a letter to the prisoner, asking to whom I should pay a sum of £30 4s., which I had received in behalf of the 'Cort's Testimonial Fund,' in consequence of which he called on me on the 15th of December, 1856, and I handed him a check for £30 4s., which has since been paid at the bank. I took no receipt, because his appearance was so highly respectable that it quite deceived me, and it is not customary to ask for a receipt for charitable contributions." Mr. Richard Cort recalled: "I have not received one farthing of this sum of £30 4s., nor any other sum since the prisoner's dismissal." Prisoner: "This is merely a question of account between Mr. Cort and me, and I shall be able to show that it is a clear case of disputed accounts." The prisoner was remanded till Friday next, when it is expected that important disclosures will be made with regard to the system pursued by the prisoner as a promoter of testimonial presentations.

Patents for Inventions.

PROVISIONAL PROTECTIONS.

Dated February 21, 1859.

474. P. Spence, of Pendleton, Manufacturing Chemist. Improvements in the manufacture of alum, and in the mode of, and apparatus for, condensing or destroying gases arising therefrom.

Dated March 11, 1859.

626. R. Hellard, Ironmonger, of Taunton. Improvements in reaping and mowing machines.

Dated March 18, 1859.

688. R. Clegg, of Islington, and R. Fell, of Limehouse. Improved apparatus for obtaining aerated fresh water from salt water.

Dated March 22, 1859.

730. T. Manlove, of Radford-grove, Lace Manufacturer, and W. Hodgkinson, of New Lenton, Draughtsman, both in Nottingham. A new method of manufacturing plain, figured, striped and plaited textile fabrics in imitation of loom-made fabrics.

Dated April 5, 1859.

852. F. C. Bakewell, of Haverstock-terrace. Improvements in open fire-places. A communication from C. Dodge.

Dated April 15, 1859.

946. G. Abeillou, of Toulouse, Tool Manufacturer. An extensible arching plane.

Dated April 30, 1859.

1082. W. Winstanley and J. Kelly, of Liverpool, Hydraulic Engineers. Improvements in pumps, and gearing and appliances for working the same.

Dated May 3, 1859.

1106. T. W. Miller, of Portsea. Improvements in apparatus for, and mode of, generating steam and economising fuel.

1108. W. Sellers, of Philadelphia, Engineer. Improvements in couplings for shafting. Partly a communication from C. Sellers.

Dated May 10, 1859.

1176. W. O. Bourne, of New York. Improvements in the means of, and apparatus for, separating metals, ores, and other substances of different specific gravities.

Dated May 12, 1859.

1194. W. Warne, J. A. Fanshawe, J. A. Jaques, and T. Galpin, of Tottenham, India Rubber Manufacturers. An improved compound or preparation of materials for, and mode of, and apparatus for, covering and insulating wires or conductors used for telegraphic or electrical purposes.

Dated May 18, 1859.

1230. A. R. Terry, Civil Engineer, of Great George-st., Westminster. Improvements in apparatus for sawing and cutting up loaf sugar.

Dated May 20, 1859.

1244. G. J. Parfitt, of Bath, Surveyor. Improvements in gas burners.

Dated May 21, 1859.

1252. A. L. Taylor, of Ludgate-hill. An improved form of harmonican pianoforte.

Dated May 23, 1859.

1260. J. H. Brierley, Manufacturer, of Halifax, and G. Old, Warehouseman, of Birmingham. A brace buckle.

1262. R. V. Leach, of Briton Perry, Glamorgan, Tin-plate Manufacturer, and T. W. Willett, of Pont-Neath-Vaughan, Brecon, Civil Engineer. Improvements in the manufacture of tin plates and terne or leaded plates, and in the apparatus connected therewith.

1264. G. Burnell, of East Hoathly, Sussex, Gentleman. An improved preparation or medicine for the cure of ague.

1266. H. A. Cooke, of Chancery-lane. Improvements in omnibuses.

1268. C. P. Moody, of Corton Denham, Somerset, Gentleman. Improvements in machinery for the manufacture of matting or fabric from straw and other vegetable fibres, and rods or bars of wood and metal.

1270. F. J. Bramwell, of Great George-st., Westminster. Improvements in apparatus for raising ships and vessels out of the water. Partly a communication.

1272. N. S. Dodge, of St. Paul's-churchyard, Merchant. Improvements in treating waste vulcanized india-rubber. A communication from H. L. Hall.

1274. N. S. Dodge, of St. Paul's-churchyard, Merchant. Improvements in finishing, colouring, and varnishing india-rubber goods, and similar manufactures. A communication from H. L. Hall.

Dated May 24, 1859.

1276. J. Stansfield, of Batley, York, Woollen Spinner. Improvements in the permanent way of railways.

1278. J. C. Fisher, of Glasgow, Manager. Improvements in preparing paints and varnishes.

1280. J. Gibbs, of Brentford, Civil Engineer. A method of treating coal, shale, lignites, and peat, in order to manufacture manure.

1282. G. Hadfield, of Carlisle, Varnish Manufacturer. An improved arrangement of heating and evaporating apparatus.

1284. A. J. Sax, of Paris, Musical Instrument Maker. Improvements in wind musical instruments.

Dated May 25, 1859.

1288. D. S. Price, of Green-st., Grosvenor-sq., Analytical Chemist. Improvements in the production of colours for dyeing and printing.

1290. E. Maw, of Doncaster Iron Works, Yorkshire. Improvements in the construction of metallic bedsteads and other furniture.

1292. A. Prince, of Trafalgar-sq. Improvements in screw propellers. A communication from H. Hirsch.

1294. J. Mallet, of Barnstaple, Watch Maker. An improved regulator for watches, portable clocks, and timepieces.

1296. J. Howard, of Bedford, Agricultural Implement Maker. An improved construction of horse-rake.

Dated May 26, 1859.

1298. J. Webster, of Birmingham, Engineer. An improvement or improvements in pressure and vacuum gauges.

1299. J. Reynolds, of Carthusian-st., Charter House-sq., Gentleman. Improvements in propelling vessels.

1300. H. W. Patrick, of Acton. A new substance or material to be used in lieu of ivory and other like substances.

1301. C. Dorn, of Stuttgart, Wurttemburg, Mining Engineer. Improvements in kilns for baking or burning china, earthenware, and bricks, and for other like purposes.

1302. J. Young, of Wolverhampton, Manufacturer. Improvements in locks, and in the manufacture of knobs for locks and latches, and also in apparatus for preventing draughts, and keeping out wet from doors and windows.

1303. P. Effertz, of Manchester, Mechanical Engineer. Certain improvements in machinery or apparatus for cutting paper, pasteboard, cardboard, and also for cutting or slicing wood into thin scaleboard or veneers, or for similarly cutting other articles.

1304. G. F. Chantrell, of Liverpool, Furnace Engineer. Improvements in the construction of charcoal kilns, and in the manufacture of coolers for charcoal kilns.

1305. W. H. Nevill, of Llanelly, Carmarthen, Manufacturer. Improvements in the manufacture of steel and wrought iron.

1306. J. Draper, of Little Tower-st. Improvements in applying indices to account and other books.

1307. M. Michaelis, of Manchester, Clerk, and R. Kershaw, of Heywood, Manufacturer. Improvements in the manufacture of velvets and other piled fabrics.

1308. J. C. Bent, of Birmingham, Gas Meter Manufacturer. Improvements in gas meters.

1309. W. Wright, of Deptford. Improvements in fastening shirts, collars, and other articles of wearing apparel.

Dated May 27, 1859.

1311. W. Weild, of Manchester, Machinist. Improvements in looms for weaving pile fabrics.

1312. M. A. F. Mennons, of Paris. An improved mode of advertising. A communication from A. Gatte.

1313. P. Aitchison, Brass Founder, and T. Binks, Plumber, of Sheffield. Improvements in self-acting and other water-closets, and in flushing apparatus connected therewith.

1314. L. Farrenc, Gentleman, and B. Subra, Professor of Mathematics, of Paris. Improvements in gas lighting by means of direct carburators.

1315. H. N. Nissen, of Mark-lane, Stationer and Printer. An improvement in book indexes.

1316. G. Hadfield, of Carlisle, Varnish Manufacturer. Improvements in the mode of and apparatus for forming casks or barrels.

Dated May 28, 1859.

1317. B. Samuelson, of Banbury. Improvements in machines for cutting roots and other vegetables.

1318. T. Wilson, of Birmingham, Engineer. Improvements in breech-loading fire-arms and ordnance.

1319. W. Crum, of Thornliebank, Renfrew, Bleacher. Improvements in printing and dyeing textile fibres and fabrics.

1320. W. H. Graveley, of Upper East Smithfield, Engineer. Improvements in apparatuses for purifying and aerating sea water, parts of which may be employed for cooking and baking purposes.

1321. R. A. Brooman, of 166 Fleet-street, London, Patent Agent. Improvements in machinery for cleaning, grinding, and bolting corn and other grain. A communication from J. B. Falguière.

1322. J. Oldbury, of Handsworth, Stafford, Gun Maker. Improvements in breech-loading fire-arms, applicable to pistols, muskets, carbines, and birding or other guns.

1323. J. Bapty, of Leeds, Foreman. An improved mode of, and apparatus for, manufacturing felted cloth.

Dated May 30, 1859.

1324. M. Davis, of Lyon's-inn, Strand, Caoutchouc Wheel Manufacturer. Improvements in the construction of wheels, axles, and boxes for carriages.

1325. A. Smith, Engineer, of Princes-st., Leicester-sq. Improvements in machinery for making lines, ropes, and cables, for telegraphic and other purposes.

1326. W. Grimshaw, of Bowdon, Chester, Gentleman.

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Certain improvements in machinery for compressing bricks, tiles, artificial fuel, and other similar articles.

1327. E. Breffit, of King William-st., City, Glass Manufacturer. Improvements in machinery or apparatus for the manufacture of hollow corks.

1328. J. Bruce, of Tiddington, near Stratford-on-Avon, Agricultural Implement Maker. An improvement in agricultural drills.

1329. W. Gossage, of Widnes, Chemist. Improvements in the manufacture of iron and steel.

1330. J. Fry, of Wrotham, Sevenoaks, Miller. An improvement in mills for grinding.

1331. O. Maggs, of Bourton, Dorset. Improvements in harrows.

1332. W. Green, of Limehouse. Improvements in washing or purifying and treating sugar.

1333. I. and R. Blackburn, of Long Eaton, Derby, Engineers. Improvements in locomotive or traction engines, and in implements connected therewith for cultivating the soil.

1334. J. L. Norton, of Belle Sauvage-yard, Ludgate-hill. Improvements in machines for stretching and drying fabrics, and in drying wool and other fibres.

1335. A. Mickelthwate, J. Peace, and S. J. Hobson, of Sheffield. Improvements in the coating and covering of metallic springs, steel, iron, and other metal bands for the use of any kind of machinery, driving bands, or straps, ribs suitable for umbrellas and parasols, staybusks, and ribs for stays, hats, bonnets, reeds and crinoline, and articles of dress, and other useful purposes.

1336. E. Leeson, of Derby, Lace Manufacturer. Improvements in machinery for the manufacture of ornamental chenille fringes and braids or other fabrics.

1337. W. Clark, of Chancery-lane. Certain improved means of reefing and shortening sail in ships and other vessels. A communication from E. E. Mulliner.

1338. W. Clark, of Chancery-lane. A new manufacture of leaven. A communication from F. Ludewig.

Dated May 31, 1859.

1340. J. S. Cockings, Civil Engineer, of Birmingham. Certain improvements in the construction of self-adjusting cases for holding and carrying cartridges of various sizes or gauges, parts of which improvements are also applicable to cartridge-carriers now in use.

1341. S. Carr and G. Butterworth, of Leeds, Manufacturers. Improvements in the manufacture of felted cloth, and in the machinery or apparatus employed in such manufacture.

1342. E. A. Wood, of Notting-hill, and M. D. Rogers, of Bromley, Middlesex, Shipwright. Improved apparatus for raising and lowering boats.

1343. J. Wansbrough, of Bridge-street, Southwark, Gentleman. Improvements in the construction of stereoscopes. A communication from E. Moxham.

1344. G. H. Smith, of Manchester. Improvements in sewing machines.

1345. P. Gambardella, of Naples, Engineer. Improvements in obtaining motive power, and in machinery or apparatus connected therewith.

1346. J. J. Lundy, of Manchester, Colour Manufacturer. Improvements in cartridges and gun-wads, for facilitating the loading and lubricating of fire-arms.

1347. A. Suter, of Fenchurch-st. A furniture castor, to be used upon the feet of tables, seats, and all descriptions of furniture or other things.

1348. F. Roberts, of Maiden Newton, and A. Roberts, of Frome, Vanchurch, Dorset. Improvements in apparatus employed for ploughing, tilling, or cultivating land, when steam power is employed.

Dated June 1, 1859.

1349. J. F. Miquel, of Paris. Improvements in trusses.

Dated June 2, 1859.

1351. F. W. Saltonstall, of Northumberland-st., Strand, and A. Bush, of St. John's Wood. An improved machine or apparatus for dredging and excavating.

1352. M. H. Chapin, of Gresham-st., Merchant. Improvements in galloons, tapes, or ribbons, for supporting steel and other hoops used for distending ladies' dresses.

1353. R. K. Whitehead, of Elton, near Bury, Bleacher. Improvements in apparatus to be used in bleaching, dyeing, and extracting the colouring matter from dye materials.

1354. S. and J. Wood, of Manchester, Embroiderers, and P. Billington, of Rusholme, Mechanic. Certain improvements in, and applicable to machines for embroideringI

1355. A. and W. Smith, of Glasgow, Engineers. Improvements in machinery for curing sugar, and for separating solid and liquid substances by centrifugal force.

1356. S. Bury, of Manchester, Manager. Certain improvements in machinery or apparatus for embossing and finishing textile fabrics or other like surfaces.

1357. S. Bury, of Manchester, Manager. Certain improvements in machinery or apparatus for embossing and finishing textile fabrics or other like surfaces.

1358. W. H. Parkes, of Birmingham, Manufacturer, and W. Bagnall, of Birmingham, Plater. A new or improved ventilator for hats and other head coverings, and also for carriages.

1359. T. Whitby, of Millbank-st., and W. Dempsey, of Great George-st., Westminster, Civil Engineers. Improvements in, and applicable to, ordnance and fire-arms, and in the projectiles to be used therewith.

1360. J. B. Pascal, of Paris, Civil Engineer. Improvements in hot-air engines.

Dated June 3, 1859.

1361. J. Wilson, of St. Helens, Manufacturing Chemist. Improvements in the manufacture of carbonate of soda.

1362. J. Edwards, of Aldermanbury. Improvements in the manufacture of anchors.

1363. R. W. Sievier, of Upper Holloway. Improvements in smelting and purifying of iron and other ores.

1364. J. Onions, of Darlaston, Stafford, Engineer. A new or improved steam-boiler.

1365. R. Mushet, of Coleford, Metallurgist. An improvement or improvements in the manufacture of iron and steel.

1366. H. N. Penrice, of Norwich. Improvements in machinery for propelling vessels.

1367. J. Kyle, of Liverpool, Pointsman. Improvements in points for railways and chairs for the same.

1368. J. H. Johnson, of Lincoln's-inn-fields. Improvements in reducing solid substances to powder, and in the machinery or apparatus employed therein. A communication from W. J. Cantelo.

1369. J. J. Baranowski, of Paris, Gentleman. Improvements in railway signal apparatuses.

1370. A. R. Arrott, of Saint Helen's, Chemist. Improvements in the manufacture of soda.

1371. J. Burrow, of Bakewell, Derby, Clerk, and W. N. Wilson, of High Holborn. An improved floor scrubber and sweeper for carpets, floors, lawns, and other such like useful purposes.

1372. A. V. Newton, of Chancery-lane. An improvement in balancing millstones. A communication from J. Fairclough.

Dated June 4, 1859.

1373. H. Crossley, of Failsworth, near Manchester. Improvements in Jacquard machines.

1374. R. Chrimes, of Rotherham, Iron Founder. Improvements in apparatus for supplying water to, and discharging the contents from, urinals, wash-hand basins, and other similar articles.

1375. E. Gill, of Wandsworth, Distiller. Improvements in producing spirit from rice, maize, and other descriptions of grain.

1376. J. Nuttall, of Old Accrington, Beerseller, G. Riding, of Clayton-le-Moors, Medical Botanist, and W. Coulthurst, of Old Accrington, Chemist. An improved size powder, to be used in sizeing cotton linen or other warps for weaving.

1377. G. Davies, of Serle-st., Lincoln's Inn. An improvement in wearing apparel. A communication from G. J. J. Laury.

1378. J. and W. Wood, of Nottingham, Lace Manufacturers. A peculiar mode or method of dyeing lace or other fabrics, and making the same into bonnet and cap fronts, or other articles.

1379. C. James, of Aberdare, Agent. An improvement in the manufacture of railway chairs.

Dated June 6, 1859.

1382. G. Davies, of Serle-street, Lincoln's Inn. Improvements in paddle wheels and screw propellers for steam vessels. A communication from A. Jouan.

1384. W. Green, of Victoria-st., City. Improvements in mowing machines.

Dated June 7, 1859.

1386. K. H. Cornish, of Essex-court, Middle Temple, Surgeon. Improvements in bedsteads, sofas, couches, and chairs, applicable to other seats or reclining surfaces.

1388. W. B. Nation, of Rotherhithe, Analytical Chemist. Improvements in the manufacture of superphosphate of lime.

1390. R. Barclay, of Bucklersbury. Improvements in the manufacture of paper from which writing or other inks cannot be expunged or extracted without detection.

1392. R. R. Fairgrieve, of Boston, U.S., Machinist, and S. Bathgate, of Selkirk, Engineer. Improvements in machinery or apparatus for winding yarns or thread.

Dated June 8, 1859.

1394. J. Henderson, W. Henderson, and T. Bagley, of Durham, Carpet Manufacturers, and S. Holdsworth, of the same place, Engineer. Improvements in looms for weaving, some of which improvements are applicable to other purposes.

1396. J. B. Howell, of Sheffield, Steel Manufacturer, J. Hick, of Great Bolton, Ironfounder, and W. Hargreaves, of the same place, Ironfounder. Improvements in apparatus for applying heat to steam or other boilers or vessels, and for facilitating the combustion of gases and smoke.

1398. J. B. Molozay, of Paris, Gentleman. New means of manufacturing velvet.

1400. A. V. Newton, of Chancery-lane. Improvements in gas meters. A communication from W. Richards.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(*From the London Gazette, June* 21, 1859.)

342. M. Curtis and J. Miller. Spinning.
346. J. Smith. Combing fibrous substances.
350. J. Hosking. Lamps.
357. A. Clark. Shutters and blinds.
362. J. S. Joseph. Coke ovens.
373. H. P. Burt. Railway carriages.
377. R. J. Ellis. Lifting submerged bodies.
390. C. Jackson. Pianofortes.
392. H. Ransford. Building ships.
400. J. and J. Bennett. Refrigerators.
491. G., G. W., and J. Betjemann. Book-slides.
410. C. Sanders. Photographic pictures.
411. J. Wright. Rolling steel and iron wire.
412. J. L. Clark. Railway signals and switches.
414. R. Clegg, F. Angerstein, and W. Page. Soap.
418. R. Mushet. Steel, iron, and cast steel.
423. G. Bedson. Joining wire.
427. R. Cookson and C. W. Homer. Bricks, tiles, &c.
429. R. J. S. Pearce. Weighing and dynamic machines.
445. P. E. Fraissinet. Iron.
453. G. Wallis. Engraving.
456. W. Clark. Pressure gauges. A commnnication.
458. P. A. J. Dujardin. Telegraphs.
464. C. F. Vasserot. Wire ropes. A communication.
483. W. S. Clark. Railways. A communication.
489. A. W. Smethurst. Driving looms.
505. J. H. G. D. Wagner. Cleansing water.
506. J. Dale. Caustic alkalis.
550. R. H. Collyer. Paper.
779. C. L. Roberts. Cigars.
797. J. Cartwright. Crushing clods.
1026. W. Moxon and J. J. Bennett. Moving heavy bodies.
1158. J. Luis. Horse machine. A communication.
1173. G. Bell. Matches or fusees.
1194. W. Warne, J. A. Fanshawe, J. A. Jaques, and T. Galpin. Insulating wires.
1286. M. A. F. Mennons. Moulds for casting. A communication.
1317. B. Samuelson. Cutting roots.
1319. W. Crum. Printing and dyeing.
1321. R. A. Brooman. Cleaning, grinding, and bolting corn. A communication.
1336. E. Leeson. Chenille fringes and braids.
1378. J. and W. Woo . Dyeing fabrics.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed June 17, 1859.

2900. J. Mac Kenzie.
2902. J. Taylor.
2908. S. Hunter.
2910. J. Ronald.
2914. W. E. Dando.
2924. M. Kenney.
2933. J. Ronald.
2958. W. A. Gilbee.
2961. C. M. A. Marion.
2997. J. W. Duncan.
30. J. Furnival, T. Furnival, J. Derbyshire, and F. J. Emery.
40. R. Rumney and W. S. Macdonald.
82. B. Robbin.
100. R. Mushet.
132. R. Mushet.
134. R. Mushet.
234. W. E. Newton.
310. H. C. Jennings.
860. I. Adams.
988. A. W. Williamson.
1110. J. Morse.

Sealed June 21, 1859.

2917. W. S. Yates.
2920. R. Clegg, F. Angerstein, and G. Ferry.
2926. E. T. Dunn.
2930. A. Prince.
2942. J. W. Child.
2954. J. Radley.
2966. J. Sinclair.
12. P. E. Guérinot.
37. P. Clark.
39. J. Howard.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1336. W. Smith.
1418. E. Guérin.
1436. W. H. Tucker.
1437. M. A. Muir and J. Mc Ilwham.
1438. C. Cowper.
1441. G. Tillett.
1453. J. Bullough.
1473. H. H. Vivian, R. H. Herrmann, and W. Morgan.
1475. I. Atkin and M. Miller.
1479. J. Saxby.
1934. P. Noyer.

LIST OF SPECIFICATIONS, &c.,

Published during the week ending June 17, 1859.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s d		s d		s d		s d		s d		s d
2517	0 3	2533	0 10	2545	0 7	2558	0 7	2572	0 10	2585	0 3
2518	1 11	2534	0 3	2546	0 7	2559	0 5	2573	0 9	2586	0 9
2519	0 3	2535	0 10	2547	0 3	2560	0 3	2574	0 3	2587	0 3
2520	0 6	2536	0 3	2548	1 9	2562	0 10	2575	0 11	2588	0 7
2524	0 6	2537	0 3	2549	0 11	2563	0 3	2576	0 3	2589	0 6
2526	0 3	2538	0 3	2550	0 3	2565	0 3	2577	0 3	2590	0 7
2527	0 5	2539	0 3	2551	0 3	2566	0 10	2578	0 3	2591	0 3
2528	0 3	2540	2 11	2552	0 3	2567	0 3	2579	0 3	2592	0 7
2529	0 6	2541	0 3	2553	0 4	2568	0 10	2580	0 7	2593	0 3
2530	0 3	2542	0 7	2554	0 3	2569	0 6	2582	0 3	2595	0 5
2531	1 0	2543	0 10	2555	0 10	2570	0 7	2583	0 6	...	...
2532	0 10	2544	0 8	2557	0 9	2571	0 6	2584	0 7	...	...

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Dates of Registration.	Nos. in Register.	Names and Addresses.	Subjects of Design.
May 27,	4177	Garton & Jarvis, Exeter	Boiler.
,, 30,	4178	Dutton & Jennens, West Bromwich	Tap.
June 7,	4179	W. Taylor, Newcastle	Window cleaning apparatus.
,, 14,	4180	H. Spence, Birmingham	Gas regulator.
,, 15,	4181	Cottam & Co., Oxford-st.	Manger fittings.
,, 16,	4182	Permanent Advertising Co., Gracechurch-st.	Advertising.
,, 17,	4183	J. Heavens, South Molton-street	Shoe.

PROVISIONAL REGISTRATIONS.

June 8,	1077	J. Stokes, Vauxhall-road	Watch & purse protector.
,, 14,	1078	W. Moginie, Camden-rd.	Camera.
,, 17,	1079	Sachexy and Muhlenfels, Berners-street	Chair.
,, 17,	1080	J. Begbie, Haddington	Drill.
,, 20,	1081	H. J. & D. Nicoll, Regent-st.	Hood.
,, 22,	1082	G. Grout, Tottenham	Spring cord.

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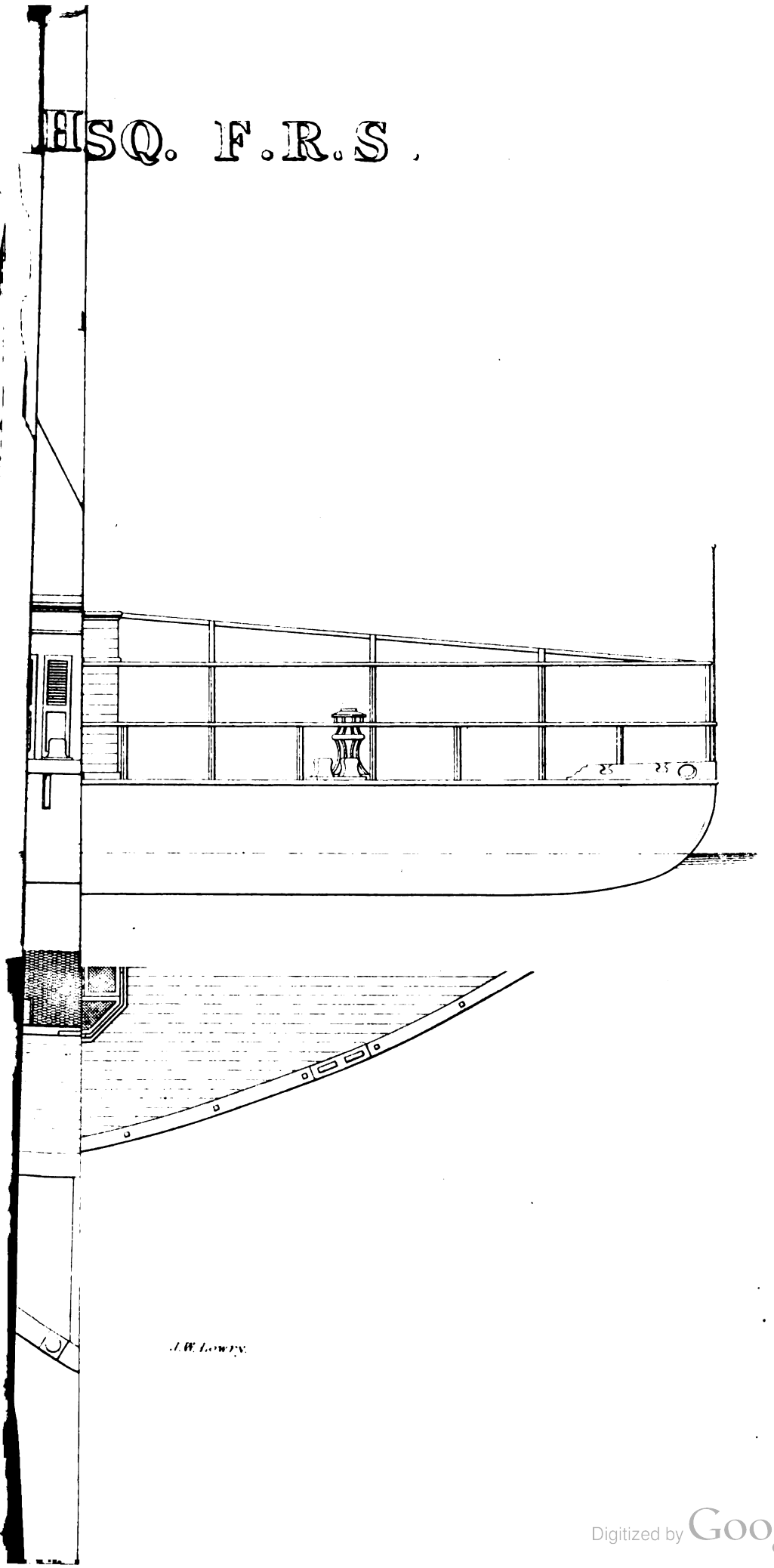
HSQ. F.R.S.



J. W. Lowry.

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[*Price, with Number*, 8d.]

SUPPLEMENT

TO THE

MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding,

OF

FEBRUARY 18, 1859.

SCREW PROPULSION

IN

HER MAJESTY'S STEAM NAVY,

WITH

OFFICIAL TABLES

OF THE

RESULTS OF TRIALS MADE WITH H.M. SCREW VESSELS OF ALL CLASSES

EDITED BY

E. J. REED,

*Late of Her Majesty's Dockyard, Portsmouth, and one of the Editors of the "*MECHANICS' MAGAZINE*."*

ROBERTSON, BROOMAN, & CO.,
"MECHANICS' MAGAZINE" AND PATENT OFFICES,
166 FLEET STREET, LONDON, E.C.

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INTRODUCTION.

THE following tables contain a mass of information which has been long desired by many scientific men.

Notwithstanding the rapidity with which steam vessels have increased in number of late years, but little regard has been shown to the conditions on which their economical construction depends; and every attempt to improve their economy and efficiency has been baffled by the want of reliable data. The persons whose good intentions have thus been frustrated, have instinctively turned towards the Admiralty, and requested to be furnished with that body of invaluable facts which the steam-ships of the Royal Navy have supplied. The official reserve of the Department, however—maintained in this case, we believe, too tenaciously—has hitherto effectually prevented their publication. It is not possible to keep such information absolutely secret in this country, and accordingly we have ourselves been in possession of the Admiralty tables for a considerable period, having obtained them through a channel which those who know us best would least suspect. But we have not, of course, felt at liberty to publish them against the will of the gentlemen who are responsible for them.

During the last month or two, however, the navy has been much thought of, and the desirability of obtaining the data kept back by the Admiralty has been so strongly felt that several members of the two Houses of Parliament determined to wait in a body upon Sir JOHN PAKINGTON to urge their production. The necessity for such cumbrous proceedings is now fortunately removed, by the publication of the whole of the Admiralty Tables in the following pages, the present Lords of the Admiralty, through their Secretary, the Right Hon. H. L. CORRY, M.P., having given the necessary sanction.

The first portion of these tables has been published, in an imperfect form, before; but in order that our readers may enjoy the full benefit of their Lordships' complaisance, we have given both sets complete. As such data would be almost valueless were they printed inaccurately, we have bestowed the utmost care upon the proof-sheets, and now put them forth in the confidence that they are as reliable as the original tables themselves. We believe the facts contained in them, however severely analysed, will redound to the credit of those who have had laid upon them the heavy responsibility of constructing Her Majesty's Steam Navy.—E. J. R.

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(Official Paper prefixed to the first set of Tables.)

ON THE INTRODUCTION AND PROGRESSIVE INCREASE OF SCREW PROPULSION IN HER MAJESTY'S NAVY.

ALTHOUGH various propositions for many years were made from time to time to use the screw as an instrument of propulsion, and a great variety of experiments tried in boats and small vessels, yet neither the reasoning of the projectors nor the results of their experiments appear to have carried conviction to the minds of most men that this kind of propeller could be usefully employed, or at all events that it could successfully compete with the paddle-wheel.

The immediate cause of its introduction into the navy was the successful performance round Great Britain and elsewhere of the Archimedes, a vessel of 237 tons, built in the year 1838 by the Screw Propeller Company, with a view of ascertaining the value of the invention. She was first tried against a paddle-wheel vessel in 1840, and the results of the trials are contained in the following report, the first official one made to the Board on the subject of screw propulsion:—

SIR, Dover, May 2nd, 1840.

In pursuance of the instructions of the Lords Commissioners of the Admiralty, as conveyed to us in your letter dated 25th ultimo, directing us to examine and report upon the principle on which the Archimedes steam vessel is propelled, we beg to state that we have made such experiments as were practicable, and we request that you will be pleased to submit to their lordships the following report.

On our arrival at this place we made arrangements with Commander Boteler, by which the Widgeon Mail Steam Packet was placed at our disposal. The following statement shows the comparative size, power, and immersion of the two vessels:—

Names.	Tonnage.	Diameter of Cylinders	Length of Stroke	Mean Draught of Water.
Widgeon.....	162	39 inches	3 feet 1 inch	7 feet 3 inches
Archimedes.....	237	37 inches	3 feet	9 „ 4 „

The Widgeon is the fastest packet upon the Dover Station. She has 10 horses power more, and 75 tons burthen less, than the Archimedes; and the mean draught of water of the former is 2 feet 1 inch less than that of the latter.

EXPERIMENTS.

1.—Our first trial was upon a run of 19 miles upon a W. S. W. course from Dover Roads, with a light breeze aft and smooth water, but without sails. The engine of the Archimedes worked 27 strokes a minute, and the speed of the vessel was 8½ knots per hour. The Widgeon performed the whole distance in six minutes less than the Archimedes.

2.—In returning the above 19 miles to Dover Roads, against a moderate head wind, without sails, the engine of the Archimedes worked 26 strokes per minute, and her speed was from 7½ to 8 knots per hour. The Widgeon performed the distance in 10 minutes less than the Archimedes.

3.—The third experiment was a run of 19 miles, from Dover Roads to Calais Roads, in a perfect calm, with the sea smooth as glass. Archimedes engine worked 27 strokes per minute, and her speed was from 8½ to 9 knots per hour. The Widgeon performed the distance in 3½ minutes less than the Archimedes, and the whole time occupied by the latter on this trial was 2 hours 9½ minutes.

4.—In returning the above 19 miles back to Dover Roads the weather was dead calm, and the sea smooth as before. The French Mail Packet, called La Poste, started at the same moment. Speed of the Archimedes and her engine as before. Widgeon ran the distance in 4 minutes less than Archimedes, and the Archimedes in 25 minutes less than La Poste. The latter has engines of only 50 horses aggregate power.

5.—On this trial there was a fresh breeze at east, and moderate sea. Both vessels set the whole of their sails, the Archimedes carrying much more canvass than the Widgeon. The run was as before, from Dover to Calais, 19 miles close hauled. Archimedes engine from 27 to 28, and her speed from 9 to 9½ knots. Archimedes ran the distance in 9 minutes less than the Widgeon.

6.—In returning to Dover with a fresh breeze abeam and all sails set, Archimedes engine 28, and speed 10 knots, she performed the distance in 5½ minutes less than the Widgeon.

REMARKS.

These trials clearly prove that the speed of the Archimedes is slightly inferior to that of the Widgeon in light airs or calms, and in smooth water; but as the steam power of the former is 10 horses less, and her burthen 75 tons more than the Widgeon, it is evident that in these vessels the propelling power of the screw is equal, if not superior, to that of the ordinary paddle wheel. In this respect, therefore, Mr. Smith's invention may be considered completely successful.

It is also plain, from the second trial, that in the steaming against even a light air of wind, the low masts and snug rig of the Widgeon gave her an advantage over the Achimedes, with loftier masts and heavier rig; and although the prevalence of calms prevented our trying them farther upon this point in blowing weather, we are satisfied that in strong breezes the advantage of the Widgeon's low rig in going head to wind would be still more apparent.

On the last two trials, however, the power of the sails operated strongly in favour of the Archimedes, as she then beat the Widgeon, and made the passages between Dover and Calais in less time than it has ever been performed by any of Her Majesty' mail packets. The Archimedes went upon this occasion from Dover to Calais in 2 hours 1 minute, and returned in 1 hour 53½ minutes.

There are two points of great practical importance respecting the screw propeller which ought not to pass unnoticed. First, the noise made by the spur-wheels used in giving the necessary velocity to the propeller shaft. Secondly, the liability of those wheels to rapid wear, and to accidental derangement. The noise alone, we conceive, would prevent its being applied to any of Her Majesty's packets in particular. Mr. Smith, however, proposes to obviate this objection by substituting spiral gearing in lieu of the present cogs; and a model of this method will be submitted to their lordships with this report. As it is the intention of Mr. Smith shortly to make trial of this alteration, we abstain from giving any opinion upon its merits at present.

It is, however, in propelling vessels of war that the value of Mr. Smith's invention will probably be experienced. In such cases, the rumbling noise

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in the ship made by the spur-wheels is of no great moment, even if it cannot be overcome; for outside the vessel, this noise is not audible to so great a distance as that made by the common paddle-wheel. A ship fitted with the screw propeller may be used either as a sailing or a steaming vessel, or as both, if required; for we ascertained by experiment that the engine can be connected or disconnected with ease, and in any weather, in two or three minutes. In carrying a press of sail, the inclination of the ship does not diminish the propelling power of the screw, nor lessen the ship's way, as with the ordinary paddle-wheel. The getting rid of paddle-boxes also leaves the broadside battery altogether clear of obstruction, and in boarding an enemy's vessel would allow of the ships lying close alongside of each other.

In conclusion, it is proper to state, that the operation of the screw facilitates the steering, and accomplishes the backing of the ship as easily as the common paddle-wheel.

We have the honour to be, Sir,

Your most obedient Servants,

(Signed) E. CHAPPELL, Captain. T. LLOYD.

The Secretary of the Admiralty.

It is obvious that in the Widgeon and Archimedes, which differed materially both in size and form, an exact comparison could not be made between the performance of the screw and that of the paddle; but the result of the trials clearly showed, especially when the peculiar fitness of the screw for war purposes was taken into consideration, the propriety of trying this new instrument in a less equivocal manner.

With this view the Rattler was ordered to be built, and, that the experiment might be conclusive, so far as a trial between two vessels could make it so, she was constructed on the same lines as the Alecto, the after part being lengthened for the insertion of the screw, and fitted with engines of the same power, and on a plan which had been previously tried in paddle-wheel vessels.

The river trials of the Rattler lasted from October, 1843, to the beginning of 1845, and from them it was clearly seen that the screw might be advantageously reduced from two half turns to about one-third of this length, an alteration which greatly reduced the weight, facilitated the operation of shipping and unshipping, and appeared to render unnecessary the wounding to so great an extent the after part of the vessel. Before this last point was decided, it not being evident that the good performance of the shorter screw was not attributable to the greater clearance which the reduction of its length had caused, the screw aperture was partly filled up in a temporary manner, so as to leave the shorter screw the same clearance as the longer one originally had. The result of this experiment showed that the screw aperture in future vessels might be constructed of very moderate dimensions without lessening the effect of the propeller.

It was also evident from these trials that the screw, as an instrument of propulsion in smooth water, was not inferior to the paddle-wheel.

In the early part of the year 1845 the Rattler proceeded, in company with the Victoria and Albert, and the Black Eagle, from Portsmouth to Pembroke. When rounding the Land's End, and steaming against a strong head wind, both these vessels, as might be expected, showed a great superiority, their power being much greater than the Rattler's in proportion to their resistance, and their paddle-floats being constructed on the vibrating principle. This comparative failure of the Rattler made an unfavourable impression on the public mind as to the efficiency of the screw against wind and sea in heavy weather, and this impression in some degree still remains, although no conclusive proof of its inferiority in this respect has yet been afforded; for in the subsequent trials of the Rattler with the Alecto at sea, against strong head winds, the only occasion on which the screw has been fairly tried under such circumstances against the paddle-wheel, no decided advantage on either side seems to have obtained, the advocates of the screw and those of the paddle respectively claiming the superiority, while in fine weather the screw is admitted to have had some advantage over the paddle.

The Rattler was next tried against the Vesuvius in a run from the Thames to Leith, and showed in respect of speed a decided superiority over the paddle-wheel vessel, whose power, as compared with her tonnage, was greater than that of her competitor.

Before joining the squadron under the command of Rear Admiral Hyde Parker, in July, 1845, the Rattler was employed to tow the Erebus and Terror to the Orkney Islands, and she appears to have performed this service to the satisfaction of Sir John Franklin.

Before this time, however, the Bee was constructed with both screw and paddle-wheel for the instruction of the officers of the Royal Naval College, the Dwarf purchased, the conditional speed of 12 miles per hour having been realised, and the Fairy built for the use of Her Majesty; but although the results of the experiments made upon the two latter vessels threw some light upon the action of the screw, and satisfactorily showed that by its means a comparatively high rate of speed could be obtained, yet they could scarcely be regarded as proper data on which to proceed in the construction and fitting of larger vessels.

Some private companies also were led to entertain so favourable an opinion of the screw that they ventured to try it; two of them on a large scale. The Great Britain, of 3,000 tons, arrived in the Thames in January, 1845, and the Great Northern, of 1,515 tons, two years previously. Neither of these vessels was successfully worked for any length of time, the former having been wrecked and the other broken up, but the results obtained, as regards the application of the screw, were considered satisfactory.

These results, probably, together with those obtained from the preliminary trials of the Rattler, and, above all, the favourable reports by naval officers of her performance at sea, induced the Board, in 1845, when the steam navy was about to be considerably increased, to determine that the screw should be adopted. They determined at the same time that the engines should be so constructed that every part of the machinery would be below the water line, an important deviation from the practice which had previously existed, and one which must be regarded as a great step towards rendering steam vessels fit for all the purposes of war. The Board likewise ordered the screw and its fitting to be so arranged, that the operation of shipping and unshipping might be easily performed in any weather, thus rendering the vessels, as far as practicable, perfect sailing ships whenever steam power was not required.

It thus became necessary, in order to fulfil the various requirements, to devise new forms of engines and new modes of application, there being at that time no kind of engine which would effectually answer the purpose. All the eminent marine engineers in the country were therefore called on to propose that construction and arrangement of engine which they might severally think the best adapted, the dimensions of the propeller, and the number of revolutions it would be required to make, being furnished for their guidance, and the necessity of keeping the whole of the machinery below the water line being insisted on. Beyond these necessary conditions the manufacturers were left unfettered, and they, as might be expected, seeing a new and wide field open for their exertions, submitted a great variety of designs, the result of their great experience and mechanical ability.

These designs differed widely from one another; some were with and some without gearing, and many of them appeared to possess great merit. Of these, selections were made, giving to nearly all the most eminent engineers an opportunity of carrying into effect one at least of the plans which they severally proposed, and in no instance giving orders for more than two engines of the same description—a decision which seems to have been judicious, when it is borne in mind that little experience had then been acquired in this novel application of steam power.

In the year 1845 tenders were accepted for fifteen pairs of screw engines for vessels of various dimensions, and, on the suggestion of the Harbour Defence Commission, eight pairs for what were originally termed block ships, four of them being line-of-battle ships and four frigates. The good performance of the former class seems to have altered their original destination from mere floating batteries to sea-going ships, calculated to

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serve with advantage in conjunction with a fleet. Of the frigate block ships, one only out of the four has been ordered to be fitted, and with smaller engines than those originally intended for her. She is not yet completed.

In order still further to test the comparative value of the screw, one paddle-wheel vessel, the Basilisk, was ordered to be built on the same lines as the Niger, and to be fitted with engines of the same power. The result of the trials recently made between these two vessels may be shortly stated. In fine weather, when equal engine-power was exerted, there was little difference of speed, and when sail could be used the advantage was in favour of the screw. There was no opportunity of trying the vessel's head to wind in heavy weather, an important point which hitherto remains undecided by actual experiment.

The expenditure of coal was much greater in the Niger than in the Basilisk, but this disadvantage arose from the construction of the boilers and engines, and not from the difference between the propelling instruments.

As far as trials have been made of the various kinds of screw engines, success to a greater or less degree may be said to have been the result of all; certainly none of them can be regarded as failures; but the pecuniary loss sustained by most of the manufacturers, and the great anxiety felt by all, can be fully appreciated by themselves alone.

Sufficient experience has not even yet been acquired for the basis of a sound opinion as to the particular form of engine which should be adopted, but the selection may now be confined within comparatively narrow limits, and experience already points out the strong probability that gearing may be altogether dispensed with, thus entirely obviating the noise so much objected to in the first screw vessel, increasing the simplicity of the machinery and reducing its bulk and weight.

One important fact, however, which during the early trials of the screw most persons doubted, has been incontestibly proved, and has already led and is calculated to lead still further to a very extensive application of the screw as an auxiliary. It has been established beyond all question that it is unnecessary to adopt complex contrivances for altering the angle of the screw, or to use, as was done in some private vessels, differential gearing, to enable the engines to work advantageously under the varying velocity of the vessel, occasioned by using the sails to a greater or less extent in conjunction with steam-power. If, for example, an engine and screw be arranged to drive a vessel at the rate of five knots, the number of strokes given out by the engine will not be inconveniently increased, or the effect of the screw diminished, when by the addition of sail power the rate of the vessel is increased to 10 knots, the simple screw thus becoming a convenient and efficient auxiliary in all classes of ships, and producing, whenever used in conjunction with sail power, a higher rate of speed than could be obtained under the same circumstances by sail alone. This view is confirmed by the successful performances of many private vessels fitted with auxiliary power. The small vessels first built traded to ports at no great distance, but their voyages have already been extended to Constantinople; and it now seems highly probable, judging by what has been accomplished, that fine sailing vessels fitted with auxiliary screw power will be found able, if not to rival, at least to approach, full-powered and expensive steamships, in respect of their capability of making a long voyage with certainty, and in a reasonably short time.

Another application of the screw, although inferior in importance to its application as a propeller to ordinary ships, is certainly deserving more attention than has hitherto been paid to it, namely, as a manœuvrer to those large ships in which engines of considerable power cannot be placed, or in which it is considered unadvisable to do so. No doubt can be entertained of the efficiency of such an instrument worked by an engine of even 50 horses power. The full extent, however, of its utility cannot, perhaps, be thoroughly appreciated until it shall have been extensively tried in Her Majesty's navy.

The proper form of the run of screw vessels being at the time of their introduction, and for some time after, a matter rather of speculation than a deduction from known principles or facts, a wide difference of opinion on this important point obtained among those who were engaged in designing these vessels; and the Board, in order to ascertain within certain limits the form which ought to be adopted, directed some experiments to be made on the Dwarf. These experiments were carried out by attaching in a temporary manner to the iron plate some pieces of wood, so as to render her afterbody as full as that of any of the vessels then in progress. The great reduction of speed from 9 knots to less than 4 knots caused by this alteration, unequivocally showed the impropriety of adopting such a form; and all the vessels then in course of construction, except those not sufficiently advanced to render necessary any alteration, were to a greater or less extent improved in the form of their stern immediately before the screw aperture.

The great importance, or rather the necessity, of introducing forms calculated to aid the action of the screw, cannot be questioned in those cases in which a high speed is regarded as indispensable, it being evident that in such cases a proper form is also indispensable, for without it the object of high speed is not attainable; but even when a moderate speed only is required, a suitable form, although not, as in the former case, absolutely necessary for obtaining the required speed, will be seen to be of greater importance than is perhaps commonly supposed, by a consideration of the great waste of power and its attendant evils occasioned by the adoption of the contrary form. If, for example, a ship, which, if of the proper form, would be propelled at 7½ knots, is propelled at 6 knots only, about one-half of the engine power is thrown away, thus wasting half the original cost of the engines and boilers, incurring double the current expense of wear and tear, consuming double the quantity of fuel, and losing the advantage of dispensing with half the weight of engines, boilers, and coals, and reducing by one-half the space which they occupy in the ship; or if the weight and space were not calculated to produce serious inconvenience, throwing away the capability of carrying fuel for perhaps three times the number of days. Probably such considerations as these induced the Board to order the afterbodies of so many screw vessels to be improved, with a view of insuring advantages which were neither doubtful nor of small moment, and which appeared to outweigh the expense of making the necessary alterations. Subsequent experience clearly proved the soundness of the views thus carried out.

The following table contains some particulars of all the screw engines which have been ordered, as well as an account of the alterations which from time to time have been made in their application, and of the result thereby produced.

It will be seen that the screw engines ordered from—

1841 to 1844	amount to...	8
in 1845	„	26 including Erebus and Terror
in 1847	„	9
in 1848	„	2 for Pinnaces of Investigator and Research
Total number ...		45

The numbers in the last column of the table, and in the column next but one preceding it, show approximately the relative excellence in respect of speed, of the forms of the various ships, conjointly with the relative efficiency of the propeller, as adapted to each of them.

The formulæ by which the calculations are made are founded on the assumption that the resistance of a ship varies as the square of her velocity, and therefore that the power required to produce that velocity varies as the cube, and that the useful effect of the engine, that is, the effect which remains after deducting the power absorbed in overcoming friction, working air pumps, &c., bears a constant ratio to the power developed in the cylinder, known by the term "Indicated Horse Power." The resistance is, in the first of these columns, assumed to vary, *cæteris paribus*, as the area of the midship section, and in the last column as the cube root of the square of the displacement.

None of these assumptions, however, more especially the last two, are absolutely correct, but probably they are not so far from the truth as to render useless and uninteresting a comparison, of which they are the basis, made between the performances of any two screw ships, while between two vessels which do not materially differ in engines and displacement, or in the area of their midship sections, such a comparison is not only highly interesting, but it may prove of great value in pointing out the forms of ships and proportions of propellers which ought to be adopted. In some striking cases it is scarcely necessary to make any other comparison than that of speed. For example, the Teazer, after her form had been improved, went above a knot an hour faster with 40 horse engines than she had previously gone with engines of 100 horse power. Again, these engines of 100 horse, when transferred to the Rifleman, a vessel approaching to double the tonnage, drove her, after her form had been altered, as fast as she was previously driven by engines of double the power, and nearly 2 knots faster than the same engines drove the smaller vessel before the alteration of her after-body.

Somerset House, May, 1850.

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(Official Paper prefixed to second set of Tables.)

RESULTS OF TRIALS MADE IN H. M.'S SCREW SHIPS AND VESSELS.

(BEING A CONTINUATION OF THE TABLES PRINTED MAY, 1850.)

THE numbers in the last two figure columns of the Table show approximately the relative excellence, in respect of speed, of the forms of the various vessels, conjointly with the relative efficiency of the propeller, as adapted to each of them.

The formulæ by which the calculations are made are founded on the assumption that the resistance of a vessel varies as the square of her velocity, and therefore that the power required to produce that velocity varies as the cube, and that the useful effect of the engine, that is, the effect which remains after deducting the power absorbed in overcoming friction, working air-pumps, &c., bears a constant ratio to the power developed in the cylinder, known by the term "Indicated Horse Power." The resistance is, in the first of these columns, assumed to vary, *cæteris paribus*, as the area of the midship section, and in the last column as the square of the cube root of the displacement.

None of these assumptions, however, more especially the last two, are absolutely correct, but probably they are not so far from the truth as to render useless and uninteresting a comparison, of which they are the basis, made between the performances of any two screw vessels; while between two vessels which do not materially differ in engines and displacement, or in the area of their midship sections, such a comparison is not only highly interesting, but it may prove of great value in pointing out the forms of vessels and proportion of propellers which ought to be adopted. In some striking cases it is scarcely necessary to make any other comparison than that of speed. For example, as may be seen in the table printed in 1850, the Teazer, after her form had been improved, went above a knot an hour faster with 40 horse engines than she had previously gone with engines of 100 horse power. Again, these engines of 100 horse, when transferred to the Rifleman, a vessel approaching to double the tonnage, drove her, after her form had been altered, as fast as she was previously driven by engines of double the power, and nearly two knots faster than the same engines drove the smaller vessel before the alteration of her after-body.

Admiralty, August, 1856.

NOTE.—The names of the vessels in the left columns of pages xii. and xiv. apply respectively to the figures of pages xiii. and xv. also, the Tables extending across both pages in each case.—E. J. R.

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VESSEL.												ENGINES.						PROPELLER.					
NAME.	Tonnage.	Speed.	Date of Trial.	Where tried.	Length between the Perpendiculars.	Breadth Extreme.	Draught of Water. Forward.	Draught of Water. Aft.	Area of midship section.	Displacement.	Cylinders. No.	Cylinders. Diameter.	Length of Stroke.	Number of Revolutions per minute.	Weight per square inch on the safety valve.	Horse-power. Nominal.	Horse-power. Indicated.	Dimensions. Diameter.	Dimensions. Pitch.	Dimensions. Length.	Centre above bottom of false keel.	Immersion of Propeller.
	Tons	Knots.			ft. in.	ft. in.	ft. in.	ft. in.	sq. ft.	Tons.		Inches.	Ft In		lbs.	Hor.	Horses.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	
AGAMEMNON	3074	11	2 Oct., 1852	Nore	230 0	55 4	17 7	20 4	816	3750	2	=70¾	3 6	60	17	600	1838·8	18 0	20 6	3 4	11 5	9
Do.	3074	11·243	3 May, 1853	Stokes Bay	230 0	55 4	23 1	23 8	1060	5080	2	=70¾	3 6	63	20	600	2268	18 0	20 6	3 4	11 5	11
ALACRITY	670	10·870	17 June, 1856	Stokes Bay	180 0	28 4	9 10	11 6	236	763	2	45	2 0	86	20	200	723·8	11 0	16 0	2 6	7 1	4
ALGIERS	3347	9	1 June, 1854	Plymouth	218 7	60 0	24 6	25 7	1053	4730	4	61	3 3	27	10	450	1117	17 0	14 0	2 4	11 9	9
ARCHER	970	7·8	24 March, 1854	Thames	186 4	33 10	14 11	14 11	383	1283	2	46	3 0	41·4	12	200	420·1	9 0	7 3	1 4	8 0	6
ARIEL	486	6·823	18 Dec., 1854	Stokes Bay	139 0	27 11	10 10	11 10	210	548	2	25½	1 9	81	20	60	193	9 0	10 9½	1 9½	6 6	5
ARROGANT	1872	8·646	9 July, 1853	Stokes Bay	200 0	45 8¾	19 1½	20 2½	615	2615	2	=55	3 0	61	12	360	774	15 6½	15 2½	2 5	10 1	10
ARROW	477	11	22 Aug., 1854	Spithead	160 0	25 4	10 0	11 8	209	586	2	42	1 9	93	20	160	594	11 0½	13 0	2 3½	7 1	4
ASSURANCE	670	11·142	16 June, 1856	Stokes Bay	180 0	28 4	10 4	11 4	240	781	2	45	2 0	87	20	200	744·6	11 0	16 0	2 6	7 1	4
BEAGLE	477	not tried	3 Sept., 1854	Thames	160 0	25 4	10 5	11 11	219	615	2	42	1 9	86	20	160	556	11 0	13 0	2 3½	7 1	4
BRISK	1074	7·35	29 March, 1853	Plymouth	193 7	35 0	12 7	14 1	360	1410	2	52	3 6	34	14	250	504·5	12 0	12 0	2 0	7 8	6
BRUNSWICK	2484	7·742	29 March, 1856	Plymouth	190 0	55 9	23 2	25 4	882	3632	2	64	3 0	53·5	20	400	1438	17 0	20 7	3 0	11 2	4
CÆSAR	2767	10·274	3 March, 1854	Stokes Bay	207 4	56 0½	19 5	22 8	726	3250	2	=58	3 3	60	22	400	1420	17 1	18 10½	2 11½	11 5	11
CENTURION	2590	8·5	14 April, 1856	Plymouth	190 0	57 1	23 10	24 11	895	3680	2	64	3 0	54	20	400	1255	17 0	21 0	3 0	11 4	12
COLOSSUS	2590	9·152	14 Aug., 1854	Stokes Bay	190 0	57 0	21 3	22 6	755	3060	2	=58	3 3	60	20	400	1432	17 1½	18 5½	2 10½	11 4	11
Do.	2590	9·312	16 Oct., 1854	Stokes Bay	190 0	57 0	23 2	25 7	892	3691	2	=58	3 3	60	20	400	1458	17 1¼	18 5½	2 10½	11 4	11
CONFLICT	1038	9·069	18 June, 1853	Stokes Bay	192 6¼	34 4	15 9	17 5	472	1752	4	46¼	2 0	63·66	10	400	724	13 7	20 1	2 10½	8 10	7
Do.	1038	9·378	4 July, 1853	Stokes Bay	192 6¼	34 4	15 9½	17 4½	472	1752	4	46¼	2 0	65·5	10	400	772	13 7	20 1	2 10½	8 10	7
Do.	1038	8·696	11 July, 1853	Stokes Bay	192 6¼	34 4	15 9½	17 4½	472	1752	4	46¼	2 0	74	10	400	747	13 5½	15 2	2 6½	8 10	7
Do.	1038	8·837	16 July, 1853	Stokes Bay	192 6¼	34 4	15 9¾	17 4½	472	1752	4	46¼	2 0	73	10	400	752	13 5¼	15 2	2 6½	8 10	7
Do.	1038	9·425	22 Aug., 1853	Stokes Bay	192 6¼	34 4	15 9	17 3	470	1740	4	46¼	2 0	77	10	400	784	13 5½	15 2	2 6½	8 10	7
Do.	1038	9·424	23 Aug., 1853	Stokes Bay	192 6¼	34 4	15 9	17 5	472	1752	4	46¼	2 0	75·75	10	400	812	13 5½	15 2	2 6½	8 10	7
Do.	1038	9·772	21 Sept., 1853	Stokes Bay	192 6¼	34 4	15 10	17 4	472	1752	4	46¼	2 0	61·5	10	400	776	13 8	19 10½	2 7	8 10	9
Do.	1038	9·428	30 Sept., 1853	Stokes Bay	192 6¼	34 4	15 9	17 4	471	1746	4	46¼	2 0	62·5	10	400	772	13 8	19 10½	2 7	8 10	9
Do.	1038	9·742	12 Oct., 1853	Stokes Bay	192 6¼	34 4	15 10	17 4	472	1752	4	46¼	2 0	67	10	400	799	13 7	20 1	2 10½	8 10	8
Do.	1038	9·913	18 Oct., 1853	Stokes Bay	192 6¼	34 4	15 9	17 4	471	1746	4	46¼	2 0	67·25	10	400	799	13 7	20 1	2 10½	8 10	8
Do.	1038	9 571	2 Nov., 1853	Stokes Bay	192 6¼	34 4	15 10	17 4	472	1752	4	46¼	2 0	66	10	400	784	13 8	19 10½	2 6	8 10	8
Do.	1038	9·772	7 Nov., 1853	Stokes Bay	192 6¼	34 4	15 9	17 4	471	1746	4	46¼	2 0	66·5	10	400	760	13 8	19 10½	2 6	8 10	8
CONQUERER	3224	10·806	16 June, 1856	Plymouth	240 0	55 4	24 3	26 4	1122	5065	2	=82	4 0	55	20	800	2812	19 0	26 9	3 6	13 4	13
COQUETTE	670	10·853	31 March, 1856	Stokes Bay	180 0	28 4	10 2	11 8	242	790	2	45	2 0	82·25	20	200	690	11 0	16 0	2 6	7 1	4
Do.	670	10·902	15 May, 1856	Stokes Bay	180 0	28 4	10 1	11 5	238	772	2	45	2 0	86·75	20	200	709·4	11 0	16 0	2 6	7 1	4
CORNWALLIS	1809	7·188	1 May, 1855	Stokes Bay	177 1	49 1	20 0	22 4	726	2678	2	=30½	2 6	103	55	200	787·4	12 0	9 6	1 7	7 9	9
COSSACK	1322	not ascer.	1 Jan., 1855	Plymouth	195 0	38 6	16 3	17 6	492	1836	2	51	2 3	64	12	250	609	12 1	16 7	2 9	8 3	5
CRESSY	2540	not tried	29 Nov., 1853	Thames	198 5	55 0	18 6	20 6	590	2410	2	64	3 0	55	17	400	1412	17 0	21 0	3 1	12 4	7
CRUISER	753	6·54	10 Dec., 1852	Thames	160 0	31 11	10 9	12 10½	278	818	2	28	2 0	53	14	60	161·4	9 0	6 9	1 1½	6 5	3
Do.	753	6·608	6 Feb., 1853	Thames	160 0	31 11	12 8	14 5	332	1007	2	28	2 0	51·337	14	60	131·7	9 0	6 8	1 1½	6 5	3
CURAÇOA	1571	10·793	26 Sept., 1854	Stokes Bay	192 0	43 0¼	14 4	17 6	467	1735	2	57½	2 9	64	20	350	1124	14 1½	20 1	3 0½	9 6	7
Do.	1571	10·309	2 Nov., 1854	Stokes Bay	192 0	43 0¼	18 0	19 6	588	2270	2	57½	2 9	64	20	350	1174	14 1½	20 1	3 0½	9 6	7
CURLEW	485	not tried	21 Aug., 1854	Thames	139 0	27 10	8 1	11 0	160	400	2	27	2 0	53	15	60	——	9 0	8 1	1 4½	6 6	3
DAUNTLESS	1575	10·016	12 Sept., 1850	Stokes Bay	219 6	39 9	16 4	16 10	542	2350	2	84	4 0	31	10	580	1347	14 8	16 4	2 10	9 7	7
Do.	1575	10·133	12 Oct., 1850	Stokes Bay	219 6	39 9	16 8	17 10	570	2480	2	84	4 0	30·5	10	580	1327·6	14 8	17 3	3 0	9 7	7
Do.	1575	9·903	27 Sept., 1851	Stokes Bay	219 6	39 9	17 0	18 7	590	2575	2	84	4 0	30·5	10	580	1305·5	14 8	17 3	3 0	9 7	7
Do.	1575	7·970	3 Jan., 1854	Stokes Bay	219 6	39 9	15 11	17 3	520	2235	2	84	4 0	26·75	8	580	925	14 8	17 3	3 0	9 7	7
DESPERATE	1037	9·432	25 May, 1850	Thames	192 4	34 4¼	13 9½	14 8½	392	1405	4	55	2 6	34·23	8	400	699·4	13 0	14 0	2 4	8 6	6
Do.	1037	10·766	18 July, 1850	Nore	192 4	34 4¼	13 6	14 10	388	1393	4	55	2 6	37·77	8	400	892 5	13 0	14 0	2 4	8 6	6
Do.	1037	8·875	18 July, 1850	Nore	192 4	34 4¼	13 6	14 10	388	1393	4	55	2 6	30·16	8	400	388·9	13 0	14 0	2 4	8 6	6
Do.	1037	9·86	11 March, 1852	Plymouth	192 4	34 4¼	14 7	15 9	424	1545	4	55	2 6	38	8	400	810·9	13 0	14 0	2 4	8 6	6
Do.	1037	8·19	11 March, 1852	Plymouth	192 4	34 4¼	14 7	15 9	424	1545	4	55	2 6	33	8	400	541·7	13 0	14 0	2 4	8 6	6
Duke of WELLINGT.	3759	10·15	11 April, 1853	Stokes Bay	240 6	60 0	23 0	24 3	988	5080	2	93¾	4 6	29·6	15	700	1979	18 0	16 3	2 9¾	12 4	11
Do.	3759	9·891	7 June, 1853	Stokes Bay	240 6	60 0	25 9	25 9	1115	5829	2	93⅝	4 6	29·75	15	700	1999·2	18 0	16 3	2 9¾	12 4	11
EDINBURGH	1772	8·873	25 May, 1852	Stokes Bay	176 6	48 7⅛	20 3	20 3	695	2598	4	55	2 6	54	6	450	962·6	16 0	18 9	3 1	10 9	7
Do.	1772	8·498	12 June, 1852	Stokes Bay	176 6	48 7⅛	21 9	22 6	785	3005	4	55	2 6	52	6	450	963·6	16 0	18 9	3 1	10 9	7
ENCOUNTER	953	10·699	10 June, 1853	Stokes Bay	190 0	33 2½	13 7	13 10	382	1459	2	=55	2 3	81·75	12	360	844	12 0	15 9½	2 8	7 3	5
ESK	1169	9·25	29 Dec., 1854	Thames	192 0	36 3	15 10	17 11	488	1835	2	50	2 9	68	18	250	721	12 2½	17 6	——	9 2	4
Do.	1169	9·439	3 Jan., 1855	Stokes Bay	192 0	36 3	15 7	17 2	470	1757	2	50	2 9	68·5	18	250	657	12 2½	18 9¼	3 2	9 2	4
Do.	1169	9·163	4 Jan., 1855	Stokes Bay	192 0	36 3	15 7	17 2	470	1757	2	50	2 9	61·5	18	250	615	12 2¼	20 9	3 4¼	9 2	4
Do.	1169	9·219	8 Jan., 1855	Stokes Bay	192 0	36 3	15 7	17 2	470	1757	2	50	2 9	63	18	250	592	12 0	20 0	3 2	9 2	4
EXMOUTH	3083	not ascer.	8 Feb., 1855	Plymouth	204 0	60 0	24 0	25 0	975	4300	2	64	3 0	53	20	400	1360	17 0	21 0	3 0¾	11 4	8
FAIRY	312	11·309	19 Sept., 1853	Stokes Bay	144 8	21 1½	5 1	7 1	86	210	2	42	3 0	35·5	11	128	359·5	6 6	8 0	1 9	3 0	3
Do.	312	12·463	30 Sept., 1853	Stokes Bay	144 8	21 1½	5 1	7 1	86	210	2	42	3 0	35·75	11	128	362	6 6	9 8	1 6¾	3 0	3
Do.	312	12·26	24 Dec., 1853	Stokes Bay	144 8	21 1⅞	5 1	7 1	86	210	2	42	3 0	34·8	11	128	348·8	6 6	9 9¾	1 6	3 0	3
Do.	312	12·137	27 Dec., 1853	Stokes Bay	144 8	21 1⅞	5 1	7 1	86	210	2	42	3 0	35·25	11	128	353·4	6 6	9 9¾	1 6	3 0	3
Do.	312	9·886	28 Dec., 1853	Stokes Bay	144 8	21 1⅞	5 1	7 1	86	210	2	42	3 0	22·5	11	128	246	6 3½	18 11½	1 11½	3 0	3
Do.	312	11·699	29 Dec., 1853	Stokes Bay	144 8	21 1⅞	5 1	7 1	86	210	2	42	3 0	45·25	11	128	335·1	5 10	7 8	2 4¼	3 0	3
Do.	312	10·926	25 March, 1851	Stokes Bay	144 8	21 1½	4 9½	7 3½	85·4	207·4	2	42	3 0	30	15	128	328	6 0¼	15 4½	1 8	3 0	3
Do.	312	11·658	28 March, 1854	Stokes Bay	144 8	21 1⅞	4 9½	7 3½	85·4	207·4	2	42	3 0	37·5	14	128	383·5	5 6¾	14 1½	1 8	3 0	3
Do.	312	13·033	24 June, 1854	Stokes Bay	144 8	21 1⅞	4 10	7 1	84	203	2	42	3 0	41·5	15	128	410	6 0	7 11½	0 9¼	3 0	3
Do.	312	13·27	11 July, 1854	Stokes Bay	144 8	21 1⅞	4 10	7 1	84	203	2	42	3 0	42·5	15	128	410	6 5¼	8 3	1 7	3 0	3
Do.	312	13·229	14 April, 1855	Stokes Bay	144 8	21 1½	4 11½	7 0½	85	205	2	42	3 0	41	15	128	406·3	6 5½	7 10½	1 10	3 0	3
Do.	312	13·216	17 April, 1856	Stokes Bay	144 8	21 1⅞	5 1	7 1	86	210	2	42	3 0	40·5	15	128	416	6 3¼	10 0	1 8¾	3 0	3
FALCON	748	not taken	17 Feb., 1855	Spithead	160 0	31 10	11 9	12 11	278	818	2	32	2 0	80	20	100	308·8	10 0	11 9	2 0	7 6	4
FLYING FISH	868	11·585	13 May, 1856	Stokes Bay	200 0	30 4	10 9	12 3	281	1090	2	58	2 3	82	20	350	1302·3	11 0	21 4	3 0	6 10	7
Do.	868	11·298	26 May, 1856	Stokes Bay	200 0	30 4	9 6	13 1	274	1061	2	58	2 3	79·5	20	350	1151·9	11 0	21 4	3 0	6 10	7
Do.	868	11·736	20 June, 1856	Stokes Bay	200 0	30 4	10 4	12 11	272	1050	2	58	2 3	75	20	350	1166·8	13 2	19 11½	3 0	7 4½	7
Do.	868	9·923	3 July, 1856	Stokes Bay	200 0	30 4	10 8	12 11	277	1072	2	58	2 3	59	20	350	576·6	13 2	19 11½	3 0	7 4½	7
Do.	868	11·201	3 July, 1856	Stokes Bay	200 0	30 4	10 8	12 11	277	1072	2	58	2 3	68·25	20	350	877·9	13 2	19 11½	3 0	7 4½	7
Do.	868	11·476	3 July, 1856	Stokes Bay	200 0	30 4	10 8	12 11	277	1072	2	58	2 3	72	20	350	1016·3	13 2	19 11½	3 0	7 4	7
Do.	868	11·603	3 July, 1856	Stokes Bay	200 0	30 4	10 8	12 11	277	1072	2	58	2 3	74·5	20	350	1160·6	13 2	19 11½	3 0	7 4	7
FORTH	1228	8·6	31 March, 1856	Plymouth	159 0	42 2	16 0	19 3	493	1704	2	=30½	2 6	110	60	200	814	12 0	10 0	1 8	7 8	11
Do.	1228	9·384	16 May, 1856	Stokes Bay	159 0	42 2	17 7	18 9	516	1792	2	=30½	2 6	114	60	200	833·6	12 0	10 0	1 8	7 8	11
GLATTON, *Battery*	1535	4·5	4 July, 1855	Nore	172 6	45 2½	8 4	8 8	379	1640	2	25½	2 0	127	62	150	693·4	6 2½	14 0	2 3¼	3 6	2
HANNIBAL	3130	8·6	12 April, 1854	Nore	217 6	58 1⅝	20 6	20 7	777	3300	2	71¾	4 0	27·5	12	450	1071·2	17 0	12 6	3 1	11 9	8
HARRIER	747	8·32	24 Oct., 1854	Stokes Bay	160 0	31 10	13 8	15 0	350	1047	2	34	1 9	93	20	100	360	10 0	11 1½	1 10	7 6	4
HASTINGS	1763	6·702	5 April, 1855	Stokes Bay	176 10½	48 6	19 9	21 11	725	2730	2	30	2 6	78	65	200	597·3	12 0	12 3½	1 11	7 11	7
HAWKE	1754	6·525	26 April, 1855	Stokes Bay	176 1	48 5½	20 10	21 11	757	2808	2	=30	2 6	89	50	200	500	12 0	9 6	1 7	7 10	11

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PROPELLER, (Continued.)

Number of Revolutions per minute.	Rate in knots per hour.	Slip. In knots per hour.	Slip. Per cent.	RATIO OF Vessel's length to breadth.	Screw's pitch to diameter.	Midship section to screw's disc.	Indicated power. To midship. section.	Indicated power. To displacement	Speed³ × Mid. Sec. ÷ Indicated Power.	Speed³ × Displt. ÷ Indicated Power.	Name of Manufacturer.	Description of Engines.	Remarks.
	Knots.	Knots.											
60	12·133	1·133	9·34	4·16	1·14	3·21	2·25	7·62	590·7	174·7	John Penn and Son	Horizontal, Trunk.....	Weather not favourable.
63	12·739	1·496	11·74	4·16	1·14	4·17	2·14	7·67	664·2	185·2	John Penn and Son	Horizontal, Trunk.....	Weather very favourable.
95	13·573	2·703	19·91	6·35	1·45	2·48	3·07	8·67	418·8	148·2	Miller, Ravenhill, and Co.	Horizontal	Wind No. 4.
69·12	9·545	0·545	5·71	3·65	0·82	4·64	1·06	3·96	687·2	183·9	Fairbairn and Sons.....	Horizontal	Speed by common log.
124·2	8·882	1·082	12·18	5·32	0·81	6·02	1·10	3·56	432·6	133·4	Miller, Ravenhill, and Co.	Horizontal	
81	8·623	1·800	20·87	4·98	1·20	3·30	0·92	2·82	345·6	110·2	Miller, Ravenhill, and Co.	Horizontal	Wind No. 7.
61	9·163	0·517	5·64	4·37	0·98	3·24	1·26	4·08	513·5	158·5	John Penn and Son	Horizontal, Trunk.....	Slide valve of forward engine defective.
93	11·926	0·926	7·76	6·32	1·18	2·18	2·85	8·48	468·3	156·9	Humphrys, Tennant, & Co.	Horizontal	Speed by patent log.
87	13·731	2·589	18·86	6·35	1·45	2·53	3·10	8·78	445·8	157·5	Miller, Ravenhill, and Co,	Horizontal	Calm.
86	11·028	——	——	6·32	1·18	2·30	2·54	7·69	— —	— —	Humphrys, Tennant, & Co.	Horizontal	
76·5	9·055	1·705	18·83	5·53	1·00	3·18	1·40	4·01	283·3	99·0	Scott, Sinclair, and Co	Horizontal	[knots with the wind.
34·5	10·862	3·120	28·72	3·41	1·21	3·89	1·63	6·09	284·6	76·3	Miller, Ravenhill, and Co.	Horizontal	Wind very strong, No. 7. Speed 4·737 knots against and 10·746
60	11·183	0·909	8·13	3·70	1·10	3·16	1·96	6·47	554·5	167·6	John Penn and Son.....	Horizontal, Trunk.....	Wind No. 1.
54	11·186	2·686	24·01	3·33	1·24	3·94	1·40	5·69	438·0	108·0	Miller, Ravenhill, and Co.	Horizontal	Fresh breeze, considerable swell.
60	10·924	1·772	16·22	3·33	1·08	3·28	1·90	6·80	404·2	112·7	John Penn and Son	Horizontal, Trunk.....	Wind No. 6.
60	10·924	1·612	14·76	3·33	1·08	3·87	1·63	6·10	494·0	132·3	John Penn and Son	Horizontal, Trunk.....	Wind No. 3 to No. 4.
65·66	12·611	3·542	28·09	5·61	1·48	3·26	1·534	4·982	486·3	149·7	Seaward and Capel	Horizontal	Bomerang propeller. Wind No. 5.
85·5	12·975	3·597	27·72	5·61	1·48	3·26	1·636	5·312	504·3	155·3	Seaward and Capel	Horizontal	Bomerang propeller. Wind No. 2.
74	11·071	2·375	21·45	5·61	1·13	3·31	1·583	5·14	415·5	127·9	Seaward and Capel	Horizontal	Spare propeller (cut.) Wind No. 4 to No. 5.
73	10·921	2·084	19·08	5·61	1·13	3·31	1·593	5·174	433·2	133·4	Seaward and Capel	Horizontal	Spare propeller (still more cut). Wind No. 5.
77	11·520	2·094	18·18	5·61	1·13	3·29	1·668	5·419	501·9	154·5	Seaward and Capel	Horizontal	Spare propeller, with wooden sphere attached to boss. Calm
75·75	11·333	1·909	16·84	5·61	1·13	3·31	1·720	5·587	486·5	149·8	Seaward and Capel	Horizontal	Same propeller as on the trial of the 16th July, 1853.
61·5	12·063	2·291	18·99	5·61	1·46	3·22	1·644	5·34	567·6	174·8	Seaward and Capel	Horizontal	Common propeller (uncut). Calm. [Wind No. 3 to No. 4.
62·5	12·259	2·831	23·09	5·61	1·46	3·21	1·639	5·324	511·3	157·4	Seaward and Capel	Horizontal	Common propeller, 1 foot cut off each corner of each blade.
67	13·274	3·532	26·61	5·61	1·48	3·26	1·693	5·498	546·2	168·2	Seaward and Capel	Horizontal	Bomerang propeller. Wind No. 2 to No. 4.
67·25	13·322	3·409	25·59	5·61	1·48	3·25	1·696	5·51	574·2	176·8	Seaward and Capel	Horizontal	Bomerang propeller. Wind No. 1. [ler. Wind No. 3 to No. 5.
66	12·946	3·375	26·07	5·61	1·46	3·22	1·661	5·395	527·8	162·5	Seaward and Capel	Horizontal	Common propeller, surface reduced to that of Bomerang propel-
66·5	13·044	3·272	25·08	5·61	1·46	3·21	1·614	5·242	578·3	178·0	Seaward and Capel	Horizontal	Do. and edges of blades bevelled. Wind No. 1.
55	14·513	3·707	25·54	4·34	1·41	3·90	2·51	8·85	503·5	142·6	John Penn and Son	Horizontal, Trunk.....	Strong breeze, with swell. Trial not considered satisfactory.
82·25	12·981	2·128	16·39	6·35	1·45	2·55	2·85	8·07	443·3	158·3	Miller, Ravenhill, and Co.	Horizontal	Wind No. 3.
86·75	13·691	2·789	20·37	6·35	1·45	2·50	2·98	8·43	434·7	153·7	Miller, Ravenhill, and Co.	Horizontal	Wind No. 5. to No. 6.
103	9·652	2·464	25·53	3·61	0·79	6·42	1·08	4·08	342·4	91·0	John Penn and Son	Horizontal. Tk., Hgh. Prs.	Wind No. 1. [the weather.
64	10·469	——	——	5·06	1·37	4·29	1·24	4·06	— —	— —	Maudslay, Sons, and Field	Horizontal	Speed not ascertained in consequence of the boisterous state of
55	11·393	——	——	3·61	1·24	1·70	2·39	7·86	— —	— —	Maudslay, Sons, and Field	Horizontal	Wind No. 6 to No. 7.
106	7·058	0·518	7·34	5·01	0·75	4·35	0·58	1·85	481·8	151·6	George and J. Rennie ...	Horizontal	
102·674	6·745	0·137	2·03	5·01	0·74	5·22	0·40	1·31	727·6	220·2	George and J. Rennie ...	Horizontal	Calm.
64	12·678	1·885	14·87	4·46	1·42	2·98	2·41	7·78	522·4	161·5	Maudslay, Sons, and Field	Horizontal	Nearly a calm.
64	12·678	2·369	18·69	4·46	1·42	3·75	2·00	6·80	548·7	161·2	Maudslay, Sons, and Field	Horizontal	Wind No. 4.
26·78	7·757	——	——	4·99	0·90	2·52	— —	— —	— —	— —	Maudslay, Sons, and Field	Horizontal, Geared	Preliminary trial, launching cleets not removed.
70·556	11·368	1·352	11·89	5·52	1·11	3·18	2·48	7·62	404·3	131·9	Robert Napier and Sons	Horizontal, Geared	
69·418	11·812	1·679	14·21	5·52	1·17	3·35	2·33	7·25	446·7	143·6	Robert Napier and Sons	Horizontal, Geared	
69·418	11·812	1·909	16·16	5·52	1·17	3·46	2·21	6·95	438·9	139·8	Robert Napier and Sons	Horizontal, Geared	Wind No. 5.
69·883	10·360	2·390	23·07	5·52	1·17	2·23	1·78	5·41	284·6	93·6	Robert Napier and Sons	Horizontal, Geared	Wind No. 8.
71·69	10·314	0·882	8·55	5·60	1·08	2·95	1·78	5·58	470·3	150·5	Maudslay, Sons, and Field	Horizontal, Geared	Preliminary trial.
82·414	11·361	0·615	5·40	5·60	1·08	2·92	2·30	7·16	542·5	174·4	Maudslay, Sons, and Field	Horizontal, Geared	
65·8	9·088	0·213	2·34	5·60	1·08	2·92	1·00	3·12	697·4	224·2	Maudslay, Sons, and Field	Horizontal, Geared	[made with two cylinders. The speed is the average of two runs only. This trial was
82·916	11·450	1·590	13·89	5·60	1·08	3·19	1·91	6·07	501·2	158·0	Maudslay, Sons, and Field	Horizontal, Geared	Wind No. 5. with some swell.
72·906	9·944	1·754	17·64	5·60	1·08	3·19	1·28	4·05	430·0	135·5	Maudslay, Sons, and Field	Horizontal, Geared	Wind No. 5. with some swell. Third grade of expansion.
65·6	10·675	0·525	4·92	4·01	0·90	3·88	2·00	6·70	522·0	156·1	Robert Napier and Sons	Horizontal, Geared	Wind No. 4.
66·937	10·730	0·839	7·82	4·01	0·90	4·38	1·79	6·17	539·7	156·8	Robert Napier and Sons	Horizontal, Geared	The speed is the average of two runs only.
51	9·987	1·114	11·15	3·63	1·17	3·46	1·39	5·09	504·4	137·2	Maudslay, Sons, and Field	Horizontal	
52	9·618	1·120	11·64	3·63	1·17	3·90	1·23	4·63	500·0	132·6	Maudslay, Sons, and Field	Horizontal	
41·75	12·735	2·036	15·99	5·72	1·32	3·38	2·21	6·56	554·3	186·7	John Penn and Son	Horizontal, Trunk	Calm. Ship fully rigged.
68	11·738	2·488	21·20	5·30	1·43	4·17	1·48	4·81	535·7	164·5	J. Scott Russell and Co.	Inclined, Oscillating	Griffiths's patent screw propeller.
68·5	12·742	3·273	25·75	5·30	1·54	4·02	1·40	4·51	601·6	186·4	J. Scott Russell and Co.	Inclined, Oscillating	Griffiths's patent screw propeller. Wind No. 2.
61·5	12·588	3.425	27·51	5·30	1·70	4·02	1·31	4·22	587·9	182·1	J. Scott Russell and Co.	Inclined, Oscillating	Griffiths's patent screw propeller. Wind No. 2.
63	12·429	3.210	25·83	5·30	1·67	4·16	1·26	4·07	622·1	192·7	J. Scott Russell and Co.	Inclined, Oscillating	Common propeller. Wind No. 2.
53	10·979	——	——	3·40	1·24	4·30	1·39	5·14	— —	— —	Maudslay, Sons, and Field	Horizontal	Speed not ascertained in consequence of strong wind.
177·5	14·007	2·698	19·26	6·85	1·23	6·33	4·18	10·17	346·0	142·1	John Penn and Son	Vertical, Oscillg., Geared	Scott's propeller. Calm.
78·75	17·044	4·581	26·88	6·85	1·49	6·33	4·21	10·25	459·9	188·9	John Penn and Son	Vertical, Oscillg., Geared	Griffiths's propeller. Wind No. 3. [Wind No. 4.
174	16·843	4·583	27·21	6·85	1·51	6·33	4·06	9·87	544·1	186·7	John Penn and Son	Vertical, Oscillg., Geared	Common propeller, cut with blades like Griffiths's propeller.
176·25	17·060	4·923	28·86	6·85	1·51	6·33	4·11	10·00	435·1	178·7	John Penn and Son	Vertical, Oscillg., Geared	Common propeller, same as 24 Dec., 1853, with sphere attached
112·5	21·038	11·152	53·01	6·85	3·01	2·77	2·86	6·96	337·8	138·8	John Penn and Son	Vertical, Oscillg., Geared	Lowe's propeller. Wind No. 7. [to the boss. Wind No. 4.
225·25	17·110	5·411	31·62	6·85	1·31	3·22	3·90	9·49	410·9	168·8	John Penn and Son	Vertical, Oscillg., Geared	Bomerang propeller. Wind No. 4.
150	22·749	11·823	51·97	6·85	2·54	2·96	3·84	9·36	339·6	139·3	John Penn and Son	Vertical, Oscillg., Geared	Lowe's propeller. Wind No. 4.
187·5	26·124	14·466	55·37	6·85	2·54	3·51	4·49	10·95	352·8	144·8	John Penn and Son	Vertical, Oscillg., Geared	Lowe's propeller, but six inches less in diameter. Calm.
167·5	16·332	3·299	20·20	6·85	1·33	2·97	4·88	11·87	453·6	186·5	John Penn and Son	Vertical, Oscillg., Geared	Fisher's Venetian propeller with flange.
112·5	17·293	4·023	23·26	6·85	1·27	2·55	4·88	11·87	478·7	196·9	John Penn and Son	Vertical, Oscillg., Geared	Griffiths's propeller. Wind No. 1. [to No. 2.
105	15·967	2·738	17·15	6·85	1·22	2·60	4·78	11·69	484·3	198·1	John Penn and Son	Vertical, Oscillg., Geared	Common propeller cast at Portsmouth in 1850. Wind No. 1
192·5	19·975	6·759	38·84	6·85	1·58	2·75	4·84	11·77	477·2	196·0	John Penn and Son	Vertical, Oscillg., Geared	Lewsey's blades fitted in boss of Griffiths's propeller. [from the Eastward.
80	9·272	——	——	5·03	1·07	2·93	1·11	3·53	— —	— —	Miller, Ravenhill, and Co.	Horizontal	Vessel not taken to Stokes Bay, the wind being No. 8 to No. 9.
42	17·255	5·670	32·86	6·59	1·94	2·96	4·63	12·30	335·5	126·5	Maudslay, Sons, and Field	Horizontal	Wind No. 3.
79·5	16·727	5·429	32·46	6·59	1·94	2·88	4·21	11·10	341·7	129·7	Maudslay, Sons, and Field	Horizontal	Wind No. 6.
75	14·765	3·029	20·51	6·59	1·52	2·00	4·29	11·29	376·8	143·1	Maudslay, Sons, and Field	Horizontal	Wind No. 4 to No. 5. Additional false keel aft.
59	11·615	1·692	14·57	6·59	1·52	2·03	2·08	5·50	469·4	177·5	Maudslay, Sons, and Field	Horizontal	Wind No. 3. Sea moderately calm.
68·25	13·436	2·235	16·63	6·59	1·52	2·03	3·17	8·38	443·4	167·7	Maudslay, Sons, and Field	Horizontal	Do. Do.
72	14·174	2·698	19·03	6·59	1·52	2·03	3·67	9·70	411·9	155·8	Maudslay, Sons, and Field	Horizontal	Do. Do.
74·5	14·667	3·064	20·89	6·59	1·52	2·03	4·19	11·08	372·8	141·0	Maudslay, Sons, and Field	Horizontal	Do. Do.
100	10·851	2·251	20·74	3·77	0·83	4·36	1·65	5·71	385·2	111·5	John Penn and Son	Horizontal, Tk., High. Prs.	Fresh breeze and a little swell.
114	11·245	1·861	16·55	3·77	0·83	4·56	1·62	5·65	511·5	146·3	John Penn and Son	Horizontal, Tk., High. Prs.	Wind No. 3 to No. 4.
127	17·539	13·039	74·35	3·82	2·25	12·48	1·83	4·99	49·8	18·3	Miller, Ravenhill, and Co.	Horizontal, High Press.	Speed by common log. [Negative slip.
64·87	7·999	0·601	7·51	3·74	0·74	3·42	1·38	4·83	461·4	131·6	Scott, Sinclair, and Co. ...	Horizontal, Geared	Speed by common log. Launching cleets not removed.
91	10·206	1·886	18·48	5·03	1·11	4·46	1·03	3·49	559·9	165·0	Humphrys, Tennant, & Co.	Horizontal	Wind. No. 4.
78	9·457	2·755	29·13	3·65	1·02	6·41	0·82	3·06	365·4	98·4	Maudslay, Sons, and Field	Horizontal, High Press.	
89	8·340	1·815	21·76	3·63	0·79	6·69	0·66	2·51	420·6	110·6	John Penn and Son	Horizontal, Tk., High. Prs.	Wind No. 2.

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VESSEL.											ENGINES.						PROPELLER.					
NAME.	Tonnage.	Speed.	Date of Trial.	Where Tried.	Length between the Perpendiculars.	Breadth Extreme.	Draught of Water.		Area of Midship Section.	Displacement.	Cylinders.		Length of Stroke.	Number of Revolutions per minute.	Weight per square inch on the safety valve.	Horsepower.	Dimensions.			Centre above bottom of false keel.	Immersion of centre at the time of trial.	
							Forward.	Aft.			No.	Diameter.				Nominal.	Indicated.	Diameter.	Pitch.	Length.		
	Tons	Knots.			ft. in.	ft. in.	ft. in.	ft. in.	sq. ft.	Tons.		in.	ft. in.		lbs.	hors.	horses.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
HIGHFLYER	1153	9	25 March, 1852	Thames	192 0	36 4	15 2	16 4	448	1655	2	55	2 6	50·58	12	250	699·1	12 0½	9 8½	1 8	9 0	7 4
Do.	1153	9·399	10 April, 1852	Thames	192 0	36 4	15 8	17 4	476	1775	2	55½	2 6	53·37	14	250	702	12 0½	9 8½	1 8	9 0	8 4
HOGUE	1846	7·809	13 Dec., 1850	Stokes Bay	184 0	48 4½	20 10	23 10	799	3054	4	51½	3 0	47	10	450	792·6	16 1	21 1½	3 2	11 5	12 5
Do.	1846	8·328	18 Dec., 1850	Stokes Bay	184 0	48 4½	21 2	23 10	805	3081	4	51½	3 0	56	10	450	797·3	16 0½	18 9	3 4	11 5	12 5
Do.	1846	5·51	17 Jan., 1853	Plymouth	184 0	48 4½	21 10	23 10	820	3135	4	51½	3 0	50	10	450	857·4	16 1	21 1½	3 2	11 5	12 5
Do.	1846	6·893	19 May, 1853	Plymouth	184 0	48 4½	21 6	23 6	805	3081	4	51½	3 0	53·5	10	450	964·4	16 1	21 1½	3 2	11 5	12 1
HORATIO	1090	8·855	17 June, 1850	Nore	154 3	40 2½	12 1	18 8	391	1175	2	54	3 0	41·28	13	250	553·1	14 0	13 0	2 2	10 0	8 8
HORNET	753	7·75	16 July, 1854	Thames	160 0	31 10½	12 9	14 9	324	980	2	38·1/10	2 0	71·	20	100	233·1	10 0	13 6	1 10½	6 9	8 0
IMPERIEUSE	2355	10·673	11 Jan., 1853	Nore	212 0	50 0	16 1	18 3	524	2225	2	=55	3 0	67·7	13	360	1080·7	16 0	16 0	2 8	10 7	7 5
Do.	2355	10·279	13 April, 1853	Stokes Bay	212 0	50 0	20 0	22 2	717	3196	2	=55	3 0	68·8	20	360	1245	16 0	16 0	2 8	10 7	11 7
Do.	2355	9·849	4 May, 1853	Stokes Bay	212 0	50 0	21 2	22 3	748	3345	2	=55	3 0	70·25	20	360	1296	16 0	16 0	2 8	10 7	11 8
INTREPID	851	not obtnd	4 April, 1856	Thames	200 0	30 2	10 11	12 8	285	1105	2	58½	2 3	77	22	350	1191	11 0	21 3	3 0½	6 9	5 11
JAMES WATT	3083	9·361	30 March, 1855	Stokes Bay	230 0	55 5	23 3	23 10	1040	4950	4	52	3 0	51	16	600	1543·6	17 0	24 4	3 1	12 2	11 8
LAPWING	670	11·021	27 May, 1856	Stokes Bay	180 0	28 4	10 2	11 6	240	781	2	45	2 0	85	20	200	689·2	11 0	15 7½	2 6	7 1	6 5
LYNX	477	not taken	15 Sept., 1851	Thames	160 0	25 4	10 3	11 7	212	592	2	=35½	1 8	113	20	160	526·9	11 0	9 8½	2 4	7 1	4 6
MALACCA	1034	9·199	3 Oct., 1854	Stokes Bay	192 0	34 4	15 5	17 4	453	1695	2	=28⅞	2 6	87·5	60	200	691	13 6	11 0	1 10½	9 1	8 8
Do.	1034	8·673	4 May, 1855	Stokes Bay	192 0	34 4	15 9	17 11	468	1758	2	=28⅞	2 6	84	50	200	551·4	13 6	11 0	1 10½	9 1	8 11
MARLBOROUGH	4000	11·06	7 May, 1856	Spithead	245 6	61 2½	22 1	22 0	933	4537	2	82	4 0	50	20	800	2239	19 1	26 9	3 6½	12 8	9 4
Do.	4000	11·866	12 May, 1856	Stokes Bay	245 6	61 2½	21 1	22 10	928	4510	2	82	4 0	53·5	20	800	2683·5	19 1	26 9	3 6½	12 8	10 2
MEGÆRA	1395	10·241	28 March, 1850	Thames	207 0	37 10	11 4	15 3	383	1554	4	49½	2 0	74·21	8	350	925·6	14 5½	16 0	2 8½	8 7	6 3
Do.	1395	9	1 Sept., 1851	Nore	207 0	37 10	14 3	14 10	432	1778	4	49½	2 0	70	8	350	826·9	14 5½	16 0	2 8½	8 7	6 3
METEOR, *Battery.*	1469	5·77	16 May, 1855	Thames	172 6	43 11	6 5	8 0	310	1346	2	26½	2 0	139	60	150	529·6	6 0	12 6	– –	3 6	4 6
Do. *Do.*	1469	5·23	28 May, 1855	Thames	172 6	43 11	6 4	8 0	308	1338	2	26⅛	2 0	113	60	150	498·1	6 0	12 6	– –	3 6	4 6
	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	6 0	7 6	.....	.....	.....
MINX	303	5·441	2 Dec., 1852	Thames	131 0¼	22 1	3 6	4 10	59	145	2	9 1/16	0 9	196	55	10	36·5	4 1	3 6¼	0 7	2 6	2 4
MIRANDA	1039	10·75	2 July, 1853	Nore	196 0½	34 0	12 3	12 6	336	1350	2	56⅜	3 9	28·5	13	250	613·1	12 0	11 6	1 11	7 3	5 3
MOHAWK	670	9·925	7 April, 1856	Stokes Bay	180 0	28 4	10 2	11 6	240	781	2	42½	2 2	75	20	200	478	11 1	14 3	2 6½	7 1	4 3
Do.	670	10·721	4 June, 1856	Stokes Bay	180 0	28 4	10 3	11 6	242	785	2	42½	2 2	88	20	200	641·5	11 1	14 3	2 6½	7 1	4 3
NIGER	1072	9·906	12 July, 1850	Stokes Bay	194 4	34 8	14 5½	15 5½	406	1375	4	47⅜	1 10	70	8	400	792·4	12 6	17 4½	2 6	8 6	6 3
NILE	2622	6·854	19 April, 1854	Stokes Bay	205 6	54 3½	24 0½	25 5½	1000	4420	4	62½	3 6	25·75	16	500	928	17 0	16 0	2 8	12 6	12 11
ORION	3232	11·446	2 May, 1856	Stokes Bay	238 0	55 9	24 5	26 10	982	5070	2	=70⅞	3 6	62·75	20	600	2328·6	18 0	23 0	3 2	12 3	14 7
PEARL	1462	11·313	20 May, 1856	Stokes Bay	200 0	40 4	16 2	19 9	540	2115	2	=58⅛	3 3	59	20	400	1324	16 0	23 6	3 0	10 7	9 4
Do.	1462	10·669	27 May, 1856	Stokes Bay	200 0	40 4	16 4	19 9	544	2130	2	=58⅛	3 3	49	20	400	1097·6	16 0	25 6	– –	10 7	9 4
PEMBROKE	1758	7·602	7 April, 1855	Stokes Bay	176 0	48 6	19 0	20 0	660	2465	2	30	2 6	82	65	200	572	12 0	12 0	2 0	7 11	12 1
PHŒNIX	809	7·674	24 March, 1855	Thames	174 7	31 10	16 3	15 0	405	1460	2	62¼	1 6	22	10	260	524·1	11 10½	9 10	1 7½	8 3	6 9
PIONEER	868	11·366	20 May, 1856	Stokes Bay	200 0	30 4	10 6	12 0	273	1056	2	55	2 6	82	20	350	1192·5	11 0	20 6	3 0	6 10	8 3
Do.	868	11·332	26 May, 1856	Stokes Bay	200 0	30 4	10 0	11 10	262	1010	2	55	2 6	82	20	350	1150	11 0	20 6	3 0	6 10	8 3
PLUMPER	490	6·951	14 June, 1853	Stokes Bay	140 0	27 6	10 1	10 7	188	493	2	27	2 0	43·5	14	60	116	8 8½	6 0⅜	0 11½	6 1	4 6
Do.	490	7·218	21 July, 1853	Stokes Bay	140 0	27 6	10 5½	10 7½	194	510	2	27	2 0	55·5	14	60	135	8 8½	6 0⅜	0 11½	6 1	4 6
PRINCESS ROYAL	3129	11·031	2 Nov., 1853	Stokes Bay	217 0	58 1½	20 2½	21 7½	805	3400	2	64⅛	3 0	58	20	400	1491	17 1	21 6½	3 0	11 10	9 3
PYLADES	1278	10·119	31 March, 1855	Stokes Bay	192 9	38 5	16 0	19 0	522	1956	2	=55	3 0	62·5	20	350	1106	15 9	20 0	3 0	10 2	8 10
RATTLER	888	9·77	5 Sept., 1851	Thames	176 6	32 8½	10 11	12 1½	266	840	4	40¼	4 0	25·76	10	200	499·7	10 0	11 0	1 3	7 0	5 5
Do.	888	9·141	4 Oct., 1851	Thames	176 6	32 8½	13 1	14 6	338	1112	4	40½	4 0	25·43	10	200	519·2	10 0	11 0	1 3	7 0	5 5
RIFLEMAN	486	7·15	25 Nov., 1853	Thames	150 0	26 7	11 3	11 10	233	678	2	34	2 9	35·57	10	100	166·5	9 0	8 5	1 5½	5 4	6 5
RINGDOVE	670	10·824	20 May, 1856	Stokes Bay	180 0	28 4	9 2	11 3	223	714	2	45	2 0	84	20	200	676·8	11 0	15 8½	2 6	7 1	4 8
ROYAL ABERT	3726	10	21 Nov., 1854	At Sea	232 9	61 0	24 8	27 4	1160	5571	2	=64½	3 4	69	20	500	1800·6	17 0	19 2	3 2	12 5	14 11
ROYAL GEORGE	2616	9·375	13 Dec., 1853	Nore	205 7	54 6½	22 10	23 10	945	4110	2	=58	3 3	62	20	400	——	17 0	17 0	3 0	11 4	12 —
RUSSELL	1751	6·68	27 April, 1855	Stokes Bay	176 6	48 4	20 8	22 9	764	2903	2	=30	2 6	97·5	50	200	578	12 0	9 6	1 7	7 10	14 11
ST. JEAN D'ACRE	3200	11·199	3 Dec., 1853	Stokes Bay	238 0	55 4	23 6	25 0	1067	5340	2	=70½	3 6	61	20	600	2136	18 0	21 8	3 6	11 9	13 3
SANS PAREIL	2339	7·05	21 May, 1852	Plymouth	200 0	52 3	19 6	21 11	880	3000	4	43½	2 6	49·5	12	350	622·4	16 0	16 0	2 8	11 5	10 6
Do.	2339	9·3	12 Aug., 1855	At Sea	200 0	52 3	22 8	25 7½	994	3800	2	64	3 0	58	15	400	1471	16 0	23 0	3 0	11 5	14 —
SATELLITE	1462	11·4	18 June, 1856	Plymouth	200 0	40 4	12 8	16 4	404	1500	2	=58	3 3	63	20	400	1362	16 0	23 6	3 0	10 7	13 7
SEAHORSE	1212	9·298	16 May, 1856	Stokes Bay	159 0	41 10	17 8	18 9	518	1799	2	=30½	2 6	112·25	60	200	832·4	12 0	10 0	1 8	7 8	11 2
SHANNON	2651	11·807	5 June, 1856	Stokes Bay	235 0	50 0	18 0	19 0	626	2948	2	=70½	3 6	56	20	600	2005·7	18 1	25 3	3 6	11 8	14 —
SHARPSHOOTER	503	9·327	9 Nov., 1852	Stokes Bay	150 5	26 7½	11 0	10 9	237·5	653	2	46	3 0	38·25	10	200	348	8 10	9 10⅜	1 5½	5 3½	5 —
SIMOOM	1980	6·744	9 Sept., 1850	Stokes Bay	246 0	41 0	11 8	17 7	473	2240	4	43⅜	2 6	49	12	350	530·8	15 11½	16 8	2 7½	9 3	8 —
Do.	1980	8·747	8 Feb., 1851	Stokes Bay	246 0	41 0	15 5	17 10	555	2760	4	43⅜	2 6	52·5	10	350	539·6	15 11½	16 6	2 7½	9 3	8 11
Do.	1980	8·696	10 Jan., 1852	Stokes Bay	246 0	41 0	16 8	18 2	588	2890	4	43⅜	2 6	52·5	10	350	603·6	16 0	16 0½	2 9	9 3	8 11
Do.	1980	7·926	25 Feb., 1851	Stokes Bay	246 0	41 0	15 6	19 7	594	2920	4	43⅜	2 6	50	12	350	616	16 0	16 9½	2 9	9 3	10 —
Do.	1980	10·647	16 Oct., 1855	Stokes Bay	246 0	41 0	15 3	19 2	578	2830	2	62½	3 0	55	20	400	1242	15 11	24 7	2 8½	9 3	9 11
SNAKE	477	not taken	16 Nov., 1854	Thames	160 0	25 4	10 6	11 8	217	608	2	=35½	1 8	112	20	160	528	11 0	10 0	2 4	7 1	4 7
SPARROWHAWK	670	11·065	16 June, 1856	Stokes Bay	180 0	28 4	10 3	11 5	240	781	2	42½	2 2	92	20	200	725·6	11 0	14 3	2 7	7 1	4 3
SURPRISE	670	11·149	14 July, 1856	Stokes Bay	180 0	28 4	10 6	11 6	244	799	2	45	2 0	88	20	200	778·2	11 0	16 0	2 6	7 1	4 8
SWALLOW	486	6·535	17 Oct., 1854	Stokes Bay	139 0	27 11	11 6	13 1	235	625	2	25½	1 9	80	20	60	182	9 0	10 9¼	1 9½	6 8	3 6
TERMAGANT	1547	8·781	2 Sept., 1852	Stokes Bay	210 1	40 6	15 5	17 5	562	2270	4	62½	3 6	34·5	14	620	1119	15 6½	18 0	3 0	9 6	7 —
Do.	1547	9·124	27 Sept., 1854	Stokes Bay	210 1	40 6	15 0	18 6	545	2185	2	62⅜	3 0	53	15	400	1134	15 7½	24 0	2 10½	11 0	7 —
Do.	1547	9·593	9 Oct., 1854	Stokes Bay	210 1	40 6	15 3	18 8	552	2230	2	62⅜	3 0	53	15	400	1082	15 7½	24 0	2 10½	11 0	7 —
THUNDER, *Batt.*	1469	not tried	21 July, 1855	Thames	172 6	43 11	8 4	8 10	368	1610	2	25½	2 0	138	60	150	668·1	6 2½	13 11½	2 3⅛	3 6	4 6
TRIBUNE	1570	9·551	25 Oct., 1853	Stokes Bay	192 0	43 0	17 5	19 5	575	2205	2	55	2 6	66·5	20	300	730	14 1	17 7	2 10½	9 6	7 —
Do.	1570	10·418	9 Nov., 1853	Stokes Bay	192 0	43 0	17 8	19 4	578	2220	2	55	2 6	72·5	20	300	1068	14 1	17 7	2 10½	9 6	7 —
VICTOR	851	11·583	12 May, 1856	Stokes Bay	200 0	30 2	10 3	12 0	264	1019	2	55	2 6	82	20	350	1165·9	11 0	20 6	3 0	6 9	5 3
VIPER	477	11·86	27 Sept., 1854	Nore	160 0	25 4	10 0	12 0	215	600	2	40½	2 0	86·5	20	160	672·9	11 0⅜	14 10¼	2 6½	7 1	4 10
VULCAN	1764	8·936	23 June, 1852	Stokes Bay	220 0	41 5	15 7	19 5	545	2474	4	40½	2 0	66	10	350	836·8	14 5½	16 3	2 8½	9 2	7 —
WANDERER	670	10·733	13 May, 1856	Stokes Bay	180 0	28 4	9 7	11 5	231	745	2	45	2 0	83·25	20	200	706·8	11 0	16 0	2 6	7 1	5 —
WASP	970	6·028	28 Sept., 1852	Thames	186 4	33 10	12 4	13 6	332	1086	2	84	2 9	53·32	10	100	185·8	11 0	13 6	2 0	8 0	5 —
Do.	970	6·356	14 Oct., 1852	Thames	186 4	33 10	14 5	14 9	390	1310	2	84	2 9	56	10	100	203·1	11 0	13 6	2 0	8 0	6 —
WRANGLER	477	not tried	3 Sept., 1854	Nore	160 0	25 4	10 4½	11 9½	217	608	2	40½	2 0	83	20	160	611·7	11 0⅜	15 0	2 8½	7 1	4 —

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PROPELLER, (Continued.)

Number of revolutions per minute.	Rate in knots per hour.	Slip. In knots per hour.	Slip. Per cent.	RATIO OF Vessel's length to breadth.	RATIO OF Screw's pitch to diameter.	RATIO OF Midship section to screw's disc.	RATIO OF Indicated power. To midship section.	RATIO OF Indicated power. To displacement	Speed³ × Mid. Sec. / Indicated Power.	Speed³ × Displ.⅔ / Indicated Power.	Name of Manufacturer.	Description of Engines.	REMARKS.
	Knots.	Knots											
101·16	9·688	0·688	7·10	5·28	0·80	3·02	1·56	5·00	467·2	145·9	Maudslay, Sons, and Field	Horizontal.	
106·74	10·222	0·823	8·05	5·28	0·80	4·17	1·47	4·79	563·0	173·0	Maudslay, Sons, and Field	Horizontal.	
47	9·799	1·990	20·31	3·80	1·31	3·93	0·99	3·77	480·0	126·5	Seaward and Capel	Horizontal	Fully rigged and complete with sea stores
56	10·357	2·029	19·59	3·80	1·17	3·97	0·99	3·77	583·2	153·4	Seaward and Capel	Horizontal	Fully rigged and complete with sea stores.
50	10·424	4·914	47·14	3·80	1·31	4·04	1·05	3·99	160·0	42·0	Seaward and Capel	Horizontal	Wind No. 5.
53·5	11·154	4·201	38·20	3·80	1·31	3·96	1·20	4·55	273·4	71·9	Seaward and Capel	Horizontal.	
80·37	10·306	1·451	14·08	3·83	0·93	2·54	1·41	4·97	490·8	139·8	Seaward and Capel	Horizontal, Geared	Preliminary trial, vessel not in trim.
71	9·455	1·705	18·03	5·02	1·35	4·13	0·72	2·36	647·0	197·0	James Watt and Co.	Horizontal.	
67·7	10·685	0·012	0·11	4·24	1·00	2·61	2·06	6·34	589·5	191·7	John Penn and Son	Horizontal, Trunk	Fresh breeze.
68·8	10·858	0·579	5·33	4·24	1·00	3·57	1·74	5·74	625·5	189·2	John Penn and Son	Horizontal, Trunk	Wind No. 6.
70·25	11·087	1·238	11·17	4·24	1·00	3·72	1·78	5·79	551·4	164·9	John Penn and Son	Horizontal, Trunk	Wind No. 5.
77	16·160	— —	— —	6·63	1·93	3·00	4·18	11·14	— —	— —	Maudslay, Sons, and Field	Horizontal	Speed not taken on account of vessel being ordered away direct.
51	12·263	2·580	23·53	4·15	1·43	4·58	1·48	5·31	552·7	164·3	James Watt and Co.	Horizontal	Wind No. 4.
85	13·101	2·080	15·88	6·35	1·42	2·53	2·87	8·13	466·2	164·7	Miller, Ravenhill, and Co	Horizontal	Wind No. 2.
113	10·882	— —	— —	6·32	0·88	2·23	2·49	7·47	— —	— —	John Penn and Son	Horizontal, Trunk	Preliminary trial.
87·5	9·494	0·295	3·11	5·59	0·81	3·16	1·53	4·86	510·3	160·1	John Penn and Son	Inclined, Tk., Hgh. Pres.	Wind No. 2.
64	9·114	0·441	4·84	5 59	0·81	3·27	1·18	3·79	553·7	172·3	John Penn and Son	Inclined, Tk., Hgh. Pres.	Wind No. 8. [to No. 5.
50	13·193	2·133	16·17	4·01	1·40	3·26	2·40	8·17	563·8	165·6	Maudslay, Sons, and Field	Horizontal	Not rigged, her lower masts only being in place. Wind No. 4
53·5	14·117	2·251	15·95	4·01	1·40	3·24	2·89	9·83	577·8	170·0	Maudslay, Sons, and Field	Horizontal	Wind variable, No. 1 to No. 2.
74·21	11·711	1·470	12·55	5·47	1·11	2·34	2·42	6·90	444·4	155·7	George and John Rennie	Horizontal.	
70	11·048	2·048	18·54	5·47	1·11	2·64	1·91	5·63	380·9	129·4	George and John Rennie	Horizontal.	
139	17·139	11·369	66·33	3·93	2·08	10·96	1·71	4·34	112·4	44·2	Maudslay, Sons, and Field	Horizontal, High Press.	
113	13·933	8·703	62·46	3·93	2·08	3·66	1·62	4·10	88·5	34·9	Maudslay, Sons, and Field	Horizontal, High Press.	
...	8·360	3·130	37·44	....	1·25	....	.....	.....	.....	.....	.....	.....	} Trial with three propellers, the centre one 12 ft. 6 in. pitch, } those on the quarters, 7 ft. 6 in. pitch. Aggregate areas
196	6·888	1·447	21·01	5·93	0·87	4·51	0·62	1·32	260·4	121·8	Seaward and Capel	Horizontal, High Press.	[of discs taken in the calculation. [out of the water. Negative slip.
87·87	9·968	0·782	7·85	5·77	0·96	2·97	1·82	5·02	680·8	247·5	Robert Napier	Horizontal, Geared	Speed by patent log. Wind No. 5. abeam. Propeller 11 ins.
75	10·542	0·617	5·85	6·35	1·29	2·49	1·99	5·64	490·9	173·5	Humphrys, Tennant, & Co.	Horizontal	Wind No. 4.
88	12·370	1·649	13·33	6·35	1·29	2·51	2·65	7·54	464·9	163·5	Humphrys, Tennant, & Co.	Horizontal	Wind No. 2. to No. 3. [service.
70	11·997	2·091	17·43	5·60	1·39	3·31	1·95	6·41	498·1	151·7	Maudslay, Sons, and Field	Horizontal	Wind No. 3. Fully rigged and complete with stores for home
51·5	8·128	1·274	15·67	3·79	0·94	4·41	0·93	3·45	347·0	93·4	Seaward and Capel	Horizontal, Geared	Wind No. 5 to No. 6.
62·75	14·236	2·790	19·60	4·27	1·28	3·86	2·37	7·89	632·4	190·1	John Penn and Son	Horizontal, Trunk	Wind varying from No. 1 to No. 3.
5	13·677	2·364	17·29	4·96	1·47	2·69	2·45	8·04	590·5	180·2	John Penn and Son	Horizontal, Trunk.	
41	12·325	1·656	13·44	4·96	1·59	2·71	2·02	6·63	601·9	183·2	John Penn and Son	Horizontal, Trunk	Griffiths's propeller.
82	9·706	2·104	21·68	3·63	1 00	5·84	0·87	3·13	506·9	149·2	Maudslay, Sons, and Field	Horizontal, High Press.	Wind No. 2.
88	8·536	0·862	10·10	5·48	0·83	3·66	1·29	4·07	349·2	111·0	John Penn and Son	Vertical, Oscillting, Grd.	
82	16·582	5·216	31·46	6·59	1·86	2·87	4·37	11·50	336·1	127·7	Miller, Ravenhill, and Co.	Horizontal	Wind No. 1.
82	16·582	5·250	31·66	6·59	1·86	2·76	4·39	11·42	331·5	127·4	Miller, Ravenhill, and Co.	Horizontal	Wind No. 6 on the beam.
108·75	6·492	0·459	7·07	5·09	0·69	3·16	0·62	1·86	544·3	180·7	Miller, Ravenhill, and Co.	Vertical, Oscillting., Grd.	Negative slip.
111	6·627	0·591	8·92	5·09	0·69	3·26	0·70	2·11	540·4	177·8	Miller, Ravenhill, and Co.	Vertical, Oscillting., Grd.	Wind No. 3 to No. 4. abeam. No guns on board. Negative slip.
58	12·324	1·293	10·49	3·73	1·26	3·51	1·85	6·69	724·7	203·6	Maudslay, Sons, and Field	Horizontal	Wind No. 3 to No. 5.
62·5	12·330	2·211	17·93	5·02	1·27	2·68	2·12	7·04	489·0	147·2	John Penn and Son	Horizontal, Trunk	Wind No. 4.
103·04	11·18	1·410	12·61	5·39	1·10	3·39	1·88	5·61	496·4	166·2	Maudslay, Sons, and Field	Vertical, Dbl. Cylrs., Grd.	Partly rigged; no yards
101·72	11·037	1·896	17·18	5·39	1·10	4·30	1·54	4·84	497·2	157·9	Maudslay, Sons, and Field	Vertical, Dbl. Cylrs., Grd.	
89·64	7·441	0·291	3·91	5·64	0·94	3·66	0·71	2·16	511·5	169·4	Miller, Ravenhill, and Co.	Vertical, Oscillting., Grd.	Fully rigged and ready for sea.
84	13·016	2·192	16·84	6·35	1·43	2·35	3·04	8·47	417·8	149·7	Miller, Ravenhill, and Co.	Horizontal	Wind No. 1.
69	13·045	3·045	23·34	3·82	1·13	5·11	1·55	5·73	644·2	174·5	John Penn and Son	Horizontal, Trunk	Calm, smooth water. Ship fully rigged and equipped.
62	10·397	1·022	9·83	3·77	1·00	4·16	— —	— —	— —	— —	John Penn and Son	Horizontal, Trunk	Speed could not be accurately ascertained. Mean of two runs.
97·5	9·137	2·457	26·89	3·65	0·79	6·76	0·76	2·84	394·0	104·9	John Penn and Son	Horizontal, Tk., High. Prs.	Wind light and variable. [Indicator broken.
61	13·037	1·338	14·10	4·30	1·20	4·19	2·00	6·99	701·6	200·9	John Penn and Son	Horizontal, Trunk	Wind No. 1. 476 tons of coal on board.
49·5	7·812	0·762	9·75	3·83	1·00	4·38	0·71	2·99	495·4	117·1	Boulton and Watt	Horizontal, Oscillating	
58	13·159	3·859	29·33	3·83	1·44	4·94	1·48	6·04	543·5	133·2	James Watt and Co.	Horizontal	Speed by patent log. Weather calm, water smooth.
63	14·604	3·204	21·94	4·96	1·47	2·01	3·37	10·39	439·5	142·5	John Penn and Son	Horizontal, Trunk	Upper edge of propeller 2 ft. 4 in. out of the water. Wind No.
112·25	11·072	1·774	16·02	3·80	0·83	4·58	1·61	5·63	500·2	142·8	John Penn and Son	Horizontal, Tk., High. Prs.	Wind No 3. [4, a little swell.
83	13·948	2·141	15·35	4·70	1·40	2·44	3·20	9·76	513·7	164·7	John Penn and Son	Horizontal, Trunk	Upper edge of propeller 1 ft. 8½ in. out of the water. Wind
11·75	11·166	1·839	16·47	5·65	1·12	3·88	1·47	4·62	553·7	175·5	Miller, Ravenhill, and Co.	Horizontal, Geared.	[No. 4.
49	7·975	1·230	15·44	6·00	1·03	2·36	1·12	3·10	273·3	98·9	Boulton and Watt	Horizontal, Oscillating	Trial not considered satisfactory.
52·5	8·545	0·202	2·36	6·00	1·03	2·78	0·97	2·78	688·5	240·5	Boulton and Watt	Horizontal, Oscillating	Vacuum imperfect. Negative slip.
52·5	8·696	0·000	0·00	6·00	1·05	2·92	1·03	2·98	640·6	221·0	Boulton and Watt	Horizontal, Oscillating	
50	8·282	0·356	4·30	6·00	1·05	2·68	1·04	3·02	480·1	165·1	Boulton and Watt	Horizontal, Oscillating	Vessel not in trim. [much by the stern.
55	13·337	2·690	20·17	6·00	1·54	2·90	2·15	6·21	561·7	194·4	Portsmh. Yard (refitted)	Horizontal	Wind No. 4. Speed not considered an average, vessel being so
112	11·048	— —	— —	6·32	0·91	2·28	2·43	7·36	— —	— —	John Penn and Son	Horizonal, Trunk.	
92	12·932	1·867	14·44	6·35	1·30	2·53	3·02	8·56	448·1	158·3	Humphrys, Tennant, & Co.	Horizontal	Wind No. 2 to No. 3.
88	13·889	2·740	19·73	6·35	1·45	2·57	3·19	9·04	434·5	153·3	Miller, Ravenhill, and Co.	Horizontal	Wind No. 2.
80	8·516	1·981	23·26	4·98	1·20	3·69	0·77	2·49	360·4	112·1	Miller, Ravenhill, and Co.	Horizontal	Wind No. 3 to No. 4.
69	12·251	3·470	28·32	5·19	1·16	2·97	1·99	6·48	340·0	104·5	Seaward and Capel	Horizontal, Geared	Wind No 2 to No. 5. variable.
53	12·547	3·423	27·28	5·19	1·54	2·84	2·08	6·73	365·0	112·8	Portsmh. Yard (refitted)	Horizontal	Wind No. 7 to No. 8. Weather unfavourable.
53	12·547	2·954	23·54	5·19	1·54	2·88	1·96	6·34	450·4	139·3	Portsmh. Yard (refitted)	Horizontal	Wind No. 3.
138	19·001	— —	— —	3·93	2·24	11·84	1·82	4·86	— —	— —	Miller, Ravenhill, and Co.	Horizontal, High. Press.	Speed not taken on account of vessel being ordered away direct.
66·5	11·534	1·988	17·19	4·47	1·25	3·69	1·27	4·31	686·3	202·2	Maudslay, Sons, and Field	Horizontal	Wind No. 6.
72·5	12·575	2·157	17·15	4·47	1·25	3·71	1·85	6·28	611·9	180·2	Maudslay, Sons, and Field	Horizontal	Wind No. 2.
82	16·581	4·998	30·14	6·63	1·86	2·78	4·42	11·51	351·9	135·0	Miller, Ravenhill, and Co.	Horizontal	Wind No. 1.
86·5	12·692	0·832	6·56	6·32	1·35	2 21	3·13	9·46	533·0	176·4	Maudslay, Sons, and Field	Horizontal	
66	10·579	1·643	15·53	5·31	1·13	3·33	1·54	4·57	464·7	156·0	George and John Rennie	Horizontal	Vessel not in good trim. Weather squally.
83·25	13·139	2·406	18·31	6·35	1·45	2·43	3·06	8·60	404·1	143·8	Maudslay, Sons, and Field	Horizontal	Wind No. 4 to No. 5.
53·32	7·100	1.072	15·10	5·51	1·23	3·49	0·56	1·76	391·4	124·6	Miller, Ravenhill, and Co.	Vertical, Oscillating.	
56	7·457	1·105	14·76	5·51	1·23	4·10	0·52	1·70	493·1	151·4	Miller, Ravenhill, and Co.	Vertical, Oscillating	Complete with stores for sea.
83	12·281	— —	— —	6·32	1·36	2·26	2·82	8·52	— —	— —	Maudslay, Sons, and Field	Horizontal	Vessel not in trim.

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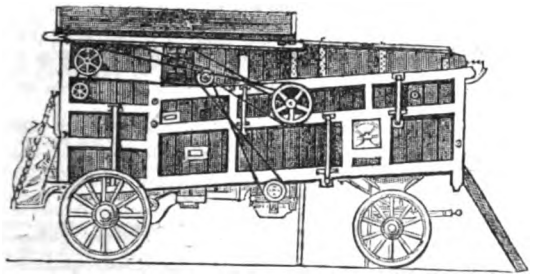

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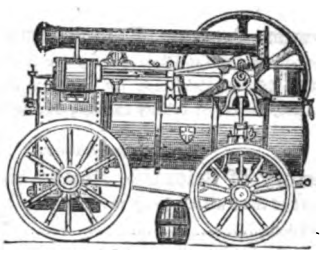

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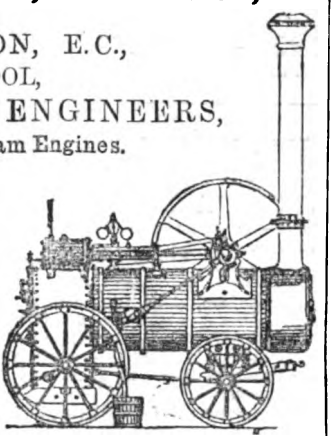

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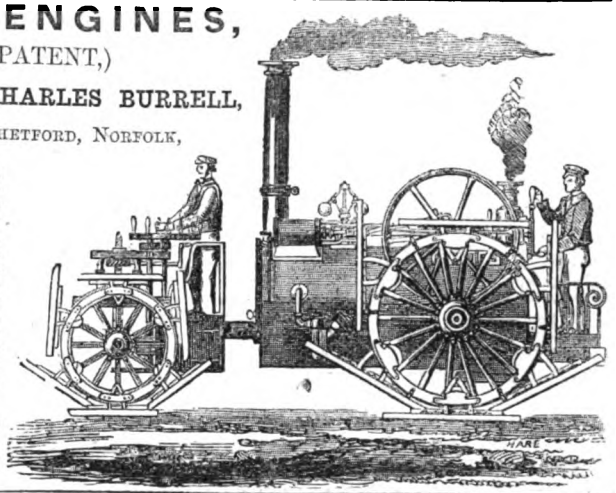

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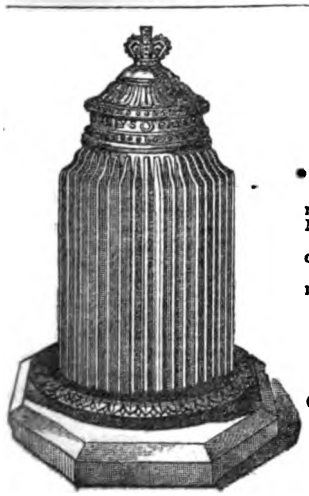

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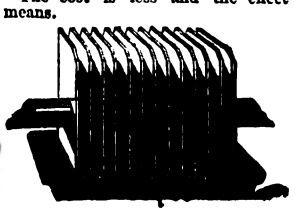

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Lists of the principal American and Foreign Books published during the present year, with the price, and name of publisher of each book.

The Titles of the Articles which appeared in the Quarterly Reviews during 1858.

Lists of Works printed by order of the Commissioners of Patents and Inventions, including Chronological Indices and Classified Abridgments of all Specifications of Patented Inventions, from the earliest enrolled to those published under the Act of 1852; and the names and addresses of the Free Libraries and Public Institutions, where such Works, including upwards of 1,000 volumes, may be daily consulted.

A List of all the Prints published during 1858, with the name of engraver, price, size, and publisher of each.

A List of all the new Maps, published during 1858, stating size, price, and publisher of each.

Lists of all the Metropolitan and Provincial Newspapers, stating where each paper is published, when it was established, its peculiar politics or principles, day of publication, and price.

The names and addresses of all the principal Newspapers in all the great towns and cities of the Continent; also those published in the British Colonies and the United States of America.

Lists of all the Weekly, Monthly, and Quarterly Publications of the Metropolis and the Provinces, stating when and where each is published, and price.

The Learned, Philosophic and Artistic Societies of the Metropolis, stating the nature and object of each Society, with the names of the Officers of each, the papers read before each in 1858, and all the necessary information about conditions of membership, entrance fees and annual subscriptions, days of meetings, &c.

The Public Metropolitan Libraries and Museums, and Lists of the Metropolitan and Provincial Schools of Art and Science, with the names of the principal promoters and teachers of each school.

A List of the Mechanics' and Literary Institutions, Working Men's Colleges, and Mutual Improvement Societies; also a List of the Young Men's Christian Associations of the country.

Book-Hawking Societies, Itinerating Libraries, and information about County Associations, Evening Classes, &c.

The Universities of the country, with the names of the Professors, Masters, Tutors, Examiners, Moderators, Officers, &c.; and the principal Grammar Schools and Dissenting Colleges, with the names of Head Masters, Tutors, &c.

The names of all who graduated at the London University during 1858, arranged in alphabetical order under their respective divisions.

Public Libraries, News Rooms, Printing Societies, Metropolitan Clubs, Philosophical Institutions, &c.

All the Successful Candidates of the Middle-Class Examination for 1858, with the Name, Address, Age, Place of Examination, and Local School of each Candidate. The Names are arranged according to merit, and in alphabetical order, under separate divisions. Also all the requisite Information, including Regulations and Particulars, for the Final Examination in June, 1859.

All the Prizes and First and Second Class Certificates awarded at the Final Examination of the Society of Arts Union of Institutes for 1858, stating Name, Age, Profession, or Trade, and Local Institution of each Candidate. The Names of the Successful Candidates are arranged according to Order of Merit, and classified under different divisions. Also a List of the Subjects for Final Examinations in 1859, including Regulations for Candidates, with the names of Books of Reference recommended by the Council. Also the Names of the Examiners for 1859, and the Prizes offered.

A List of the Names of the first 216 Apprentices of the Royal Dockyards, arranged in Order of Merit, as determined by the Examinations of the Inspectors.

The paid and gratuitous Lecturers in the country, stating the address and general subject or subjects treated of by each person.

An Obituary of Eminent Persons of all Countries for 1858.

Literary, Artistic, and Educational Memoranda, in which all noteworthy information referring to Books, Pictures, Autographs, &c., for 1858 is recorded.

THE LITERARY and EDUCATIONAL YEAR-BOOK for 1859 also contains a variety of other information on the Copyright and International Copyright Laws, Statistics of Public Libraries, Hints on the best mode of establishing and sustaining Educational Institutions for the People, Female Education, Hints on Printing, Publishing, Advertising, &c.

THE LITERARY and EDUCATIONAL YEAR-BOOK for 1859 contains upwards of 25,000 Facts appertaining to Literature, Art, Science, and Education.

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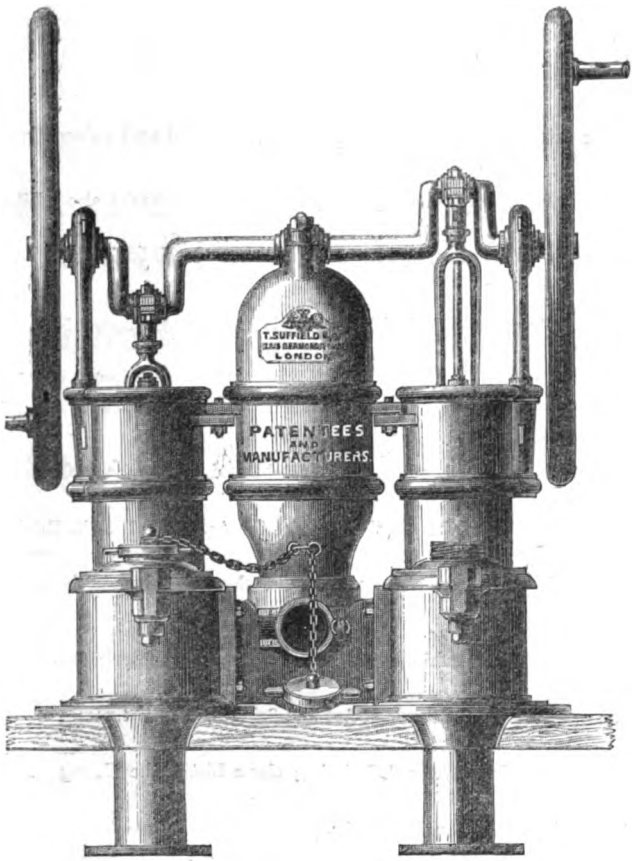
Call the particular attention of

SHIP-OWNERS, SHIP-BUILDERS, AND COMMANDERS OF STEAM AND SAILING VESSELS,

to the Simple and Efficient Arrangements of their

PATENT PUMPS.



Ships' Pumps

AND

Fire Engines,

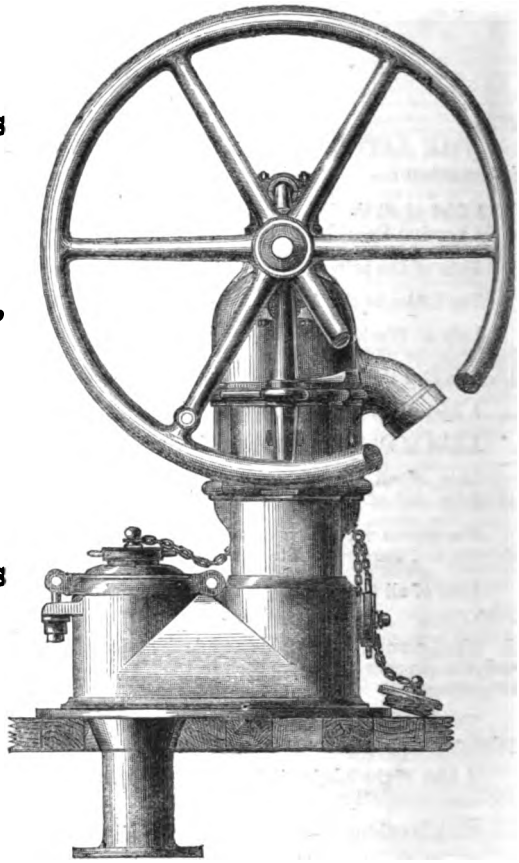
Fixed and Portable.

WITH

Patent Valves

AND OTHER

Improvements.



These Pumps are free from that liability to choke which is common to other Pumps, and their Working Parts are not susceptible of derangement either from wear or from being long out of use. They pass entirely through them, with ease, any substance that may enter the Suction Pipes. The Novelties in these Pumps are their adaptation to the varied duties of Ships' Pumps; the facilities they afford for Cleansing the Suction Pipes, and for Sounding or Examining the Valves; the readiness with which they may be used for Ventilating the Bilge, or for acting as a Syphon either for Watering the Ship, or for extinguishing Accidental Fires on board; the rapidity with which they can be converted into Fire Pumps, or be applied to the Washing of Decks; and their capability of Pumping from Several Compartments.

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Also respectfully solicit the attention of STEAM SHIP BUILDERS and OWNERS to their Large and Varied STOCK of

ASSORTED STORES FOR MARINE PURPOSES.

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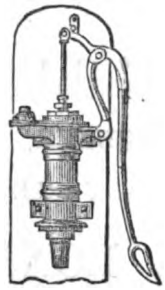
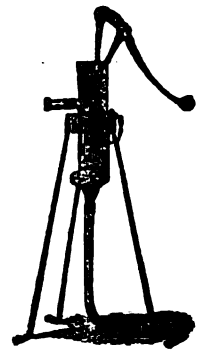
HYDRAULIC ENGINEERS, BRASS AND BELL FOUNDERS,

PATENTEES OF IMPROVEMENTS IN PUMPS.

Patent Vibrating Standard Lift and Force Pumps.





PATENT CAST-IRON PUMP fitted with J. Warner and Sons' Patent Bucket and Sucker, which cannot clog in action, for Farms, Cottages, and Wells, not exceeding 28 feet.

Dia.	Height.	£ s.
2½ in. short	1 ft. 7 in.	1 10
2½ in. long	3 ,, 3 ,,	1 14
3 ,,	6 ,, 6 ,,	2 8
3½ ,,	3 ,, 6 ,,	3 3
4 ,,	3 ,, 6 ,,	3 3
2½ ,,	3 ,, 6 ,,	3 3
2½ in. short, with 15 feet of Lead Pipe attached, ready for fixing		2 14
2½ in. long. do. do.		2 18

PATENT BRASS LIFT AND FORCE PUMP, on Plank, for House purposes, supply of Cisterns, &c.

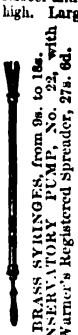
	£ s.
2½ inch	6 0
3 ,,	7 5
3½ ,,	8 0

A lighter Pump of 3 inches diameter, can be supplied if required 5 15

IMPROVED LIQUID MANURE, OR GENERAL PORTABLE PUMP.

These Pumps are fitted with J. Warner and Son's Patent Bucket and Sucker, and cannot clog in action. The Barrel is of Galvanized Iron, not likely to corrode, and can be raised or lowered at pleasure. The legs will fold together, and the whole may be carried on shoulder to any pond or tank required.

4½ in. Liquid Manure Pumps, with legs, £3 3s.; 1¾ in. Gutta Percha Suction Pipe, 1s. 11d. per foot; 2 in. Flexible Rubber and Canvass Suction Pipe, on Wires, 3s. 3d. per foot. The Barrel is 27½ inches long, and the legs are 5 feet high. Larger sizes of the above if required.



BRASS SYRINGES, from 9s. to 18s.
CONSERVATORY PUMP, No. 22½, with Warner's Registered Spreader, 27s. 6d.

Galvanized Iron Tub GARDEN ENGINE, with Warner's Registered Spreader, is strongly recommended for durability and low price, viz., £2 19s., to hold Ten Gallons. Larger sizes, in either wood or iron.

WARNER'S SWING WATER-BARROW.
(To hold Thirty Gallons), £3 3s.,

is intended for all large Establishments where much watering is done by the watering-pot. By its use much time and labour of the Gardener are saved, particularly where the Tank, Pond, or Pump is at a distance from the garden.

MUSICAL SHEEP BELLS, with Straps, in sets of 6, 19s.; ditto, in sets of 8, 25s.; ditto, in sets of 12, 38s.

WARNER'S CATTLE AND SHEEP BELLS, in sets of 6, with Straps, 13s. per set.

Bells for Churches, Chapels, Colleges, Schools, Turret Clocks, &c., cast for any size, note, or weight, singly or in peals. Tuned by machinery. Stocked and wheeled ready for fixing. Old Bells re-cast or taken in exchange.

The great 16-ton Bell, for the Houses of Parliament, was made by JOHN WARNER and SONS, 1856, under their Patent.

May be obtained of any Ironmonger or Plumber, in town and Country; or of the Patentees and Manufacturers, as above. (30)

Pumping Machinery.

GWYNNE AND Co., Engineers, London, manufacture and supply the following Machinery, of the most approved construction and with all the latest improvements :—Portable and Fixed Steam-Engines and Boilers of every description ; Waterwheels, Windmills, Horse and Hand-power Machines ; Pumping Machinery for the Supply of Towns, Cities, and Districts, and for the Irrigation of Coffee, Cotton, Indigo, Sugar-cane, and Rice Estates, for pumping out Coffer-dams, Canals, Dry Docks, Reservoirs, &c. They also manufacture and supply the Pumping and other Machinery for Paper, Pulp, and Fulling Mills, Breweries, Distilleries, Tanneries, Starch Works, Bleaching, Dyeing, and Calico Printing Works, Chemical Works, Silk, Cotton, and Flax Mills, and Manufactories in general. All Letters not paid will be refused. Illustrated Price Lists forwarded on receipt of Six Postage Stamps.—GWYNNE AND Co., Hydraulic and Mechanical Engineers, Essex-wharf, Strand, London.

For Exportation.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (24)

CAST STEEL SHOVELS AND SPADES,

HAY, MANURE, AND DIGGING FORKS.

RECOMMENDED FOR THEIR EXTREME LIGHTNESS AND DURABILITY.

MANUFACTURED BY

SPEAR AND JACKSON,

ETNA WORKS, SHEFFIELD.

To be had of all Implement Dealers and Ironmongers throughout the Country, and Wholesale (only) of the Manufacturers. (22

IMPORTANT TO MANUFACTURERS, MILL OWNERS, &c.

GUTTA PERCHA MILL BANDS.

THE GUTTA PERCHA COMPANY beg to state that the increasing demand for the Gutta Percha Strapping for Driving-bands, Lathe-straps, &c., fully justifies the strong recommendations they have everywhere received.

Their durability and strength—permanent contractability and uniformity of substance—their non-susceptibility of injury from contact with oils, grease, acids, alkalies, or water—and the facility with which the only joint required can be made in bands of from 200 to 300 feet long—render them superior to leather for almost all working purposes, and decidedly more economical.

TESTIMONIALS.

IMPORTANT ANNUAL SAVING.

From TRUMAN, HANBURY, BUXTON, & Co., Brewery, London.

"In reply to your inquiry, we have much pleasure in bearing our testimony to the advantages, both as regards economy and saving of time, effected by the use of your Patent Gutta Percha Bands in lieu of Leather Straps. The stoppage of one portion of our works through the failing of the leather strap used to be of daily occurrence—but with this annoyance we are now never troubled. We have had these straps in operation for nearly three years, and are assured by our Engineer that *they effect a saving to us of at least* THIRTY POUNDS *a year*."

From JAMES ABERNETHY & Co., Fury Hill Foundry, Aberdeen.

"We have now had Gutta Percha Bands working here *for three years*. One of them has been driving the fan blast for our smith's shop for all that time, and for anything we see, may drive it as long again. The speed of the fan is but 1,200 per minute. We have used them with complete satisfaction, driving circular saws, and in some cases where leather bands would have been quite inapplicable from damp. We have uniformly endeavoured to have the drums and pulleys so proportioned to the strain, as that there is no chance of the band slipping; and with this precaution, and taking care in using *cross bands that they do not rub*, we are quite satisfied that they are superior in every respect to leather—stronger at the same weight, and keeping quite straight in working—requiring no lacings, and very seldom any repairs."

WATER POISONED BY LEADEN PIPES.

The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight.

POISONED WATER PREVENTABLE

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

From Dr. MURRAY, Hull.

"It is impossible to conceive of anything more injurious or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha Tubing. Nothing can be better. I have also recommended it to others, who have adopted the expedient."

A variety of Gutta Percha Articles, such as Mill Bands, Tubing, Sheet, Soles, Pump Buckets, Bosses, Union Joints, Bottles, Bowls, Flasks, Curtain and Cornice Rings, Solid Frames, Galvanic Batteries, &c., &c.

MANUFACTURED BY THE

Gutta Percha Company, Patentees,

18 WHARF ROAD, CITY ROAD, LONDON,

AND SOLD BY THEIR

WHOLESALE DEALERS IN TOWN AND COUNTRY. (29.)

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By Her Majesty's Royal Letters Patent.

HART'S

PATENT GAS ECONOMIZING BURNER,

AND ILLUMINATING POWER DIFFUSER,

ONE SENT ON RECEIPT OF THIRTY POSTAGE STAMPS.

DEPOT, 69 FLEET STREET, LONDON.

No. 4.

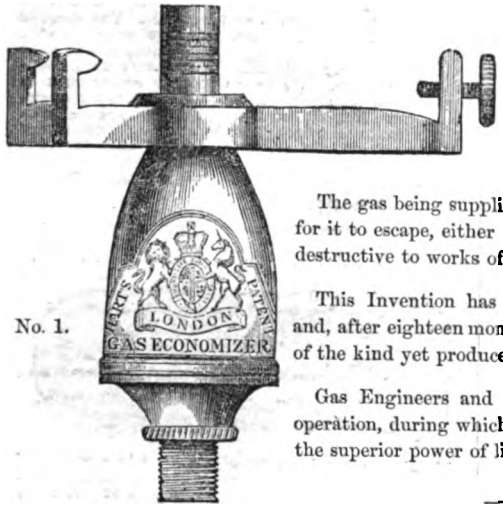
This very complete and simple apparatus is the greatest desideratum of the age to all gas consumers. It can be applied to any Gas Chandelier Stand or Bracket in a few moments by the most inexperienced hand. It is impossible for it to get out of repair, and its construction is so simple that it cannot be deranged in any way. The saving effected—from 5 to 35 per cent.—will defray its own cost in from one to three months.

The evil which necessarily arises from the great variation of pressure in the mains, is remedied by means of the Gas Economizing Burner producing an illuminating power far superior to any other (varying in degree from 10 to 50 per cent., as proved by experiments made with photometer); the effectual working will be guaranteed for ten years. This is produced by means of a simple apparatus fitted within the Economizer, which effectually checks the undue pressure, and so allows the gas to permeate with its natural velocity; this being attained, all noises caused by overdue pressure are obviated, and, at the same time, any flickering prevented.

No. 3.

PRICE

2s. EACH.

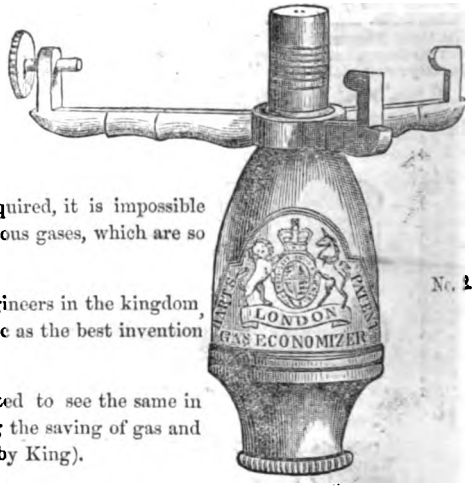


No. 1.

The gas being supplied from the burner at the exact velocity required, it is impossible for it to escape, either as smoke or other invisible but more noxious gases, which are so destructive to works of art, and also injurious to health.

This Invention has been tested by the most eminent Gas Engineers in the kingdom, and, after eighteen months' severe trial, is brought before the public as the best invention of the kind yet produced, and by far the cheapest.

Gas Engineers and other scientific men are respectfully invited to see the same in operation, during which time thorough tests will be made, proving the saving of gas and the superior power of light (by Bunsen's Photometer as improved by King).



No. 2.

SOLD BY ALL RESPECTABLE GAS FITTERS AND IRONMONGERS

IN THE UNITED KINGDOM,

AND BY THE PATENTEE AT THE ABOVE ADDRESS.

NO REGULATOR OF ANY KIND REQUIRED,

NEITHER WILL ANY REGULATOR DIFFUSE THE ILLUMINATING POWER, BUT, ON THE CONTRARY, CHECK ITS DEVELOPMENT.

TESTIMONIALS.

POLYTECHNIC CHEMICAL SCHOOL, LONDON.

This is to certify that I have carefully conducted a series of experiments with various gas burners in present use, and find that "Hart's Patent Economizing Gas Burner" is the most economical of all, producing, when compared with others, a saving of 40 per cent.

(Signed this 14th Dec., 1858.)

EDW. V. GARDNER,
Professor of Chemistry, &c., &c., &c.

809 Regent Street.

I have Mr. Hart's Gas Economizing Burner fitted to every branch in my house, and can speak in the highest terms of its success. The light is perfectly steady, and the flame more brilliant, with perfect combustion, so that the air is by no means oppressive as formerly; the ceilings have no chance of being blackened, and the gilt frames and furniture cannot now, as before, be injured. I most warmly recommend their adoption.

(Signed)

WM. V. PETTIGREW, M.D., Hon. F.R.C.S., Eng.

7 Chester St., Grosvenor Place, Pimlico, Nov. 3, 1858.

Published by RICHARD ARCHIBALD BROOMAN, at the MECHANICS' MAGAZINE Office, 166 Fleet-street, in the Parish of St. Dunstan's-in-the-West, in the County of Middlesex; and printed by JAMES JUDD and HENRY ALEXANDER GLASS, of 34 Holford-square, Pentonville, in the County of Middlesex, at their Office, 38A New Bridge-street, in the Parish of St. Anne's Blackfriars, in the City of London—Friday, December 31, 1858.

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 2.
[NEW SERIES.]

LONDON: FRIDAY EVENING, JANUARY 7, 1859.

PRICE FOURPENCE.
BY POST 5d.

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THE MUSEUM OF PRACTICAL GEOLOGY, Jermyn-street, is OPEN every day but Friday. Admission free. (42)

LECTURES TO WORKING MEN.—Government School of Mines, Jermyn Street.—The Second Course of Six Lectures on the Models which illustrate the Art of Mining, by WARRINGTON W. SMYTH, M.A., F.R.S., will be commenced on Monday, January 10th, at Eight o'clock. Tickets may be obtained by Working Men only, on Monday, January 3rd, from 10 to 4 o'clock, upon payment of a registration fee of 6d. Each applicant is requested to bring his name, address, and occupation written on a piece of paper, for which the ticket will be exchanged.
(27) TRENHAM REEKS, Secretary.

ROYAL INSTITUTION of GREAT BRITAIN, Albermarle-street.
The WEEKLY EVENING MEETINGS of the Members of the Royal Institution will commence for the season on Friday, the 28th of January, 1859, at half-past 8 o'clock, and will be continued on each succeeding Friday evening, at the same hour.
Arrangement of the Lectures before Easter.
Twelve Lectures on Fossil Mammals—By RICHARD OWEN, Esq., D.C.L., F.R.S., Fullerian Professor of Physiology, R.I. To commence on Tuesday, January 25, at 3 o'clock; and to be continued on each succeeding Tuesday, at the same hour.
Twelve Lectures on the Force of Gravity—By JOHN TYNDALL, Esq., F.R.S., Professor of Natural Philosophy, R.I. To commence on Thursday, January 27, at 3 o'clock; and to be continued on each succeeding Thursday, at the same hour.
Nine Lectures on Organic Chemistry—By W. A. MILLER, M.D., F.R.S., Professor of Chemistry at King's College, London. To commence on Saturday, January 29, at 3 o'clock; and to be continued on each succeeding Saturday, at the same hour.
Subscribers to the Lectures are admitted on payment of two guineas for the season, or one guinea for a single course. A Syllabus may be obtained at the Royal Institution. J. BARLOW, M.A., V.P., and Sec. R.I.
Dec. 25, 1858. (64)

TO PUBLIC COMPANIES, Carriage Builders, Pianoforte Makers, and others. Mr. Lerew is directed to LET or SELL, with immediate possession, those extensive MANUFACTURING PREMISES, near the Goods Station of the London and North-Western Railway, known as the Camden Works, elegibly situate at Hawley-crescent, Camden-town, on the banks of the Regent's Canal, with good lay-by, and excellent wharf; consisting of a spacious and lofty fire-proof hall, 120 ft. long by 40 ft. wide, two engine-houses, and stacks of very extensive workshops and store-rooms, admirably arranged and spacious airy offices. These most substantial and elegible works will be found worthy of the inspection of any manufacturers of extent. For further particulars and orders to view apply to Mr. Lerew, auctioneer, Cardington-street, Hampstead-road, near the Euston Station, N.W. (65

STEAM ENGINES FOR SALE.
PORTABLE STEAM ENGINES, from 6 to 12 horse power,
STATIONARY STEAM ENGINES, from 4 to 50 horse power,
TUBULAR BOILERS, from 4 to 50 horse power,
CORNISH BOILERS, from 4 to 50 horse power,
Are in hand, and can be despatched on eight days' notice. Prices moderate. Workmanship and Material of the best description.
Apply to R. THORNTON & Co., St. Leonard's Iron Works, Edinburgh. (60)

ENGINEERS' MACHINES AND TOOLS—
READY AND NEARLY READY FOR DELIVERY.—For Planing, Shaping, Drilling, Boring, Turning, Slotting, Bolt-screwing, Nut-shaping, Rivet and Spike-making, Boilerplate Bending, Punching and Shearing. Machines and Tools for other purposes made to order. Apply to JOHN TODD and Co., Kent Iron Works, Bridge-street, Greenwich. (71)

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Orders for Malleable Iron Castings executed within a week. (77)

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THE PROPRIETOR of a VALUABLE PATENT for Double-expansive Marine Engines (by which great economy of space and fuel are obtained) is desirous of entering into arrangements with a respectable firm for the construction of the same. An adequate portion of the patent-right would be assigned by the advertiser to any firm taking the matter up; and he would render all assistance in his power, either in London or elsewhere, amongst ship-owners (to many of whom he is well known), in obtaining contracts, &c. Unexceptionable references given. Address C. E., MECHANICS' MAGAZINE Office, 166, Fleet-street. (76)

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Are prepared to ESTIMATE FOR and CONSTRUCT BRIDGES, PIERS, JETTIES, &c., in Iron, Wood, or Stone. Also to supply Cranes, Girders, Turntables, and Railway Work and Plant generally. (81)

PARTNERSHIP in an Iron Manufactory in the Midland Counties. The services of any young man of business habits and experience, and having the command of £1,000, can be made available. The business is a very old one, and will give each partner from £400 to £500 per annum, Apply to Messrs. Lara & Walters, professional agents, 6 Pump-court, Middle Temple, E.C. (67)

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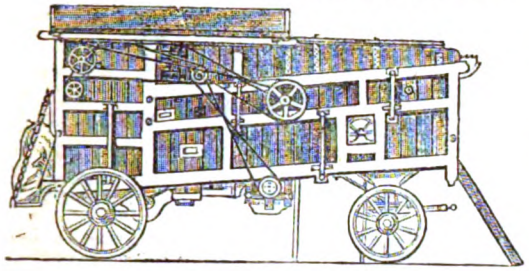

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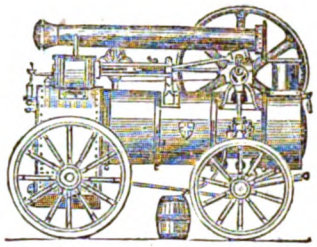

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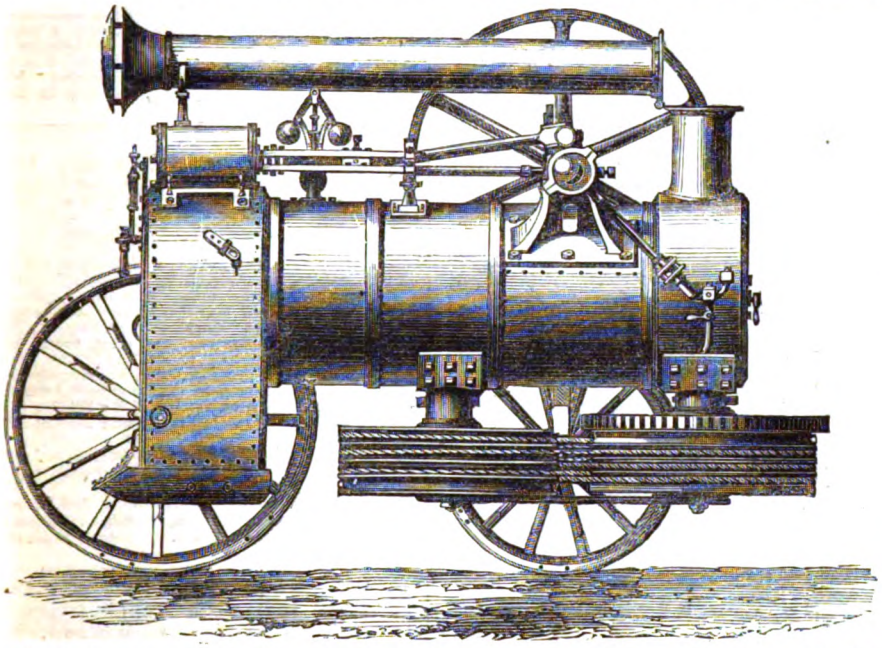

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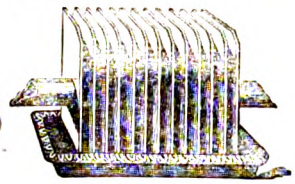

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TAUNTON DISTRICT.—WANTED, by the Taunton Local Board of Health, a PERSON practically acquainted with levelling, drawing, general building and drainage works, repairs of roads, pavements, &c., to devote the whole of his time to the performance of the duties required by, and devolving on a Surveyor to said Local Board of Health. Salary £120. For any other particulars apply to the clerk, to whom all applications are to be sent on or before the 26th day of January next. References as to competency and integrity of character will be required. WM. MARWOOD, Clerk.
East-street, Taunton, 30th December, 1858. (68)

ENGINEERING PUPIL.—A good opportunity now presents itself in the office of a Civil Engineer to advance the interests of a young gentleman with a taste for the profession. Premium moderate. Address C. E. Reid's, Stationer, 15 Charing-cross, S.W. (69)

TO ENGINEERS, &c.—Partnership.—There is an opportunity for a gentleman of business habits, with £5,000, to succeed a retiring partner in a large and flourishing business in London. Time for bringing in the capital may be partially deferred or arranged in such a way as to accommodate the incoming partner. Address, personally, to S. N. Driver, Esq., solicitor, 13 Birchin-lane, Lombard-street, E.C. (70)

PUMPING MACHINERY.

GWYNNE AND Co., Engineers, London, manufacture and supply the following Machinery, of the most approved construction and with all the latest improvements:—Portable and Fixed Steam-Engines and Boilers of every description; Waterwheels, Windmills, Horse and Hand-power Machines; Pumping Machinery for the Supply of Towns, Cities, and Districts, and for the Irrigation of Coffee, Cotton, Indigo, Sugar-cane, and Rice Estates, for pumping out Coffer-dams, Canals, Dry Docks, Reservoirs, &c. They also manufacture and supply the Pumping and other Machinery for Paper, Pulp, and Fulling Mills, Breweries, Distilleries, Tanneries, Starch Works, Bleaching, Dyeing, and Calico Printing Works, Chemical Works, Silk, Cotton, and Flax Mills, and Manufactories in general. All Letters not paid will be refused. Illustrated Price Lists forwarded on receipt of Six Postage Stamps.—GWYNNE AND Co., Hydraulic and Mechanical Engineers, Essex-wharf, Strand, London.

For Exportation.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (24)

VITRIFIED BLUE BRICKS are delivered at the Nine Elms Station, London, at 80s. per 1,000.—Address, G. H. OGSTON, J. M. Paine's Silica Works, Farnham, Surrey. (56)

BY HER MAJESTY'S ROYAL LETTERS PATENT.

PATENT SPHERICAL SELF-ADJUSTING BEARINGS, which do not heat in work. The advantages possessed by these Bearings are:—

1st. They are Self-adjusting; and, consequently, can be put down by the most ordinary Mechanic.

2nd. They are not liable to heat, even at high speeds.

3rd. They remain constantly parellel to the Spindle; and, therefore, wear equally all across the Bearing.

4th. They require only a very small quantity of oil.

Engravings and Prices forwarded on application to the Patentees.

WALLIS & HASLAM,
Engineers and Iron Founders, North Hants Iron Works, Basingstoke. (11)

FOR SALE a SISSON ACHROMATIC EQUATORIAL, by Troughton and Simms, London. Object glass 5¼ inches clear aperture, 7ft. 8 inches focal length, polar axis 11ft. 3 inches long by 11 inches square; wheels brass, 2 feet diameter. The telescope has a micrometer and a large battery of eye-pieces, and a great variety of diaphragams. A very superior 8¼ feet Munich Telescope, by Merz and Sons, with or without its stand; tube mahogany object glass, 6¾ inches clear aperture, with micrometer by Dollond, and a large battery of eye-pieces. A heavy Iron Mortar Equatorial, suitable for a tube of from 10 to 15 feet, with declination and right ascension circles; this style of equatorial is remarkable for its stability and freedom from tremor. For particulars apply to Mr. How Miller, Ochtertyre, Crieff, N.B. (47)

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TO BE LET, on Lease or otherwise, with Plant and Clayton's Machine complete, and with immediate possession.

The ground is situated on the east side of London; it contains very superior materials for Bricks and Drainage Tiles, and a good supply of water without the cost of pumping. Hack-ground and Drying-sheds spacious and well situated. A railway-siding into the ground, with ample accomodation for making three or four millions per annum. For particulars, apply by letter to C. W., 166 Fleet-street, London, E.C. (17)

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LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

RAILWAY WORKS.—The directors of the Fortpatrick Railway are prepared to receive tenders for the following works.— First, a viaduct over the Ken, adjacent to the ferry, at Boat of Rhone, about seven miles north from Castle Douglas, to consist of three large and four small spans. In addition to the masonry, it will require about 200 tons of wrought iron in girders, and 90 tons of cast iron. Second, a portion of the railway to be called the "Glenluce Contract," extending from a point a cut half a mile west of Kirkcowan, and terminating at a point about three-quarters of a mile west of Glenluce, in length upwards of nine miles Third, a portion of the railway to be called the "Stranrear contract," extending from the termination of the Glenluce contract to a point about 400 yards beyond Stranrear, in length upwards of eight miles. Separate tenders for each contract. The rails to be supplied by the company. Drawings and specifications at the offices of the engineers, Messrs. H. and E. Blyth, 135 George-street, Edinburgh, on and after 21st January, from which day the draft of a contract deed will lie at the secretary's office in Stranrear, or at that of the engineers in Edinburgh. Forms of tenders to be had of either the secretary or the engineer. Date of return to the secretary February 5. To be determined upon at one o'clock on the 8th February, at the County Hotel, Carlisle, when intending contractors or their agents must be present. The assistant engineer will be at the Castle Arms Inn, Castle Douglas, at 11 on the 25th January, to go to the site of the viaduct, will leave the Galloway Arms, Newton Stewart, at 9 on the following day, and arrive at 10 at the commencement of the contract near Kirkcowan, for the Glenluce contract; and on the 27th at 9 will leave the King's Arms, Glenluce, for the Stranraer contract, remaining at Glenluce on the 28th.

RAILWAY, *London and North-Western.*—The directors solicit tenders for the construction of the Shropshire Canal Conversion, being from a point on the Shropshire Canal, near the turnpike road from Wellington to Shiffnall, in the parish of Wombridge, to the terminus at Coalport, on the river Severn, being a distance of about 5¾ miles. Plans, &c., ready for inspection on and after Monday, 10th January, at the office of the engineers, Messrs. Locke and Errington, 13 Duke-st., Westminster. Tenders, marked "Tender for works, Shropshire Canal Conversion," to be delivered not later than February 7, addressed to the secretary (Mr. C. E Stewart) at the Euston Station.

RAILS.—The directors of the Manchester, Sheffield, and Lincolnshire Railway are prepared to receive tenders for 1,200 tons of rails, 72lbs. to the yard; also 200 tons of bracket chairs to patterns, to be furnished on application to the company's engineer at Manchester. Tenders to be sent in to Edward Ross, Secretary, London-road Station, not later than Thursday, January 13.

RAILS.—The directors of the Edinburgh and Glasgow Railway Company require tenders for 1,300 tons of 75-lb. rails, to be delivered at any station on their line (Queen-street excepted), one-half before 1st March, the other half before 1st of April next. The rails are to be of the best quality and make. Specifications may be had at the office of Mr. Adie, the Company's engineer. Tenders on or before 17th of Jan. inst.

RAILWAY CHAIRS.—The directors of the Edinburgh and Glasgow Railway Company are prepared to receive tenders for the supply of about 436 tons railway chairs, good sound castings of No. 2 pig iron, to be delivered at any station on their line (Queen-street excepted) one-half before 1st March, the other half before the 1st of April next. Tenders to be lodged on or before 17th of January inst. Edinburgh and Glasgow Railway Engineer's Office.

RAILWAY SLEEPERS.—The directors of the Edinburgh and Glasgow Railway Company are prepared to receive tenders for the supply of about 20,000 sleepers, one-sixth of the quantity to be 9 feet long × 10 × 5, and the remainder 9 feet long × 9 × 4½. To be delivered at any station on their line (Queen-street excepted) on or before 1st of March next. Offers may be for one-half the quantity to be of Scotch larch and the other half to be of Scotch fir. Specifications to be had of Mr. Adie, Company's Engineer. Tenders to be lodged on or before 17th of January inst.

PLATE IRON, *East India Board.*—On the 14th instant the Finance, Home, and Public Works Committee of the India Council will be ready to receive proposals in writing for the supply of best plate and sheet iron; also British iron. The conditions of these two contracts may be had on application at the Secretariat office where the proposals must be left before eleven in the forenoon of the 14th.

WROUGHT IRON BRIDGE, *Victoria.*—Plans have been on view only since Monday last, at the offices of Mr. Carr, 4 Victoria-street, Westminster Abbey, London, and tenders must be sent in to Mr. W. L. Stoney, care of Mr. Carr, before noon to-morrow (January 8), for the construction of a lattice girder bridge, of three openings, in all about 300 feet, for the river Yarra, Victoria, to be shipped at London or Liverpool.

RAILWAY WAGGONS.—The Waterford and Limerick Railway Company are in immediate want of from sixty to seventy goods and cattle trucks. Tenders received to the 18th January. Specifications at the offices of the company, the Mall, Waterford. Mr. Thos. Ainsworth, the secretary, will be glad to hear from parties having waggons ready for immediate delivery.

COLLIERY STORES.—The owners of the Backworth and West Cramlington Collieries invite tenders for their year's supply of bar, bolt, nut, and hoop iron; rails and chairs (say 50 tons) forgings; sand and loam castings; Memel, Norway, and other timber; nails, shovels, and other hardware goods; hempen and wire-rope; spunyarn, hemp, and oakum; bucket leather, strap hides, and saddlery goods; waggon soles, sheths, and coverings; whale and pine oil; candles, tallow, grease, lamp cotton, and cotton waste; fire-bricks and lime. To be delivered, free of cost, either at Cramlington Station, Whitehill Point Staith, or the Colliery. Tenders, stating terms of payment, to be sent to the Backworth Colliery office, Backworth, on or before the 10th proximo.

GAS-PIPES.—GEELONG.—Tenders are wanted immediately for cast-iron pipes, bends, branches, syphons, &c., for the Geelong Gas Company, Victoria, Australia. Specifications at the office of Mr. J. Scoltock, inspecting engineer, 75 Old Broad-street, London, and at the Company's Agents', Messrs. John Warrack and Co, Leith, with whom tenders must be lodged on or before the 20th January.

IRON GASOMETER — CAST-IRON TANK. — The Great Coggeshall Gas and Coke Company require an iron gasometer and cast-iron tank to hold 5,000 or 8 000 feet of gas. Tenders to include carriage, fixing, and all the apparatus necessary for the perfect working, to be sent to Mr. Wm. Doubleday, secretary, Coggeshall, who will supply any further information required.

BRITISH OAK TIMBER—THICK STUFF AND PLANK—TREENAILS.—THE NAVY.—The Navy Commissioners give notice, that at two o'clock on the 25th inst, they will be ready to treat with such persons as may be willing to contract for supplying 26,000 loads of British oak timber; 9,500 loads of British oak, thick stuff, and plank; and 1,800,000 British oak treenails, to be delivered at her Majesty's dockyards, by the 31st of Dec., 1861, at prices including all carriage and other expenses. A tender may be made for the whole contract, but not for less than the quantity required at any one yard. Forms of tender and particulars at the office of the Storekeeper-General of the Navy, Somerset-place. Tenders to be presented by principals, or agents duly authorised in writing, addressed to the Secretary of the Admiralty; and having "Tender for British Oak" in the left-hand corner. They must be accompanied by a letter signed by two responsible persons engaging to become bond with the person tendering, in the sum of £20,000, for the due performance of the whole, or in a due proportion for a part only.

PUDDLED TIMBER COFFER DAM. — MERSEY DOCKS ESTATE.—The Mersey Docks and Harbour Board are prepared to receive tenders for the construction, maintenance, and removal of a puddled timber coffer dam, at the entrance to the intended deep low-water basin at Birkenhead. Plans, &c., of the engineer, at the Dock-yard, Cobourg-dock, Liverpool. Tenders to be duly endorsed, and addressed to the Chairman of the Committee of Works, and left at the office of the Secretary, Dock-office, Liverpool, not later than eleven o'clock on the forenoon of January 22. The Board will decline all the tenders if they deem it necessary.

FACTORY, &c.—The directors of the King's Cross Patent Wheel Company are prepared to enter into a contract for erecting a factory, buildings, offices, &c., at King's Cross. Plans, &c., from 12 till 3, till 17th January, at 23 Martin's-lane, Cannon street, City.

ECCLESIASTICAL EDIFICES.—The necessary particulars as to the time of inspecting the plans, delivery of tenders, &c., in connection with the rebuilding of the parish church of St. Michael, Farnsfield, Notts, may be had on or before the 1st of February. at the office of Messrs. Hine and Evans, architects, Nottingham.——The same in regard to tendering for works required to be done in the rebuilding of the parish church of St. Giles, Darlton, Notts.——The like respecting the erection of a tower and spire to the new church, Brackenfield near Alfreton, Derbyshire.——Similar in every respect to the three foregoing is the notice inviting tenders for the rebuilding of the parish church of St. Oswald, Dunham-upon-Trent, Notts—for all of which undertakings Messrs. Hine and Evans are the architects.

GRAMMAR SCHOOL, PREPARATORY SCHOOL, NEW-ROAD.—The trustees of the Bedford Charity ask for tenders for the enlargement of the Grammar School, the erection of a new Preparatory School, and the making of a new road. Plans, &c., at the offices of Mr. James Horsford, architect, Bedford. Separate tenders duly endorsed to be delivered at Mr. Horsford's office at or before 11 in the forenoon of January 24.

CHAPEL SCHOOL, *War Department.*—Newbridge Barracks, County Kildare. Information at the Commanding Royal Engineers' Office, Lower Castle-yard, Dublin, and at the Royal Engineers' offices at Curragh and Newbridge. Letters of tender endorsed "Tenders for Work at Newbridge," be sent by January 22, to "The Director of Contracts, War Office, Pall Mall, London."

MANAGER OF COPPER ROLLING MILLS. — At Llanelly, South Wales, a manager, with a practical knowledge of the rolling of copper and yellow metal, is required. Applications to C. W. Nevill, Esq., Copper Works, Llanelly, South Wales.

SCIENTIFIC BREWER.—A head brewer, possessing a thorough knowledge of chemistry and of the practice of brewing, is required in a large establishment. Z, care of Messrs. Wigan, White, and Wigan, Hibernia Chambers, London Bridge, Southwark.

MAY BE PURCHASED.—20,000 Scotch fir sleepers, from James Forbes, 45 High-street, Inverness, N.B.

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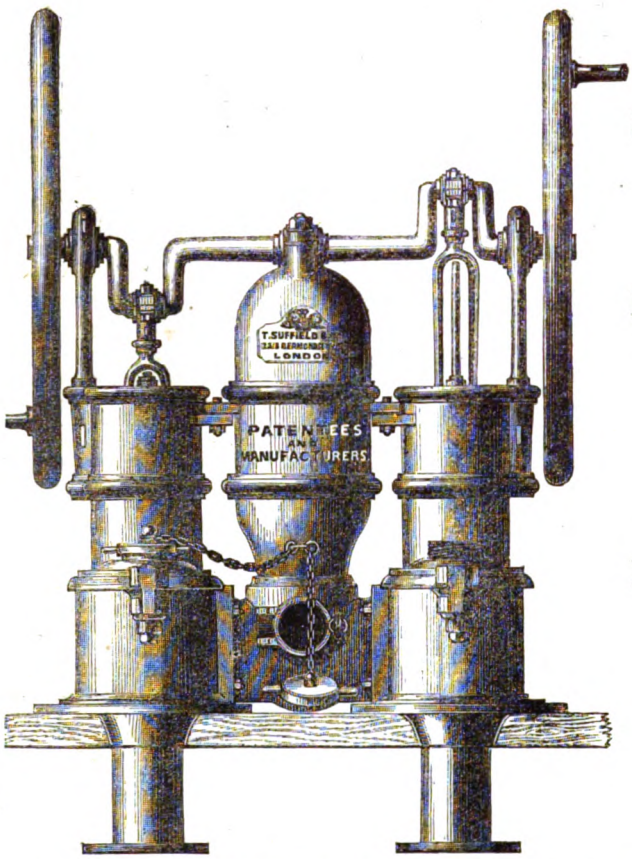
Call the particular attention of

SHIP-OWNERS, SHIP-BUILDERS, AND COMMANDERS OF STEAM AND SAILING VESSELS,

to the Simple and Efficient Arrangements of their

PATENT PUMPS.



Ships' Pumps

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Fire Engines,

Fixed and Portable.

WITH

Patent Valves

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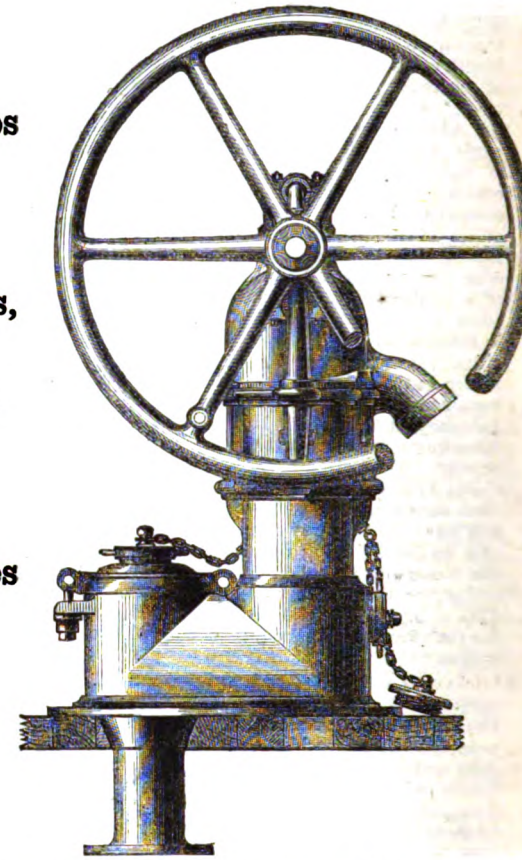
Improvements.



These Pumps are free from that liability to choke which is common to other Pumps, and their Working Parts are not susceptible of derangement either from wear or from being long out of use. They pass entirely through them, with ease, any substance that may enter the Suction Pipes. The Novelties in these Pumps are their adaptation to the varied duties of Ships' Pumps, the facilities they afford for Cleansing the Suction Pipes, and for Sounding or Examining the Valves; the readiness with which they may be used for Ventilating the Bilge, or for acting as a Syphon either for Watering the Ship, or for extinguishing Accidental Fires on board; the rapidity with which they can be converted into Fire Pumps, or be applied to the Washing of Decks; and their capability of Pumping from Several Compartments.

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Also respectfully solicit the attention of STEAM SHIP BUILDERS and OWNERS to their Large and Varied STOCK of

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They keep a Large Stock of Goods, of their own Manufacture and from the Best Makers, constantly on view; so that by a visit to their Works or Depôt, much valuable time may be saved by Managers, Engineers, and other Gentlemen who may require such Stores, together with a further saving in the cost of such Articles.

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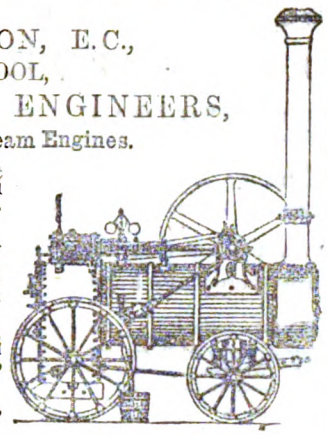
AGRICULTURAL AND GENERAL ENGINEERS,

And Manufacturers of Portable and Fixed Steam Engines.



Combined Threshing Machines, which dress the corn ready for market at one operation. Grinding Mills, Saw Benches, Pumps for Irrigation and Mining purposes, with all necessary gearing for being driven by steam power. Full particulars and estimates given on application to the above address.

C. S. and Co.'s PORTABLE STEAM ENGINES are adapted for every purpose to which steam-power can be applied. When intended for winding, they are fitted with reversible link motion and winding gear. They are easy of removal, as may be seen by the engraving, and can be set to work immediately on arrival.

C. S. and Co. are now doing an extensive foreign and colonial business, and are prepared to send off engines and machinery of the before-mentioned kinds in a few days from the date of order. They would also call attention to the important *reduction in prices* made for the new year.

For Exportation.---The above can be obtained through British Merchants, Shippers, and Colonial Agents. (23)

TRACTION ENGINES,

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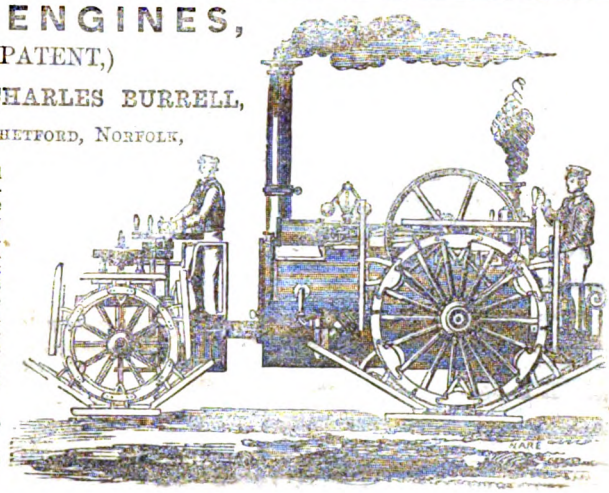

And ordered for India, Australia, and South America, may now be seen, complete and in course of construction at the above works. BOYDELL'S TRACTION ENGINES AND ENDLESS RAILWAY will draw heavier loads over good roads than any other traction engine, and on soft and bad roads will draw heavy loads where no other traction engine can move itself. All objection to the wear and tear of these Engines is entirely removed by the use of Charles Burrell's improved patent Wrought Iron Wheels, fitted with Rails and Tyre, as well as all the wearing parts, of Steel.

Apply also to Mr. Hemming, 47 Mark Lane, E.C.

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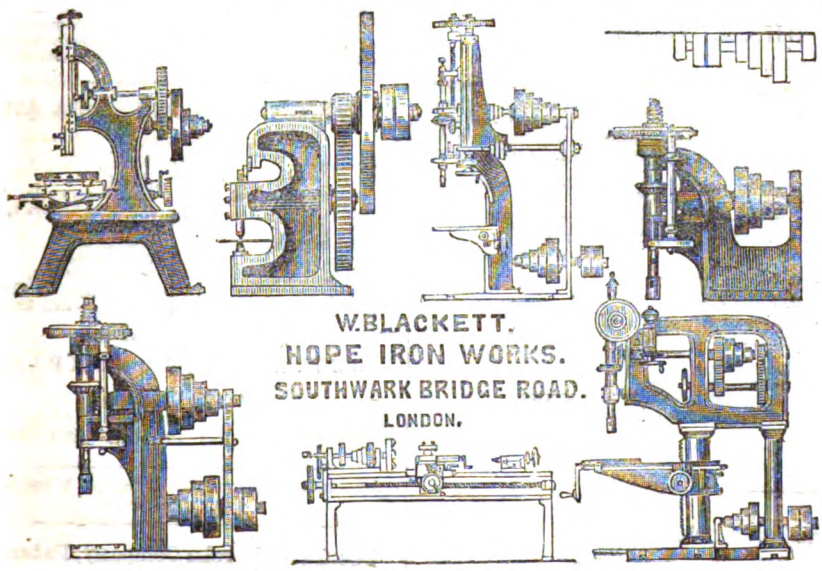

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Is prepared to supply all kinds of Vertical, Horizontal, and Portable Steam Engines and Boilers. Warehouse, Wharf, and portable Travelling Cranes. Vertical and Circular Sawing Machinery. Hydraulic Presses, Steam Hammers, &c. Every kind of large and small Lathes, Drilling, Punching and Shearing, Planing, Shapeing, Slotting, and Screwing Machines, Screw-jacks and other Machinery. A large assortment of Engineers' Tools and Steam Engines always in stock, and ready for delivery. Inspection is respectfully invited. Written communications promptly attended to.

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"MECHANICS' MAGAZINE" & PATENT OFFICE,

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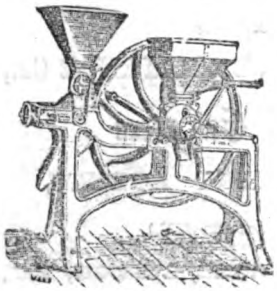
E. R. & F. TURNER,

ST. PETER'S IRON WORKS, IPSWICH,

PRIZE CORN AND SEED CRUSHING MILLS.



THESE MILLS obtained the First Prizes of the Royal Agricultural Society at the Norwich, Gloucester, Lincoln, and Carlisle Shows;

The Prizes of the Bath and West of England Society, at the Annual Meetings' 1854, 1855, 1857, and 1858;

The Gold Medal and Prize of 150 Francs at the French Universal Exhibition of Agriculture, 1856;

Large Silver Medal at the Austrian Imperial Agricultural Exhibition, 1857;

The Highland Agricultural Society's Prize for the Best Linseed Crusher, at Aberdeen, 1858;

And numerous Prizes from Local Societies.

For Crushing Oats, Linseed, Barley, Malt, &c., and Grinding Beans and Peas, these Mills are unrivalled. Numerous varieties are made, adapted for the requirements of all who use crushed corn or seed.

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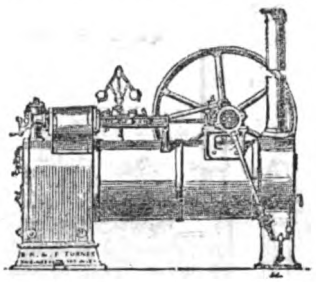
Are of superior design and first-class workmanship, and have proved themselves to be highly efficient, economical, and durable. They are applicable for working Thrashing Machines, Chaff Cutters, Crushing Mills, Pumps, Brick and Tile Machines, &c., and may be had as fixtures on Iron Pedestals, as here represented, or made Portable, on Wood or Iron Wheels. Combined Thrashing Machines are made expressly adapted for these Engines.



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PATENT CRUSHING AND GRINDING MILL—a combination of Crushing Rollers and Mill Stones, capable of either crushing or grinding to meal every description of corn, pulse, or seed.
GRINDING MILLS—with French or Derbyshire Stones, from 18in. to 3 ft. diameter, compactly fitted upon strong iron frames.
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OILCAKE BREAKERS—made entirely of iron, and capable of breaking all description of cake for sheep and beasts.
HORSE GEARS—with intermediate motions, all of iron, suitable for small Thrashing Machines, Chaff Cutters, Crushing Mills, &c.
CIRCULAR SAW TABLES—with improved adjusting guide fence, and with or without boring apparatus.
THRASHING MACHINES—for 2, 3, and 4 Horse, suitable for exportation.
PORTABLE STEAM ENGINES—from 2 Horse Power, and upwards.
COMBINED THRASHING and WINNOWING MACHINES.
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IMPROVED MACHINERY FOR AGRICULTURISTS.

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(ESTABLISHED A.D. 1778),

EARNESTLY solicit the continued support of their numerous Friends, Agriculturists, Shippers, and others; the additions made to their Works during the present year, in the erection of new sets of Workshops, fitted with the best mechanical appliances for producing Machinery of the most improved construction, expeditiously and economically, justifies their soliciting increased support, while their leading reputation as Inventors and Manufacturers of FIRST CLASS Agricultural Machinery, is a sufficient guarantee that every Machine supplied from Leiston Works will prove to the entire satisfaction of the purchaser.

R. G. & S. are now manufacturing the following Machines and Implements, which they guarantee to be thoroughly efficient in every respect:—

PORTABLE AND FIXED STEAM ENGINES. } From 4 to 40 Horse Power, suited for every kind of work
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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 3. [NEW SERIES.]

LONDON: FRIDAY EVENING, JANUARY 14, 1859.

PRICE FOURPENCE. BY POST 5d.

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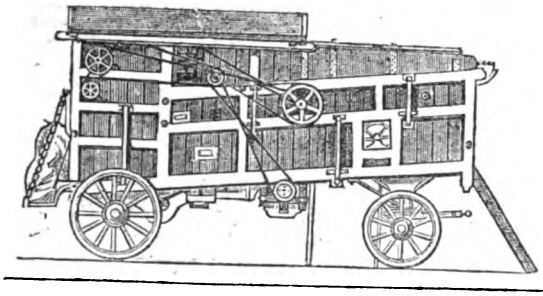

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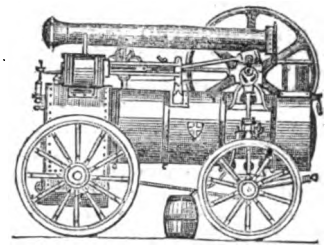

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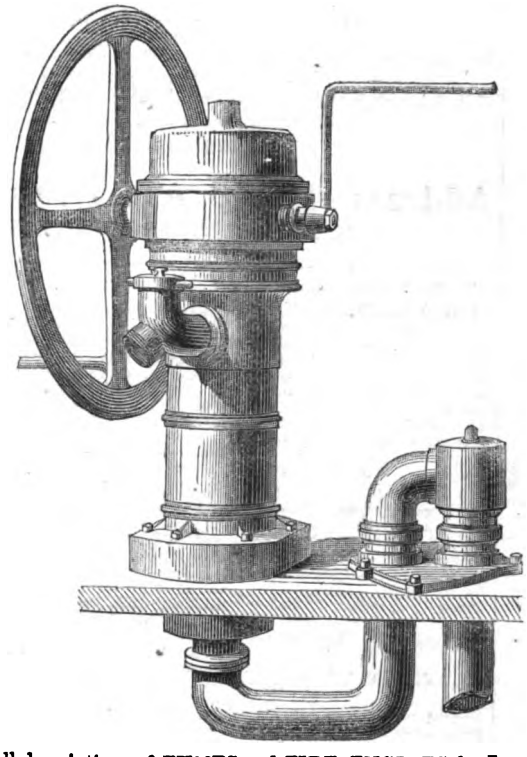

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LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

RAILWAY WORKS, *Limerick and Castle Connell Railway.*—The directors of this Company advertise for tenders for the construction of their line from Castle Connell to Killaloe. Plans, &c., at the Engineer's office, 51 George-street, Limerick. Mr. E. W. Maunsell, the Secretary of the Company, will receive sealed tenders at 1 Upper Hartstoye-street, Limerick, on or before the 1st of Feb.

DOCK AND RAILWAY, *Penarth.*—The Penarth Harbour, Dock and Railway Directors solicit tenders for the construction of the Dock at Penarth, and a portion of railway leading thereto. Plans, &c., on and after Jan. 24, at Mr. Hawkshaw's office, 33 Great George-street, Westminster. The directors will meet at their offices in Cardiff at ten on Feb. 12, to receive the tenders. Secretary, Mr. Booth Bacon.

ERECTION OF A JETTY, *War Department.*—Up to the 17th inst. tenders will be received at the office of the Director of Contracts, War Department, Pall-mall, for the erection of a jetty at the Powder Magazine, Bull Point, Plymouth. Drawings, &c., at the War Office, Whitehall, or at the Royal Engineer Office, Devonport.

DRAINAGE PLANS, *Bicester.*—The Local Board for the parish of Bicester, in Oxfordshire, are ready to receive tenders for preparing the necessary plans and estimating the cost of drainage of the town of Bicester. The tenders, with references to the competency and experience of the persons making them to be delivered on or before Feb. 5, to Mr. George Cannold, Clerk to the Board.

MARINE WORKS, *Swansea.*—Specifications and plans for the construction of a battery and other buildings on the Light House Island, Mumbles, in the Swansea Bay, may be seen at the Royal Engineers' Office, Pembroke Dock, by whom tenders will be received to the 20th January.

ROADS, *Hull.*—Tenders are invited for the repairs of the roads and footways within the borough of Hull, from March, 1859, to June 30, 1860. Specification on application to Mr. R. A. Sharliker, Surveyor, 73 Lowgate-st. Hull.

NEW PUBLIC BATHS, *Birmingham.*—The Baths and Parks Committee of the Birmingham Town Council are prepared to receive tenders for the erection of baths in Woodcock-street in that town. Drawings, &c., at the office of the architect, Mr. Edward Holmes, 25 Temple-row, Birmingham, to whom builders wishing to compete were requested to send their names by the 12th inst. Tenders to be sent to the Town Clerk (Thos. Stanbridge, Esq.), on or before the 29th inst., and to be accompanied with the names of two sureties for at least one-fourth of the tender.

BUILDINGS, &c., *Bishopstone.*—Tenders are requested for the new buildings and works on the estate of the Ecclesiastical Commissioners at Bishopstone, Wilts, near Shrivenham, on the line of the Great Western Railway. The works will be commenced so soon as the weather permits. Two sureties will be required for three-fourths of the tender. Drawings, &c., at the offices of Messrs. R. J. and H. Cluton, 9 Whitehall-place, Westminster, or at the residence, at Bishopstone, of Mr. Hodge. Tenders to Messrs. Cluton, on or before Feb. 5.

VICARAGE AND SCHOOLS, *Portsmouth.*—Mr. C. E. Davis, F.S.A., of 3 Westgate Buildings, Bath; or the Rev. Thos. Baugh, vicar of Catherington, near Portsmouth, Hants, will both show the plans and quantities necessary to the erection of a vicarage house and other buildings at Catherington; and Horndian Church of England Schools, also in the parish of Catherington, for each of which separate erection tenders are invited, that must be delivered at 3 Westgate-buildings, Bath, not later than January 20.

RAGGED SCHOOLS, *Nottingham.*—Tenders are invited until Feb. 4 for the erection and complete finishing of Ragged Schools in Nottingham. Drawings, &c., at the office of Mr. Charles Wright Edwards, 4 St. James's-terrace, Camden-town, London.

COPPER, *Navy.*—The Board of Admiralty invite tenders to Jan. 18 for the supply of 100 tons of tough-cake copper at Chatham Dockyard.

CONSTRUCTION OF AN EMBANKMENT.—*River Shannon.*—Tenders are wanted from persons willing to construct an embankment on the foreshore of the river Shannon, adjoining the lands of Shannon Grove, the estate of C. Brinsley Marlay, Esq., in the parish of Ardkenney, Barony of Kenry and county of Limerick, according to plans and specifications to be seen at the office of Mr. W. F. Irwin, Land Improvement Department, Custom House, Dublin, and at Mr. Cruise's Hotel, Limerick. The contractor must give two solvent securities to the amount of £2,500, for the due fulfilment of the contract within such time as may be agreed upon. Application to be made, and proposals forwarded to Mr. Wm. Featherstonhaugh, Carrick, Mullingar, up to the 1st of February.

COALS, *Navy.*—The Admiralty Commissioners will be ready at two o'clock on the 8th February, to treat with such persons as may be willing to contract for supplying and delivering into store at Ascension, 3,500 tons of South Wales coals, fit for the service of Her Majesty's steam vessels. Conditions and a form of tender to be had at the office of the Storekeeper General of the Navy, Somerset Place. No tenders after two o'clock on the day named; and principals or agents to be present. Every tender to be addressed to the Secretary of the Admiralty, to have "Tender for Coals" in the left-hand corner, be delivered at Somerset Place, and be accompanied by a letter signed by two responsible persons engaging to become bound with the person tendering for £3,000.

SWINGING LAMPS AND MESS UTENSILS, *Navy.*—At half-past one o'clock on the 18th instant, the Admiralty Commissioners will be ready to treat with persons willing to contract for supplying and delivering into Her Majesty's Transport Stores at Deptford, all such quantities of swinging lamps, knives, forks, spoons, bowls, plates, dishes, &c., as shall from time to time be demanded under a contract 12 months' certain, and afterwards, until the expiration of three months' warning. Patterns of the articles and the conditions of the revised contract at the Office, in Somerset Place, of the Comptroller for Victualling and Transport service. All tenders must be on the printed form to be supplied, and must be delivered by the hour named, at Somerset Place, addressed to the Secretary of the Admiralty, and have on the left hand corner "Tender for Swinging Lamps and Mess Utensils."

ELM TIMBER, *Navy.*—The Admiralty Commissioners will be ready on the 1st of February, at two o'clock, to treat with persons willing to contract for supplying Her Majesty's Dockyards with 4,000 loads of English Elm Timber, felled between the middle of November last and the end of February next, and to be delivered (at prices including all carriage and other expenses) by the 30th November, 1859. Tenders may be made for supplying of one or any more of the yards, or for the whole of them. A form of tender showing the distribution and conditions of the contract may be obtained at the Office of the Storekeeper General of the Navy, Somerset Place. No tender will be received after the hour named, and principals or agents duly authorised in writing must attend. Tenders must be addressed to the Secretary of the Admiralty, be duly endorsed, and to be accompanied with the engagement of two persons willing to be bound with the person tendering to the extent of £1 a load.

STEAM ENGINE.—The Bristol Water Works Company are desirous to obtain a new or second-hand steam engine, horizontal or cross-head, of 25 to 35 horse power, intended for pumping. Price and particulars to be forwarded to the Secretary, Mr. Chas. Wm. Bragge, at the Bristol Water Works Office.

ROAD SURVEYORS.—The Stow and Moreton United Trust of Turnpike Roads want a general superintending surveyor, who will be required to keep a horse and reside at Stow-on-the-Wold, Gloucestershire. Salary, £150; to undertake no other business. Qualifications and testimonials to be sent in to Mr. Brookes, the Clerk to the Trustees, at Stow-on-the-Wold, on or before the 20th of January. The candidates to attend at the Unicorn Inn, Stow-on-the-Wold, at 12 at noon, on the 27th inst., when the appointment will be made.

VILLAS, *Upper Norwood.*—Persons are solicited to contract for the building and finishing complete of two semi-detached villas at Upper Norwood, each house to contain six rooms 17 ft. by 16 ft., with attic; hall, 8 ft. 10 in.; elevation, 9, 11, and 10 ft. Bricks are provided but to be carted by the contractor, from the Jolly Sailor, Norwood. Payment to be taken in two London leasehold houses, one let at £40 lease from the Trinity Corporation, at £3 ground rent, having about seventy years to run. The other let at £28 per annum, in the best part of the Grange-road, Bermondsey, under lease at £5 ground rent, having about 80 years to run. Both houses to be finished by September, 1852. Application by prepaid letter to Mr. Hopcroft, printer, 1 Mincing-lane, with initials in left hand corner, "J. J. B."

SCAVENGING, *Paddington.*—The Vestry of Paddington invite tenders for carting away the street slop, from Lady-day, 1859, to Lady-day, 1860. Tenders are also invited for watering the parish roads twice a day (except Sundays), from the 1st of March next to the 15th of October following, the Vestry to find the water. Tenders may apply either to the whole parish or to two divisions, to be addressed to "The Vestry," at the Vestry-hall, Harrow-road, on or before the 31st January; and all persons tendering to be there at ten on the following morning prepared with the names of two sureties, or their proposals will not be considered. Particulars of the roads, with printed forms of tender, which are indispensable, on and after the 17th inst., at the Vestry-clerk's office, between 10 and 4. The expenses of the contracts and bonds to be paid by the contractors.

BUILDING ADDITIONS AND ALTERATIONS, *Galway.*—Tenders are sought from persons willing to make additions and alterations to Rychill House, near Monivea, in the county of Galway, according to plans and specifications which may be seen on application to Stephen Roche, Esq., Rychill, Monivea; or at the office of J. F. Kempster, Esq., Architect, Ballinasloe. Tenders to be sent to Mr. Roche on or before the 1st of February.

GAS WORKS, *Dublin.*—The directors of the Government Independent Gas Consumers' Company are desirous of receiving tenders for the erection of Retort Houses, Coal Stores, Purifying House and other buildings, upon their works, 74 Sir John Rogerson's Quay, according to drawings and specifications to be seen at the office, No. 5 Dame-street, on and after Monday, January 17th. Tenders to be forwarded to Mr. George Flintoff, secretary to the Company, not later than January 27th, at noon.

FIFTY COTTAGES, *Blyth.*—The proprietors of Cowpen Colliery, Blyth, are willing to let the building of fifty cottages at that colliery. Plans and specifications at the office of the colliery.

PAVING WORKS, *Tynemouth.*—The Tynemouth Local Board of Health invite tenders for paving works required within the Borough during the present year. Specimens may be seen and information obtained at the office of the Borough Surveyor, Norfolk-street. Tenders will be seen at the Town Clerk's Office, Howard-street, not later than the 19th inst.

CANVAS FOR PACKING, *East India Board.*—The India Finance Home and General Works Committee, give notice that they will be ready on or before the 25th inst., to receive proposals from persons willing to supply canvas for packing; and that the conditions of the contract may be had at the Secretariat Office, where the proposals are to be left any time before 11 in the forenoon of the 25th of January, after which no tenders will be received.

GOODS AND STORES, *Port of Sunderland.*—The Commissioners of the River Wear are prepared to receive tenders for the ensuing year's supply of malleable and cast iron, brass casts, nails, oils, tallow, white lead and paints, hempen rope (tarred and white) and coir warps and tawlings.

GAS PIPES, *Walsall.*—The Walsall Improvement Commissioners are ready to receive tenders for a further supply of 3, 4, 5, and 6-inch cast-iron turned and bored socket pipes, delivered at their gas works. Sealed tenders, marked "Tenders for gas-pipes," stating the price and weight per yard, to be sent to the Commissioners' Clerk's office, on or before Thursday, the 20th of January instant.

CAST STEEL FILES, &c., *India Board.*—The Finance, Home, and Public Works Committee give notice that the will be ready, on or before Friday, the 21st instant, to receive proposals in writing, sealed up, from such persons as may be willing to supply cast steel files, rasps, and rubbers; and that the conditions of the said contract may be had on application at the Secretariat Office, where the proposals are to be left any time before eleven o'clock in the forenoon of the said 21st day of January, 1859, after which hour no tender will be received.

STONE AND BRICKS, *Wolverhampton.*—The Wolverhampton town council are prepared to receive tenders for supplying them with rowley rag and other stone and bricks, for one year, to be delivered at their wharf in the borough, the tenders to be in the following form:—Rough stone, broken rag stone, randoms, six-inch squares, four and five-inch squares, three-inch squares, all at per ton, delivered; bricks—best common blue, plain barn floor, chequered ditto, all at per 1000, delivered. The tender for bricks must be accompanied by samples. The town council do not bind themselves to accept the lowest or any tender. Tenders must be sent to Mr. Parnell, borough surveyor, on or before Saturday, January 22, 1859, marked "Tender for stone and bricks."

ARCHITECTS' COMPETITIONS. *Cemetery Chapels.*—Detailed plans and elevations are required by the Burial Board of Oakham, in the county of Rutland, accompanied by specifications and estimates for erecting two chapels, connected externally as one building, and also an entrance lodge with board-room in it; the plans are also to include entrance gates, boundary fencing, and the draining and the laying out of the grounds, 4½ acres in extent. A premium of £30 will be given for the approved designs, which the board will keep, returning the unsuccessful; but the board do not bind themselves to employ the architect of the approved plan to carry out the works, nor do they undertake to accept any plan. Information will be given by Mr. Alfred Ellingworth, the clerk to the board, to whom the plans must be sent on or before Feb. 8.——*Monuments.*—Designs for a monument to be erected in the Mowbray Park, Sunderland, to the late General Sir Henry Havelock, at a cost exceeding £1,600, are solicited by the committee appointed by the promoters of the movement. Further information will be given by the Hon. Secs. Messrs. E. T. Gourley and Wm. Snowball; and the designs must be sent to the Mayor of Sunderland, on or before the 7th of Feb.——A monument upon which it is hoped by the promoters that they will be able to expend from £400 to £500, and towards which £345 has been already subscribed, is proposed to be erected on Hatherleigh Moor, Devonshire, to the memory of the late Lieut.-Col. Harris, C.B. The erection committee invite designs or models to be delivered for them before Thursday, Jan. 20, to the care of Mr. Pearse, Solicitor, Hatherleigh. On that day, at one o'clock, the committee will meet at the Subscription Rooms, Hatherleigh, to decide upon the designs or models sent in, for none of which, however, are they to be held liable to pay.——The Police Committee of the Loughborough Magistrates are prepared to spend not more than £1,600 on a Police Station there. The proposed site contains an area of 1,011 square yards, belongs to the Town Hall Directors, has a frontage to Wood Gate, and extends thence back to the Town Hall, and lies within a few yards of the Market-place, whence to the new building there will be access by a road to be secured. The building must comprise a police station with eight cells; house for superintendent; house for serjeant of police; a room for stamping weights and measures; and a cart-house and stable. Also a room for magistrates' meetings, 40ft. by 20ft., with retiring room, clerk's office, and room for witnesses in attendance. A plan of the ground, &c., may be inspected at the office of the Clerk of the Peace, New street, Leicester, and at the Magistrate's Clerk's Office, Loughborough; to which latter place plans must be sent by the 24th January.——Premiums of £50, £30, and £20 respectively are offered for plans or models of a new Tabernacle for the congregation of the Rev. C. H. Spurgeon, on land situated near the Elephant and Castle, Newington. Every cost, including architect's commission, to be about £16,000. Gothic designs will not be accepted, and the plan of the Surrey Music Hall, because of its acoustic excellence, decidedly preferred. The drawings to show a plan of each floor and gallery—longitudinal and transverse sections—and elevations drawn to a scale of eight feet to the inch, and tinted in light brown Indian ink. One perspective view tinted in like manner may accompany each design; but bird's-eye perspective views and drawings in frames (other than straining frames) and glasses, will not be received. The building to contain, on the basement floor (which is to be five feet below the level of the footway), school-rooms, 12ft. high, for boys and girls, and lecture-hall, to seat 800 persons. The chapel above to seat 3,000 persons, and standing room for not less than 1,000, and with not more than two tiers of galleries; each sitting to be not less than 2ft. 6in. by 1ft. 7in. Provision to be made for baptistry, six vestries, water-closets, urinals, &c. Each architect to state the commission he will require on outlay—such commission to include all expenses for measuring, superintendence, &c. The architects who compete will be requested to be the judges of the plans, and to award the first and third premiums. For this purpose the committee will require the name and address of each competitor to be forwarded to them by post on the 1st day of February. No architect will be allowed to select his own design. The designs must be sent in by Jan. 31.

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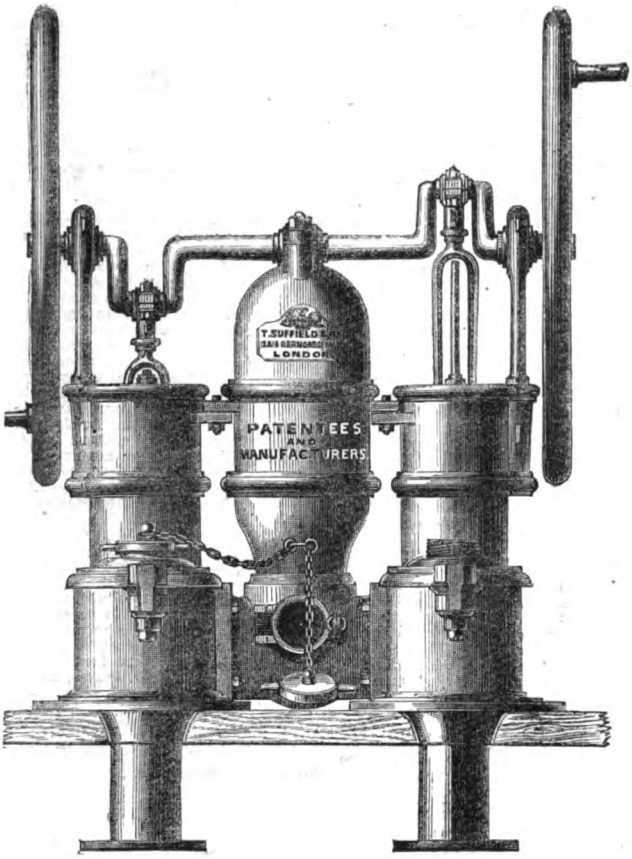

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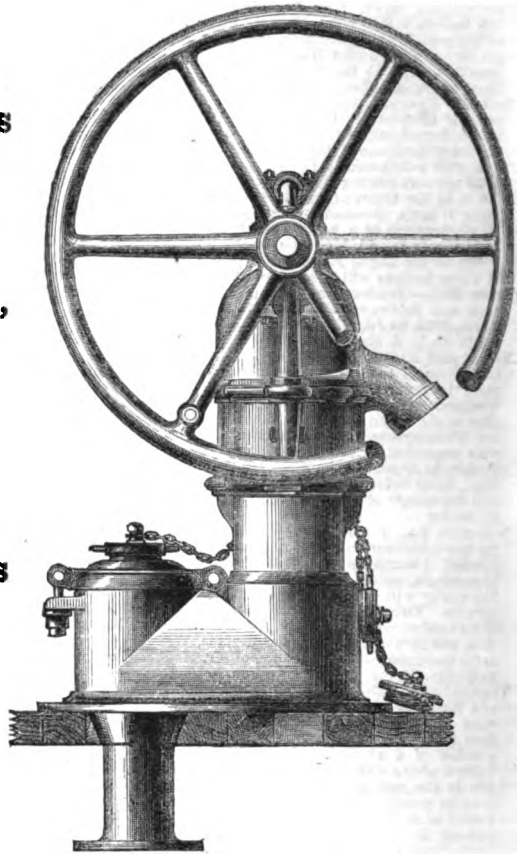

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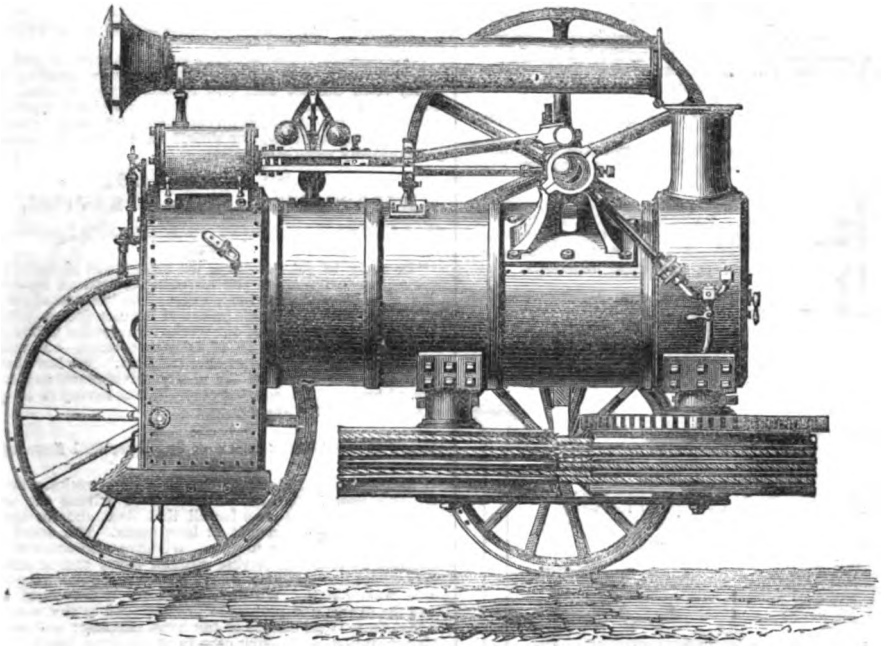

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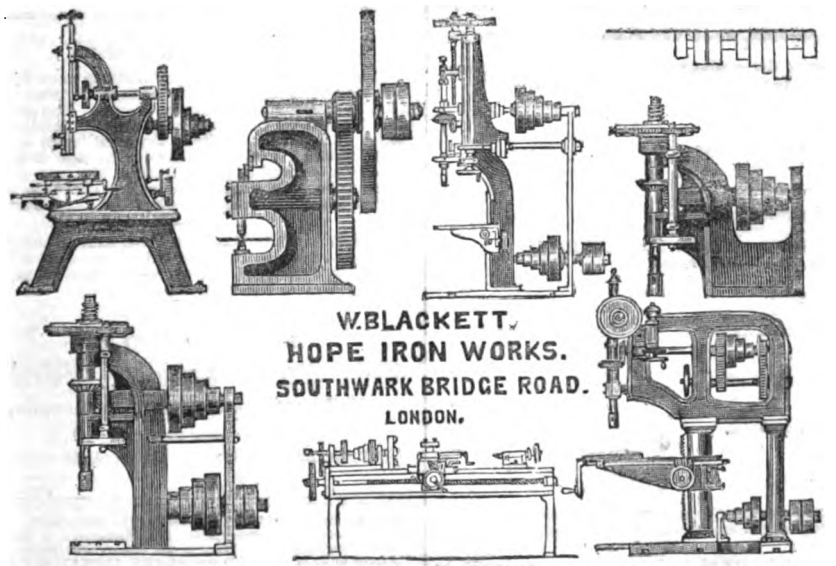

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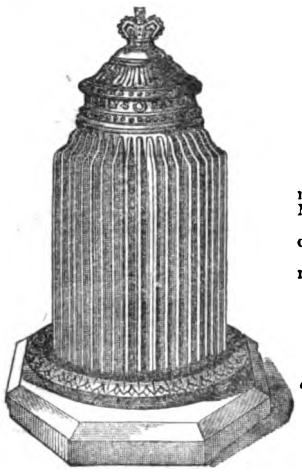

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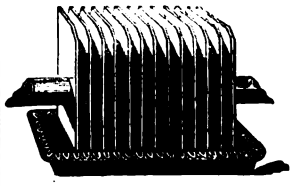

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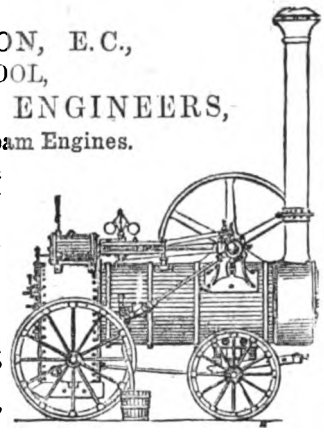

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 4. [NEW SERIES.]

LONDON: FRIDAY EVENING, JANUARY 21, 1859.

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CLOVER AND TREFOIL MILLING OR DRAWING MACHINE,

which effectually removes the beard from Carrot Seed, rendering it fit for sowing with facility by drill or otherwise, and by the separation of abortive or diseased grains vastly increases its vegetative per centage. By a slight modification it is applicable to the other purposes before mentioned.

These Machines were admittedly the most novel, and, at the same time, the most useful and important to the Farmer of any exhibited at the late SMITHFIELD CLUB SHOW.

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Mr. T. MIDDLETON, Engineer, Southwark.

Communications to be sent to the Patentee, J. SCOTT, 111 Drummond Street, Euston Square, London, N.W. (48.)

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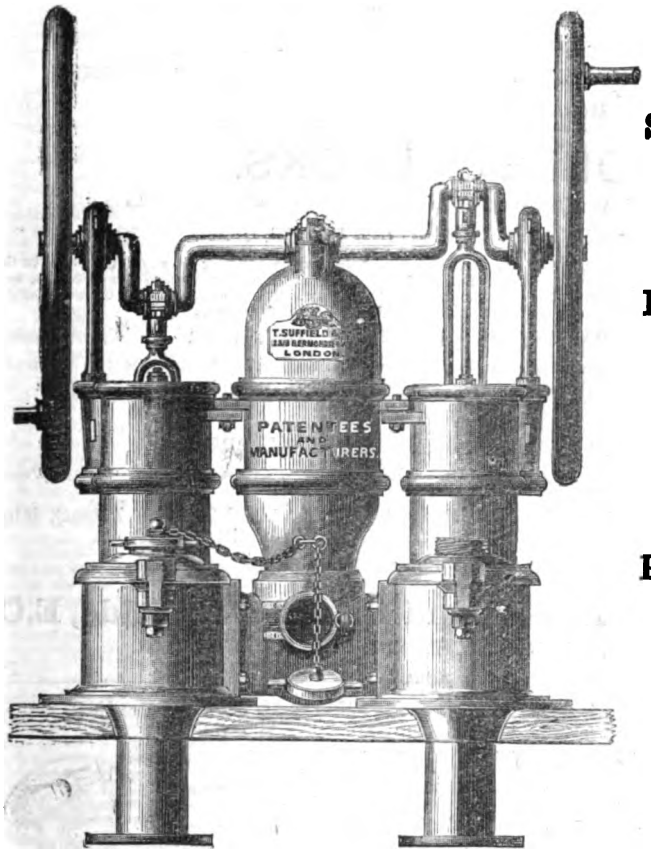

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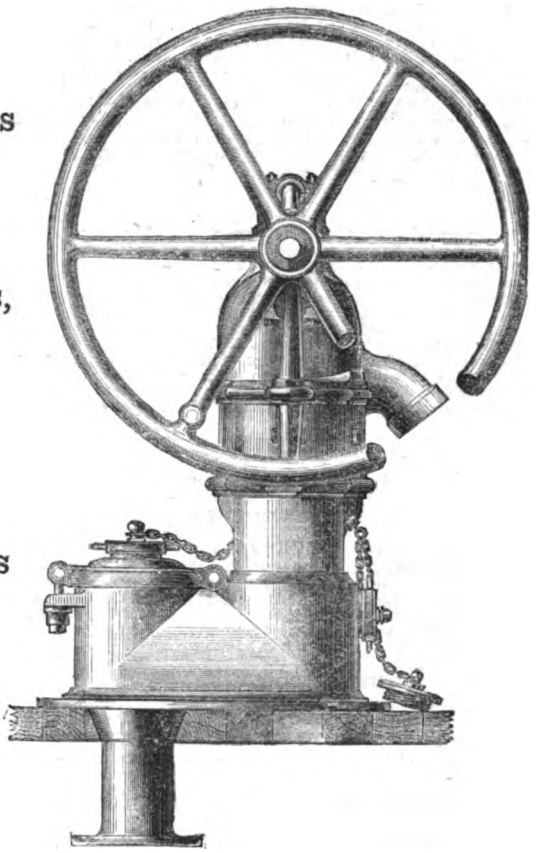

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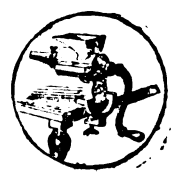

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IRON, Rails in Wales and N. of England	pr ton	6 10 0	to	7 0 0	nett
Welsh Bars, in Wales	„	6 5 0	„	6 10 0	3
Staf. Bars at the Works	„	7 5 0	„	7 10 0	2½
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„ Sheets, Singles	„	8 15 0	„	9 0 0	„
„ Nail Rods	„	7 5 0	„	7 10 0	„
„ Boiler Plates	„	8 10 0	„	9 0 0	„
*Scotch Pig, M.-Nos. Warrants, at Glasgow	„	2 14 0	„		nett
Do. No. 1, Good Brands	„	2 13 9	„	2 14 9	„
Scotch Bars	„	7 5 0	„	8 0 0	3
Swedish Bars, in London	„	13 10 0	„	14 10 0	2½
COPPER, Sheet and Sheathing per lb.		0 1 0½			3
Tough Cake and Tile	„ ton	112 10 0			„
Best Selected	„	11 10 0			„
Australian	„				
South American	„				
Yellow Metal Sheathing	per lb.	0 0 10½			„
STEEL, Swedish Keg	pr. ton	20 0 0			2½
„ Faggot		None.			
TIN, English, Block	pr. cwt.	6 6 0			2½
„ Bar	„	6 7 0			
†Foreign, Banca	„	6 12 0			nett
† „ Straits	„	6 10 0			„
TINPLATES, Charcoal, I.C.	pr. box	1 12 0	„	1 13 6	3
Coke, I.C.	„	1 5 0	„	1 7 0	„
LEAD, Pig, English	pr. ton	21 5 0	„	22 0 0	2½
Spanish	„	20 10 0	„	21 0 0	„
Sheet	„	22 5 0			„
SPELTER, on the spot	pr. ton	22 15 0			nett
for arrival	„	23 15 0	„	23 0 0	„
ZINC, English, Sheet	„	30 0 0			1½
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LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

RAILWAY, *Ireland.*—The Directors of the Dundalk and Enniskillen Railway are prepared to receive tenders for the construction of their branch line from Shantonah to Cootehill. Plans and specis. at office of Mr. J. Barton, Company's Eng., Dundalk. Tenders (according to forms to be furnished), to be lodged with Mr. Edwards, Sec., 43 Lower Gardner-street, Dublin, on or before 1st March. The lowest tender not necessarily accepted.

RAILWAY, *Scotland.*—The Directors of the Alyth Ry. will receive tenders for construction of line of 5½ miles. The bridges over the Isla and the Dean not to be included. The Compy. supply rails and chairs. Apply for partics. to Mr. D. H. Halkett, C. E., Ballendoch, near Meigle, for 10 days subsequent to 17th inst. Tenders to Feb. 2.

SEWERS, *Blackburn.*—The Corporation invite tenders for constn. of about 2,800 yds. of Brick and Pipe Sewers, with branch drains, gullies, manholes, flushing chambers, &c., comprised in contracts D. and E. of the sewerage of the borough. Plans, &c., seen at Mr. Brierley's, Borough Surveyor, Town-hall. Sealed tenders "tender for sewers," to be sent to Mr. Ainsworth, Town Clerk, by 29th inst. No tender necessarily accepted.

WATERWORKS, *Leeds.*—Tenders invited for works in extension of Corporation Water Works, Leeds, to the high-level district in that borough. 1st contract: making, fixing, and getting to work a pumping engine and boiler, about 15 H.P. 2nd.: delivery of about 1,200 tons cast-iron socket pipes, of various sizes; also branches, &c. Plans, &c., at Mr. E. Filliter's, C. E., Borough Surveyor, Town-hall, Leeds. Tenders to 10 a.m. 4th Feb.

GAS, *Devonport.*—The Commissrs. ask tenders for lighting Devonport with gas. Apply to Surv. of Devonport and Stoke-Damerel, Devon, to Jan. 27.

STEAM-ENGINE, PUMP, &c., *Bury St. Edmunds.*—The Paving Comms. ask tenders for a 3-H.P. high-pressure steam-engine for raising water; a deep Well-Pump for raising 4,000 galls. per hour; a circular iron-tank, 15 ft. diameter and 10 ft. deep; and about 3,500 yds. of water-pipe, diam. 8 in. by 2 in. inclusive. Tenders to Mr. Sparke, Clerk to Board, on or before Feb. 2. Mr Sparke will supply further particulars. No tender necessarily received.

SCAVENGING, *Oxford.*—Tenders received to Jan. 31, by Mr. Galpin, Surveyor to the Oxford Comms., Town Hall-yard, (where speci. may be seen), for sweeping, cleansing, and watering streets; also, for carting materials for repairs of roads, &c.

CHURCH, *Shropshire.*—To rebuild parish church of Bishop's Castle, Salop, for seating 700 on ground-floor. Mr. Nicholson, diocesan architect, Hereford, gives further informn., or plans be seen at the Six Bells, Bishop's Castle. Tenders sent to architect by 14th Feb.

CEMETERY CHAPEL AND LODGE, *Sudbury.*—Burial Board of St. Peter and St. Gregory, All Saints, and Ballingdoncum, Brundon, Sudbury (Suffolk and Essex), will enter into contract for two Cemetery Chapels and Lodge. Plans and specifications have been adopted by the Board, may be seen at the Town Hall, Sudbury, Durdon, to Mr. R. Ransom, Clerk, by noon, 1st February. The Board decides at 7 same evening.

HOUSES AND SCHOOLS, *England.*—Trustees of Sutton St. James's Charities, Lincolnshire, will erect two School-rooms and a master's house, at Sutton St. James's. Plans and specs. seen at Mr. J. P. Sturton's, Solicitor, Holbeach; to whom tenders must be sent on or before 29th inst.——Tenders for erection of a residence at Hartford, Cheshire, near the Railway Station, for F. H. Firth, Esq. Plans and Specs. at his present residence, Hartfort House, to-morrow, Sat., must be sent in to Mr. Firth, by Mon. Jan. 24. No tender necessarily accepted. Mr. J. Douglas, jun., of Sandiway, is architect.

HOUSES AND SCHOOLS, *Scotland.*—A house on the lands of Pitfodels, plans at Messrs. A. & W. Reid, and Mackenzie's, architects, until 27 inst. Tenders to following day.—Dwelling house and steading of office on the farm of Rogiehill, Skene. Plans with Overseer, at Kirkville. Tenders to Jan 29.——Converting the buildings of the Old Flesh Market, at Old Meldrum, into houses for the poor. Plans &c. from Mr. W. Don, Inspector of Poor, Old Meldrum. Tenders to Jan. 29.—For additions and repairs to the School and Schoolmaster's house at Cartly. Specs. on application to Mr. M'Pherson, Gibsson. Tenders to Jan. 27; the premises shown by schoolmaster.——School and schoolhouse, in the village of Old Deer. Plans &c. with Mr. Clarke, architect, Strichen. Tenders to Jan. 24th.

BOUNDARY WALL, *Birmingham.*—The guardians of the Birmingham Poor will receive tenders for erection of a Boundary Wall at the Workhouse. Specs. &c. seen on application at Parish Offices, Paradise-st., where printed forms of tender may be had. Sealed tenders at Parish Offices, 1st Feb. Each proposal must contain names of two persons to become sureties for performance to a moiety of tender. No tender necessarily accepted. Works to commence 1st March, and completed in three months.

ROAD MATERIALS, *Staffordshire.*—Willenhall Local Board of Health will receive Tenders for 600 Tons of Pebbles, during the present year, 50 tons per month, in any part of the parish. Tenders stating price per cub. yard, by Sat. 29th inst. to Clerk, Board of Health, Willenhall.

Winchester.—The Commissioners of Winchester Pavement ask for Tenders (to be sent to their Surveyor, Mr. H. Newman, Jewry-st., that city), up to Jan. 28th, for supplying 400 cubic yards of flints (broken or unbroken) for carriage roads. To be paid for within a month.

IRON WORKS, *Wanted.*—A Small Forge and Rolling Mill required in Lancashire, Cheshire, or neighbourhood, with about 6 Puddling Furnaces, or convenience for them, and plant for turning out about 50 tons of bar iron per week. Address to J. H., *Engineer* Office, 163 Strand, London.

RAILWAY STORES, *Ireland.*—The Directors of the Waterford and Limerick Railway will receive Tenders during the half-year commencing Feb. 1, for English bar and plate iron, for fire bars, nails, steel files, tools, boiler tubes for engines, wheel tyers, chains (joints and middle), sleepers, keys, trenails, and screws; timber (American oak and elm, red pine, deals, &c.), turf, carriage trimmings, glass, door-handles, &c., canvas and leather, brushes and brooms; oils, best Colza, refined rape, boiled, palm, &c.; paints, turpentine and varnishes, tallow, wick and cotton waste, and waggon sheets. Particulars, &c., on application to the Solicitor, Mr. T. Ainsworth, The Mall, Waterford. Parties applying are to state the articles for which they propose tendering. Offers addressed to the Directors till the 25th inst.

EMBANKMENT, *Ireland.*—Quantities for the Shannon Grove Embankment Company, Limerick, can be had from Mr. H. Townlow, C.E., 67 Amiens-street, Dublin.

CHURCHES, *Ireland.*—The Ecclesiastical Commissioners for Ireland, on or before the 5th Feb., will receive proposals for rebuilding the Church of St. James, Dublin; for fitting up interior of the Church of Rathcunnell, co. Westmeath; and for repairing and painting externally the churches of Dunmore, Moylough, co. Galway; Fenagh, co. Leitrim; Kicoleman, co. Mayo; Strut, co. Westmeath. Specs. in the hands of resident ministers of the parishes. No tender necessarily accepted. Sealed tenders to be addressed, "The Ecclesiastical Commissioners for Ireland."

CHAPEL SCHOOLS, *Dublin.*—The quantities for Newbridge Chapel School can be obtained from Mr. F. Regan, 55 Bolton-street, Dublin.

HOUSES, *Dublin.*—Tenders will be received for making alterations in houses 5 & 6 Lower Bridge-street. Plans, &c. with Mr. J. S. Butler, architect, 16 Hume-street, Dublin. Proposals on or before 27th inst. No tender necessarily accepted.

TIMBER FENCING, *Scotland.*—The Directors of the Caledonian Railway will receive tenders for about 20,000 rails of Larch Fencing. Particulars from Mr. G. Graham, Engineers Office, Buchanan-street Station, Glasgow, till 2 th inst, on which day offers must be lodged with Secretary, 85 Renfield-street. No tender necessarily accepted.

WIRE FENCING, *Scotland.*—Tenders are wanted to erect about 2,400 lineal yards of wire fencing, on the line of march between the lands of Kidlan, on Newton Estate, and Strobshiel, six miles north of Haddington. Specs. in hands of Mr. Dalgleish, W.S., 14 Rutland-square, Edinburgh. Tenders lodged by Feb. 9th.

DRYSTONE DYKES, *Scotland.*—Tenders are wanted for the erection of several thousand yards of Drystone Dykes on the farms of Airdrie Mains, Frithfield and Drumrack, on the Estate of Airdrie, Crail. Specs. in hands of respective tenants, who will cart materials. Tenders sent to Mr. Dalgleish, 14 Rutland-square, Edinburgh, by the 9th Feb.

HAVELOCK MONUMENT, *Sunderland.*—The Committee will receive designs and estimates for the erection of a bronze Colossal Statue, in the Mowbray-park, figure not to exceed 9ft., and pedestal 10 to 12 feet; models, 2 to 3 feet, to be forwarded to the Mayor of Sunderland, by 1st March. The monument on a prominent eminence, having a front of rock about 40 feet in height.

OLD RAILS, *London.*—The Directors of the South-Eastern Railway Company will receive tenders for a quantity of old rails, at Angerssein Wharf, Thames. Terms, &c. on application to Storekeeper. Tenders addressed to Mr. S. Smiles, Sec., London-bridge Terminus, by 26th inst.

RAILWAY ACCOUNTANT, *India.*—The Bombay, Baroda, and Central India Railway Company will engage an experienced accountant for India. Preference given to one who has held a similar appointment in a railway undertaking in working operations. Candidates to address to the Sec., Mr. C. H. Kennedy, 10 Liverpool-street, New Broad-street, London, E.C. (with testimonials), by Feb. 1. Salary £600 per an. Successful canditate to proceed to India forthwith.

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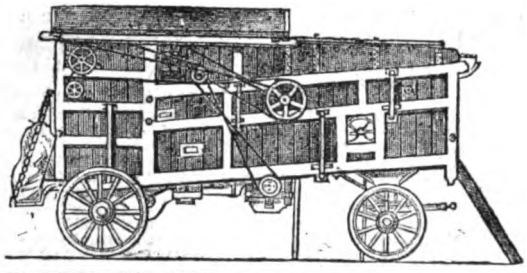

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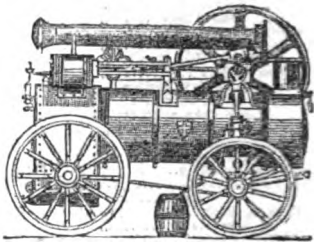

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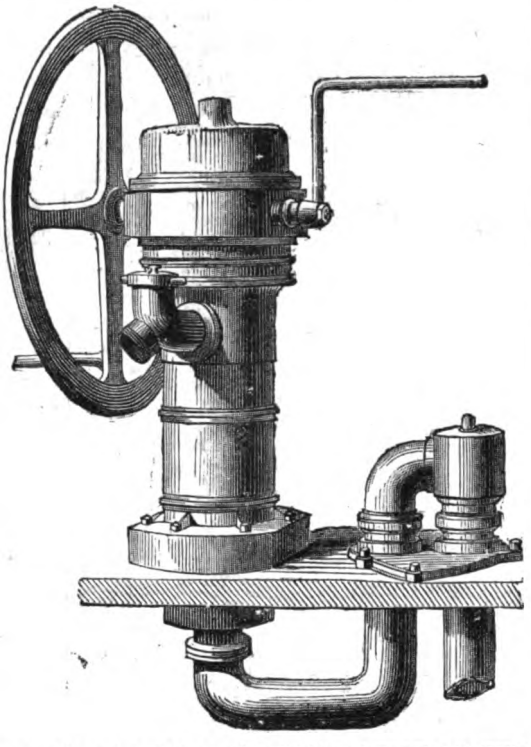

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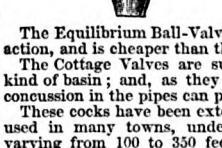

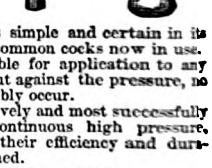

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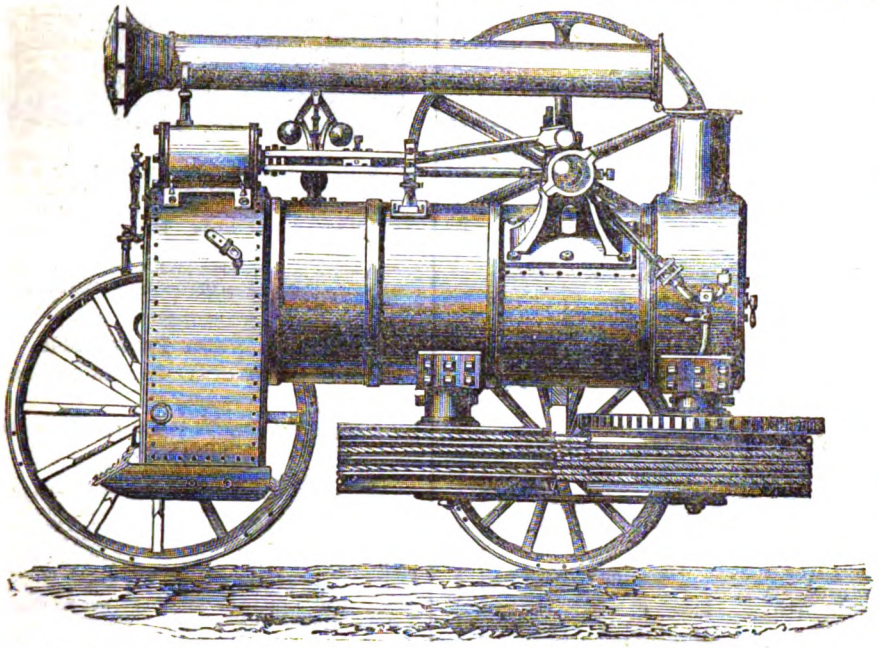

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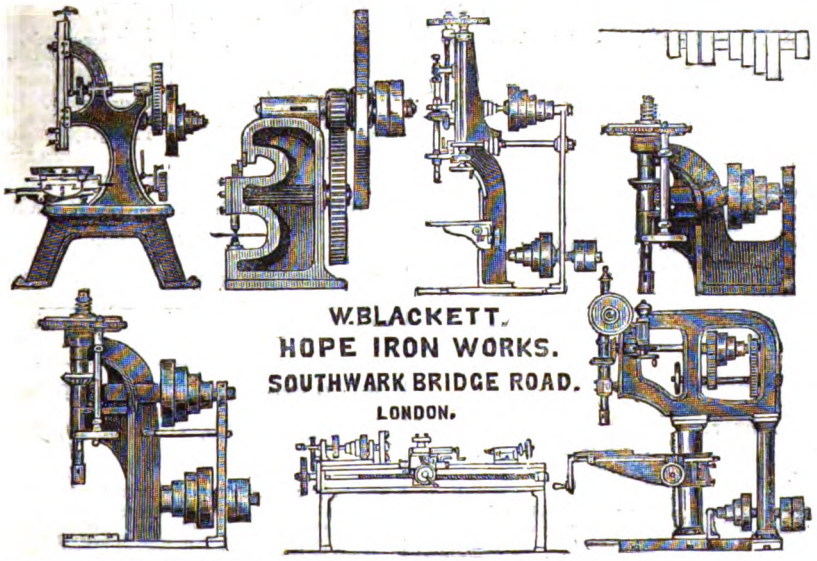

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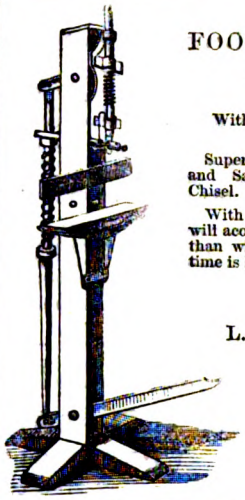

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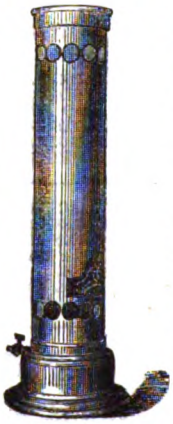

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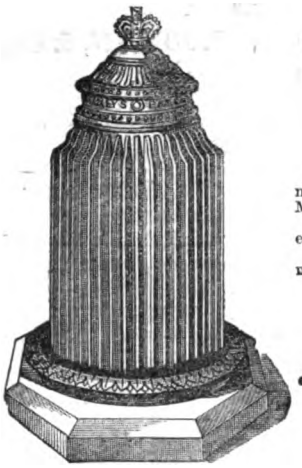

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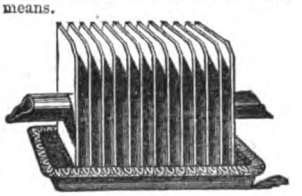

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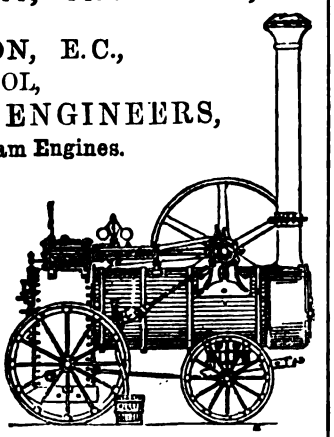

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Published by RICHARD ARCHIBALD BROOMAN, at the MECHANICS' MAGAZINE Office, 166 Fleet-street, in the Parish of St. Dunstan's-in-the-West, in the County of Middlesex; and printed by JAMES JUDD and HENRY ALEXANDER GLASS, of 14 Holford-square, Pentonville, in the County of Middlesex, at their Office, 38A New Bridge-street, in the Parish of St. Anne's Blackfriars, in the City of London.—Friday, January 21 1859.

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 5. [NEW SERIES.]

LONDON: FRIDAY EVENING, JANUARY 28, 1859.

PRICE FOURPENCE. BY POST 5d.

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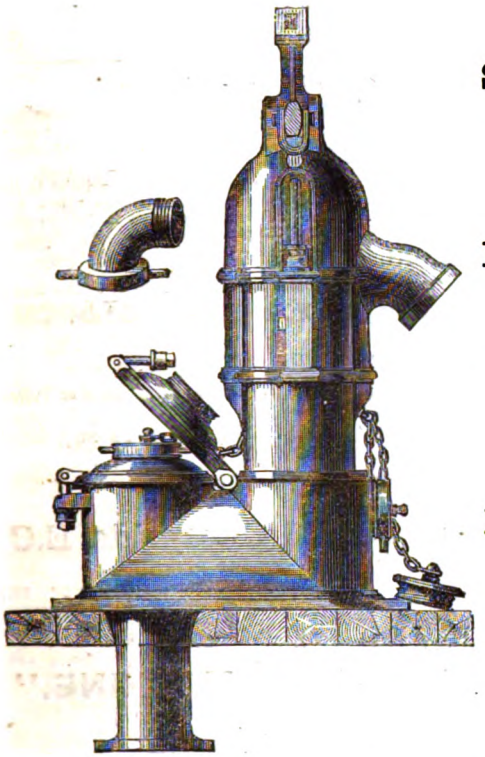

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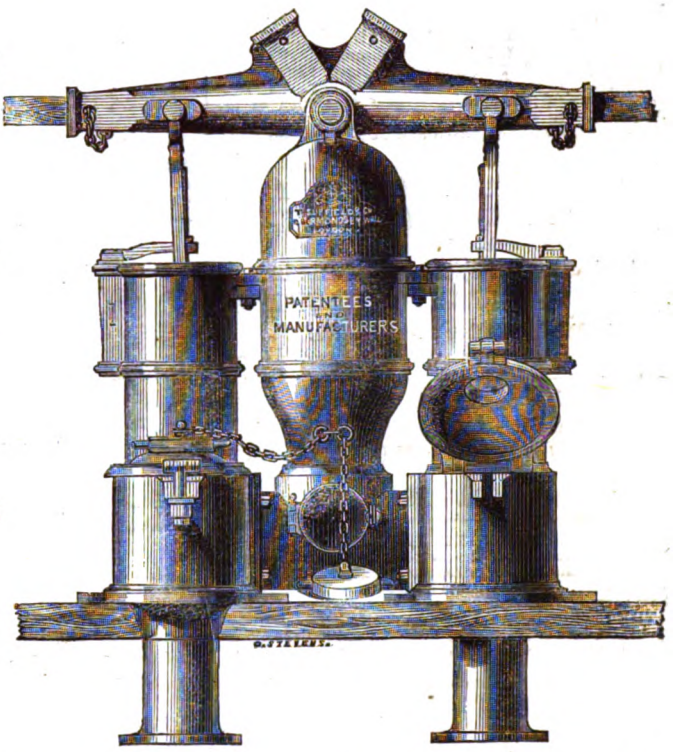

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On the first of March next will be published, price 6d., No. 1 of the LITERARY RECORD, a new monthly periodical, to be conducted on a new principle, and which will differ from every existing periodical as much as chalk from cheese! The LITERARY RECORD will, to all intents and purposes, supply a want, and will be found a *vade mecum* for Authors, Editors, Journalists, Artists, and the whole Book-making, Book-selling, and Book-reading public. If the proprietor's idea be realised—and there is no reason why it should not—then the LITERARY RECORD will become the constant companion of every public Reading-room, Editor's-desk, and Bookseller's-counter in the country.

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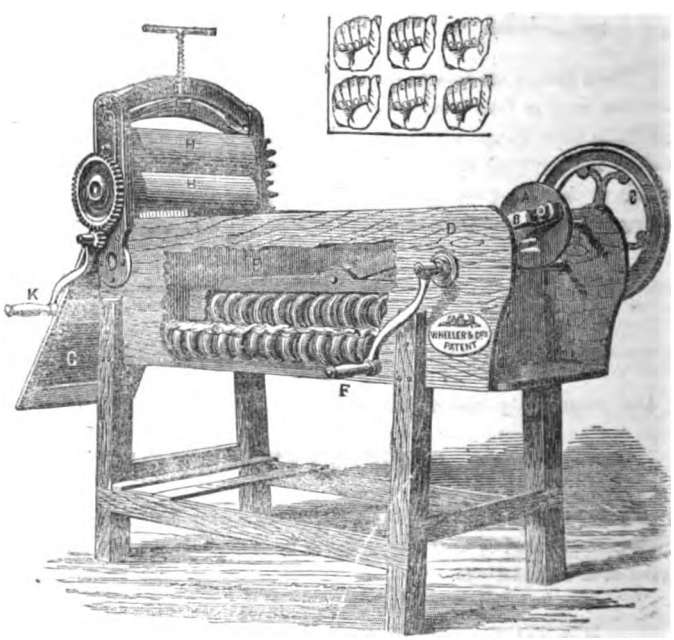
T. WHEELER AND CO.'S
"OXONIAN KNUCKLE WASHING MACHINE."



THE Improvements in these New Inventions are the non-exposure of the user's hands to the dangerous parts of the Machine, and the rapidity with which the work is done. These Machines have neither bands or wheels passing on the outside, wherein lies the liability to accident. The rubbers are the truest representation of the knuckles or hand washing yet brought out; the compensating floating rubbers work at right angles, backward and forward, in the same manner as does the hands. These Machines can be supplied with rubbers that represent a person's hand in the action of rubbing; the knuckles, finger nails, and palm of the hand being truly modelled. They are capable of Washing Clothes of every description whatsoever, the largest bedding to the most delicate piece of muslin can be washed without breaking a single thread; in fact, such is the delicacy of the action of these Machines, that the paper you are now reading can be passed between the rubbers without sustaining any injury, at the same time being thoroughly effective in cleansing. The Patentees confidently recommend these Machines to the notice of Laundresses, Heads of Families, Hotels, Emigrants, &c. So simple is the action of this Machine, that a boy or girl of 10 or 12 years of age can work it; the only skill required is to soak the clothes one hour before placing them in the Machine, placing a portion of the clothes at the handle end of the Machine; laying on the rubbers a part of them; turn the handle, and the clothes will pass through between the rubbers to the opposite end, effecting a saving of at least 50 per cent.

Prices: Washing Machines, £1 6s., £2 6s., £3 6s., £4 10s., £5 15s.; Washing, Wringing, and Mangling, £8 8s., £10 15s., £14 14s.—Full Instructions sent with every Machine. Testimonials or References sent on application.

MANUFACTORY, ALBION WORKS, PARK END STREET, OXFORD. (114)

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NOTICES.

Numbers 1845 and 1846 of the MECHANICS' MAGAZINE (original series), containing the paper read at the Society of Arts, Dec. 15, 1858, "ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY IN RESPECT OF DIMENSIONS, FORM, MEANS OF PROPULSION, AND POWERS OF ATTACK AND DEFENCE," by one of the EDITORS of this Magazine, together with the discussion on the same, are still on sale.

The MECHANICS' MAGAZINE will be sent free by post to all subscribers of £1 1s. 8d., annually, *payable in advance*. Post Office Orders to be made payable to R. A. Brooman, at the Post Office, Fleet Street, London, E.C.

TO ADVERTISERS.

All Advertisements occupying less than half-a-column are charged at the rate of 6d. per line for any number of insertions less than 13; for 13 insertions, 5d. per line; and for 52 insertions, 4d. per line.

Each line consists of 10 words, the first line counting as two. Wood-cuts are charged at the same rate as type for the space occupied.

Special Arrangements for larger or Serial Advertisements. To ensure insertion, Advertisements must reach the Office by 6 o'clock on Thursday evening each week. None can be received after 9 o'clock on Friday morning for the ensuing number.

TO CORRESPONDENTS.

We have to ask for the patience of several correspondents whose communications are unavoidably left over till next week.

PRICES CURRENT OF METALS.

London, 21st Jan., 1859.

		£ s. d.		£ s. d.	Dis. p. cent.
IRON, Rails in Wales and N. of England	pr. ton	0 10 0	to	6 15 0	nett
Welsh Bars, in Wales	"	6 5 0	"	6 10 0	2
Staf. Bars at the Works	"	7 5 0	"	7 10 0	2½
" Hoops	"	7 15 0	"	8 10 0	"
" Sheets, Singles	"	8 15 0	"	9 0 0	"
" Nail Rods	"	7 5 0	"	9 10 0	"
" Boiler Plates	"	8 10 0	"	9 0 0	"
Scotch Pig, M.-Nos. Warrants, at Glasgow	"	2 13 0	"		nett
Do. No. 1, Good Brands	"	2 13 0	"	2 14 6	"
Scotch Bars	"	7 5 0	"	8 0 0	2½
Swedish Bars, in London	"	13 10 0	"	14 0 0	2½
COPPER, Sheet and Sheathing per lb.		0 1 0½			2
Tough Cake and Tile	" ton	112 10 0			"
Best Selected	"	115 10 0			"
Australian	"	115 0 0	"	117 0 0	"
South American	"	108 0 0			"
Yellow Metal Sheathing	per lb.	0 0 10½			"
STEEL, Swedish Keg	pr. ton	20 0 0			2½
" Faggot	"	20 10 0			"
TIN, English, Block	pr. cwt.	6 5 0			2½
" Bar	"	6 7 0			"
Foreign, Banca	"	6 11 0	"	6 12 0	nett
Straits	"	6 10 0			"
TINPLATES, Charcoal, I.C.	pr. box	1 12 0	"	1 13 0	5
Coke, I.C.	"	1 5 6	"	1 6 0	"
LEAD, Pig, English	pr. ton	22 10 0	"	23 0 0	2½
" Spanish	"	22 0 0	"	22 5 0	"
" Sheet	"	23 5 0	"	23 10 0	"
SPELTER, on the spot	pr. ton	22 10 0		22 15 0	nett
" for arrival	"	22 15 0			"
ZINC, English, Sheet	"	30 0 0			1½
QUICKSILVER	per lb.	0 2 0			1½

REMARKS.—We have had a quiet market for Metals during the week. The continued anxiety felt respecting political affairs having had a depressing effect on business.

LAWRIE AND HAGGER, Metal Brokers.

33 Lombard-street, E.C.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

RAILWAY WORKS, *India*.—For the Nangpore branch of the Great Indian Peninsular Railway, 262 miles in five contracts. Particulars at offices, 3 New Broad Street. Tenders before February 4.

RAILS, *Paris*.—For a supply of rails called "*Vignolle*." Conditions, &c., at 99 Rue Richelieu, Paris. No date given.

WHEELS AND AXLES, *South-Eastern Railway*. — For 300 sets of Wrought Iron Waggon Wheels and Axles. Further particulars of Mr. E. Fletcher, Locomotive Works, Gateshead. Tenders to the Secretary, (Mr. J. Cleghorn, York,) to February 2.

IRON BRIDGES, *Brighton and South Coast Railway*.—For the construction, delivery, and fixing of all the wrought and cast-iron girder bridges to be erected upon new branch line from Shoreham to West Grinstead, Sussex, ten miles. Drawings, &c., at Engineer's office, London Bridge Terminus. Tenders on prescribed form, till noon, February 10, to Mr. F. Slight, Secretary, London Bridge Terminus.

PASSENGER STATIONS, *Darlington*.—The directors of the North-Eastern Railway will receive tenders for erection of a Passenger Station, with iron shed roof, at Darlington. Plans, &c., with Mr. T. Prosser, architect, Central Station, Newcastle-on-Tyne. Tenders addressed to the Secretary not later than 12 at noon, 17th February next.

Scarborough.—The directors will receive tenders for an Iron Shed Roof and other works, at Scarborough Station. Plans, &c., with Mr. T. Prosser, as above; and tenders by noon, 3rd February.

RAILWAY FENCING, *Stratford-upon-Avon*.—For supplying about 20 miles of good sound larch post and rail fencing, to be fixed on a proposed line from Hatton to Stratford-upon-Avon. Specifications, &c., at Messrs. Banson and Gwyther's offices, Belmont Row, Birmingham. No date.

PIG LEAD, *India Board*.—The Finance, Home, and Public Works Committee, invite proposals from persons willing to supply Pig Lead. Conditions at the Secretariat Office, at the India House, where the proposals are to be left before 11 forenoon, 4th February, 1859.

GAS LAMPS, *Norwich*.—For providing and erecting about 800 gas lamps, on columns and brackets. Specifications, &c., at the office of City Surveyor, 24 Castle Meadow, Norwich. Tenders to February 3.

BUILDING, *Rainhill*. — The committee of visitors of the County Asylum for the hundred of West Derby, Rainhill, near Prescot, will receive tenders for the erection of two additional wings to that Institution. Plans at the office of the architect, Mr. H. P. Horner, 10 Basnett-street, Liverpool, till Feb. 9th, inclusive; and at the Asylum, as above, from Thursday, Feb. 10th, to Friday, Feb. 18th, inclusive; and bills of quantities, prepared by Mr. John Longrigg, Lord-street, Liverpool, and forms of tender will be delivered to parties leaving their names, as purposing to tender, at the architect's office, or at the Asylum, on and after Tues., Feb. 1st, 1859.—The contract will be taken on a single sum, and each tender must contain the names of the several sub-contractors proposed for the different branches of the work, and the signatures of two sureties. Tenders at No. 10 Sweeting-street, Liverpool, on or before Sat., 19th of Feb., 1859, by twelve at noon; or at the Asylum, on or before Mon., 21st Feb., by ten forenoon, to Mr. T. Martin, solicitor, clerk to committee of visitors.

CEMETERY, *Borough of Hanley*.—Contract for erection and finishing of the mortuary chapels, registrar's house, porter's lodge, and gates, for this cemetery. Plans, &c., at offices of Messrs. Ward and Son, architects, Hanley Tenders, to the offices of the town clerk before Fri., 11th Feb. Contract for making and constructing the road, and for the drainage and sewerage of the cemetery. Plans, &c., at office of Mr. Forbes, Shelton Hall. Separate tenders for the road, and for the drainage and sewerage, at the town clerk's office, on or before Fri., 18th Feb.

SCHOOLS, &c., *Wakefield*.—For the erection of Catholic Schools at Wakefield. Plans, &c., at the office of Messrs. Harrison and Nettleton, Solicitors, Wakefield, on and after January 31. Tenders to February 14.

Derbyshire.—New Schools and Master's House at Sawley. Plans, &c., at the Parsonage. Tenders to February 8.

Rossall.—Tender for whole works or several works required in erecting a New Wing to the Rossall School Buildings, containing studies, dormitory, master's rooms, and class room. Plans, &c., at the Bull Inn, Preston; further information from C. G. Harvey, Esq., Bursar, Rossall, Fleetwood. Tenders to Mr. Harvey, on or before February 14.

ROADS, *Powick District*.—For improvement on turnpike-road from Worcester to Malvern, by lowering the hill in the village of Powick, Worcester. Plans at office of Mr. M. Curtler, Sansome-place, Worcester. Tenders to Feb. 1.

Leicester and Peterborough.—For repairs of Leicester district of the road, about 700 tons of the best picked broken granite, to be delivered between 1st March next and the last February following. The trustees will also receive tenders for carriage or haulage of the granite into parishes as may be directed, and for other team-labour and haulage required between the 1st March next and last February following. Terms, &c., with Mr. C. A. Macaulay, surveyor of district, office, Friar-lane, Leicester. Tenders to February 7.

Market Harborough, Loughborough, and Melton Mowbray. —For supplying surveyor of turnpike-roads of these places with about 1,800 tons of broken granite, or part thereof. The carriage of such granite, or part thereof, from wharfs to turnpike-roads. Tenders to chairman of trustees of said roads. Terms, &c., at office of Mr. M. J. Dain, surveyor, St. Martin's, Leicester. Tenders to February 7.

Hinckley and Narborough, Ashby-de-la-Zouch.—For supplying surveyor of above turnpike-roads with about 2,000 tons of broken granite, or part thereof. The carriage of such granite, or part thereof, from wharfs to turnpike-roads. Tenders, &c., as above mentioned. The terms, &c., at the office of Mr. C. A. Macaulay, surveyor of roads, Friar-lane, Leicester. Tenders to February 7.

LEVELLING GROUND AND ERECTING BUILDING, *Worcester*. —Contract 1: For removing turf from one acre of land (Worcester Pleasure Grounds Company) levelling surface, and relaying turf for a cricket ground. Contract 2: For erecting a span-roofed propagating house for plants, 40 ft. by 12, of brick, wood, and glass; and finishing the same with apparatus for heating it with water. Specifications, &c., Mr. H. Strange, Hon. Sec., 42 Foregate-st., Worcester. Tenders to Jan. 26.

TOLL HOUSE, *Malvern*.—For building a toll-house on the Powick district of turnpike roads, at the Twelve-mile Gate, Little Malvern. Plans, &c., at the office of Mr. M. Curtler, Sansome-place, Worcester. Tenders to Feb. 1.

PIG PENS, *Leeds*.—Tenders to Feb. 1 for providing and fixing pig pens, of iron and wood, in the Kirkgate Market, Leeds; also for painting the market bye-laws on boards, and fixing the same. Plans, &c., at the office of Mr. Ed. Filliter, C.E., Borough Surveyor, Town-hall, Leeds.

TAR, *Chester-le-Street*.—The Birtley Iron Company will receive offers for the purchase of the tar at their Gas Works. The tar can be delivered either on to North-Eastern Railway, or at Pelaw Main Staith in the Tyne. 300 to 400 barrels a-year. Parties tendering to find their own barrels.

SANITARY PIPES, *Cashel*.—Wanted by Town Commissioners for city of Cashel, 10,200 feet of piping, of some 3, 4, and 5-in. diam., and from 2 to 3 ft. in length, free from flaws or warps, and perfectly sound. Applications before 1st Feb., stating price per foot, delivered in Waterford, to Mr. John Corby, Town Clerk.

WATERING STREETS, &c., *London*.—Watering the roads and streets in Limehouse district. Particulars, upon payment of 2s. 6d., by application at office of the Board, White Horse-street, Commercial-road, E. Tenders to Feb. 7.

TIMBER, *Eastern Counties Railway*.—The Directors of this Railway will receive tenders for supply of 2,000 loads of Memel timber at Lowestoft. Forms of tender, &c., with the Eng. of the Company, London. Tenders to the Sec., J. B. Owen, Bishopsgate terminus, by 1st Feb.

TRAMWAY, *Portsmouth*.—Tenders for constructing a tramway at the Gun-wharf, Portsmouth, will be received at office of Director of contracts, War-department, Pall-Mall, London, on Monday, 14th Feb. Plans, &c. at the Royal Engineer's office, Portsmouth, from 10 till 4 o'clock, until 12th Feb.

BUILDING AND DRAINAGE, *Lymington*.—Generally repairing and decorating, making various alterations, reconstructing drainage, &c., at Newtown-park Mansion, near Lymington, Hants. Plans, &c., with Mr. Hill, Surveyor, Southampton, to whom tenders must be sent by Feb. 12.

GULLEY GRATINGS, *London*.—The Vestry of Bethnal Green will meet at the Town Hall, Church-row, Bethnal Green-road, at 11, on Feb. 3, to receive tenders for 150 cast-iron gully-gratings, according to pattern to be seen at office of Surveyor at Town Hall. Tenders to Clerk of Vestry by Feb. 2.

GRANITE SPALLS, *London*.—The Vestry of the Hamlet of Mile End Old Town, will meet at the Town House, Mile End-road, on the 2nd Feb., at 7 p.m., to receive tenders for supply of 500 tons of unbroken best blue Guernsey granite spalls, to be delivered alongside Gardner's-wharf, Regent's-canal, Mile End-road, according to the terms of a specification which may be seen at office of Surveyor at Town House, between 10 and 1. Contractors to pay for the contract to be drawn up by the Clerk, and to find two sureties. Tenders by 3, at the office of the Clerk to the Vestry, Feb. 2.

FARM, *Scotland*.—To erect a complete farm-steading on the farm of Woodend, parish of Langton, Berwickshire, conform to plans, &c., now with the farm-overseer, Woodend. Offers to be addressed to Messrs. Davidson & Lyme, W.S., 22 Castle-st., Edinburgh. No date.

NEW CONGREGATIONAL CHAPEL AND SCHOOLS, *Eccles, Manchester*.—Plans, &c., on and after Wed., 9th of Feb., by application to Messrs. Dilworth and Son, New Market Hall, Cross-street, Manchester, between ten a.m. and four p.m. Tenders to be at Messrs. Dilworth's not later than Tues., 22nd Feb, at three p.m. Information by application to architects, Messrs. Poulton & Woodman, Reading.

ARCHITECTS' COMPETITION, *Wales*.—The time for sending in the designs for a new chapel for the Calvanistic Methodists at Aberystwith is extended to the 1st of March next. The gallery, if hereafter required, is to be over both sides and one end of the building.

WORKING QUARRIES, *Newcastle-upon-Tyne*.—The Working to let of a large quantity of Limestone and Quarry Baring, at the Fourstone Lime Quarries. Particulars at the office, where tenders will be received until Feb. 7.

TO INVENTORS AND PATENTEES.

MESSRS.

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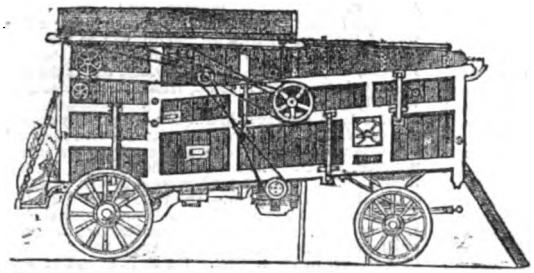

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MILLS of all Kinds, FIXED and PORTABLE, for Grinding Bones, Flour, Linseed, Mortar, Clay, &c.
PUMPS, CRANES, CRABS, SCREW-JACKS, &c.

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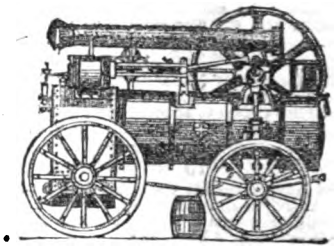

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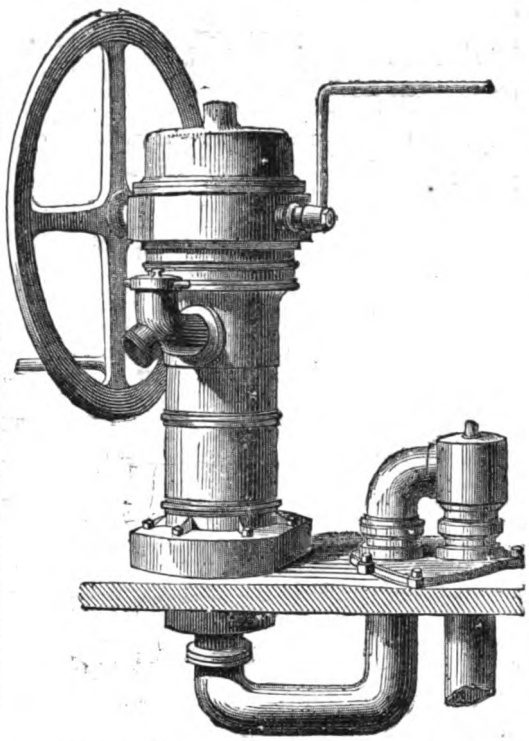
Sole Manufacturer of DOWNTON'S well-known and much approved SHIPS' PUMPS, which have been used in preference to all others on board the vessels of Her Majesty's Navy, for upwards of thirty years, and have given the greatest satisfaction, effectually answering all the purposes required of any Ships' Pumps, and capable of throwing most powerful jets of water in case of fire.

These Pumps have also been most extensively used on board merchant vessels, both at home and abroad, and have been supplied to the Royal Navies of France, Prussia, Holland, Russia, Spain, and Turkey. The Pumps are portable, as they may be easily removed from the ship and put to work in a boat alongside in a few minutes. Each pump is fitted with a large foot valve plate (which may be placed in any part of the vessel most convenient), and from which communication is made to any number of distinct compartments in the vessel. In case of any of these pipes fouling, the water, by an almost momentary attachment, may be forced from the Pump downwards, so as to clear all obstructions, preventing any possibility of stoppage. The valves are of the simplest description, and being faced with ordinary leather discs, the latter may be renewed in a few minutes by the most inexperienced hands. By the peculiar construction of these Pumps, a most perfect and uninterrupted flow of water may be maintained; so uniform as to be undistinguishable from that proceeding from a cistern. The Pumps are made of several sizes, those of 7, 9, and 12 inches bore being most generally used. They may, however, be ordered of any dimensions required, and may be fitted either with one or two fly wheels. A standard, &c., is also supplied with these Pumps, to enable them, when necessary, to be used as ordinary hand-lever pumps.



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PYRO-PNEUMATIC FIRE-LUMP WARMING AND VENTILATING STOVE GRATES,

WITH the cheerful, open fire, producing healthful warmth, with continuous Self-acting Ventilation, for Churches, Schools, Public Buildings, Banking Houses, &c. These Grates are manufactured solely by PIERCE, the Inventor, for which he received the Prize Medals of London in 1851, and of Paris in 1855.

PRICE, from £7 10s.

ILLUSTRATED CATALOGUE, with Prices and Estimates for Work, furnished on application to the Inventor and Sole Manufacturer.

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TO BRASS-FOUNDERS, ENGINEERS, &c.

THE PATENT PLUMBAGO CRUCIBLE COMPANY having completed the enlargement of their premises, beg to call the attention of all users and shippers of Melting Pots to the great superiority of the PATENT CRUCIBLES, which have been used during the last three years by some of the largest melters in England and abroad. In addition to their capabilities of melting an average of from thirty-five to forty pourings; they are unaffected by change of temperature, never crack, but can be used till worn out, requiring only one annealing for several days' work, and become heated much more rapidly than ordinary pots, effecting thereby a saving of more than fifty per cent. in time, labour, fuel, and waste. The Patent Plumbago Crucible Company also manufacture and import clay crucibles, muffles, portable furnaces, sublimate pans and covers, glass-pots, all descriptions of fire-standing goods, and every requisite for the assayer and dentists. For Lists, Testimonials, &c., apply to Battersea Works, London, &c. (43

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Equilibrium Ball Valve. Cottage Closet Valve.

The Equilibrium Ball-Valve is simple and certain in its action, and is cheaper than the common cocks now in use.

The Cottage Valves are suitable for application to any kind of basin; and, as they shut against the pressure, no concussion in the pipes can possibly occur.

These cocks have been extensively and most successfully used in many towns, under continuous high pressure, varying from 100 to 350 feet; their efficiency and durability is, by experience, established.

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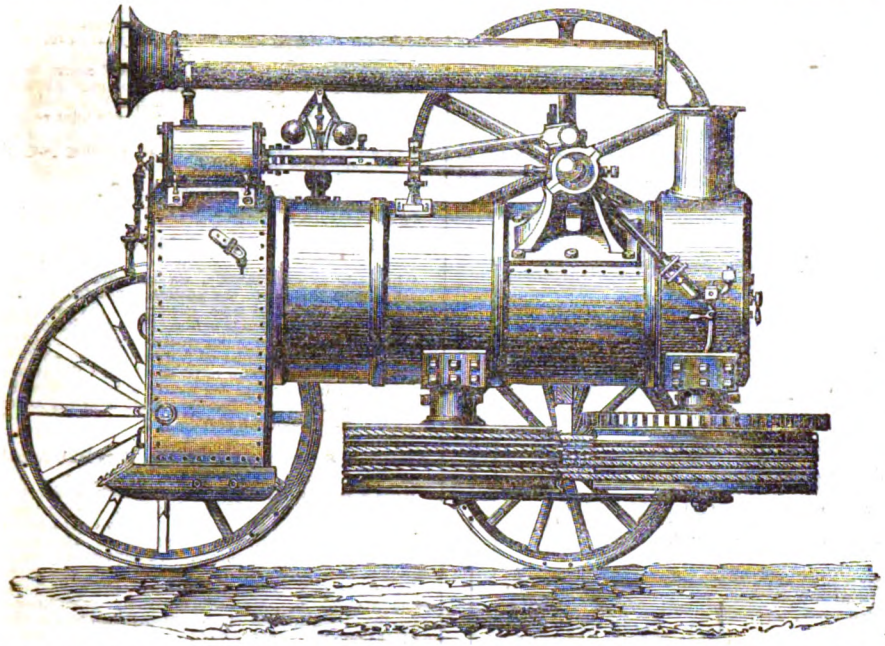
COLLINSON HALL'S PATENT WINDLASS
AND
STEAM PLOUGH AND IMPLEMENT GEAR.



The object of this mechanism is to render effective the WHOLE POWER of engines used in drawing ploughs or other implements in tilling land. This is accomplished by carrying the wire rope, in the form of the figure 8 round horizontal drums fixed (so as to be easily removable) under the engines. By this arrangement the evils arising from overlaying the coils of rope when wound upon the capstan principle are avoided, as also are those arising from an unequal wear of the ordinary horizontal pulleys. In the new arrangement the solid drum is constructed with several grooves, while the other is composed of as many independent pulleys as there are grooves in the drum. The upper or lower pulley, as the case may be, revolves in one direction, while the remaining ones revolve in the opposite direction. The solid drum only is driven directly by the engine, while the pulleys revolve by frictional contact, and thus all slipping is avoided.

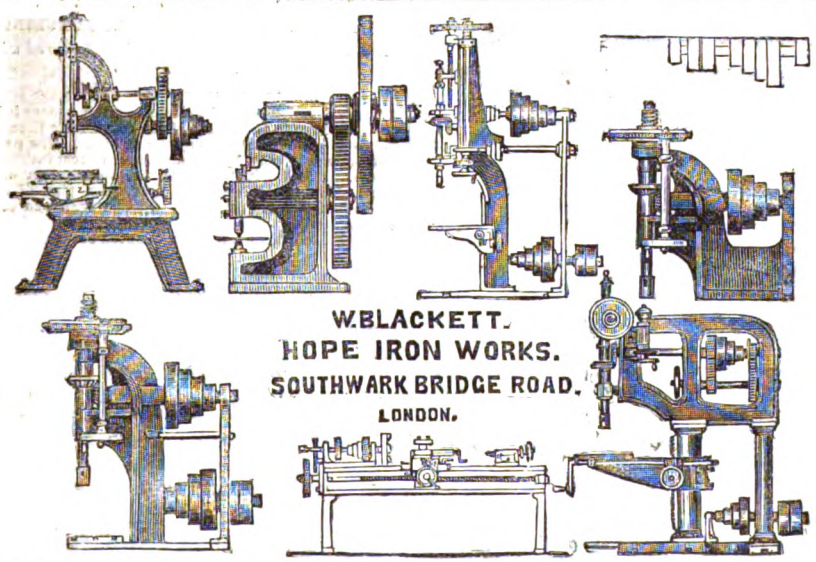
The simplicity of this Gear is one of its chief recommendations, little or no framing being required. The axes being bolted to the bottom of the boiler, a simple rod or beam retains them in a vertical position. The Gear may be fitted and again unshipped from an engine (by means of keys through the axes, by which the Gear is retained in place) in less than ten minutes.

COLLINSON HALL respectfully informs Agricultural Engineers that he has disposed of his interest in the above Patent to

MR. J. FOWLER, JUN., 28 CORNHILL,

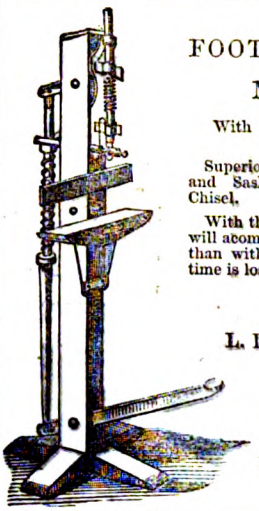
To whom Applications for Licences must in future be made.

(53)



W. BLACKETT has in Stock a variety of Vertical and Horizontal Steam Engines, Boilers, and Engineers' Tools, ready for delivery on the shortest notice. Apply as above.

(70)



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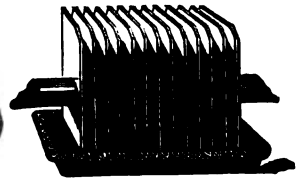

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Particulars and Testimonials forwarded on application.

(12)

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OF LINCOLN,

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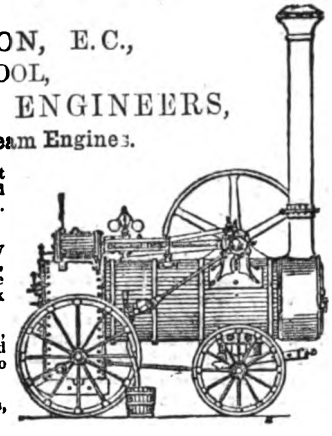
AGRICULTURAL AND GENERAL ENGINEERS,

And Manufacturers of Portable and Fixed Steam Engines.



Combined Threshing Machines, which dress the corn ready for market at one operation. Grinding Mills, Saw Benches, Pumps for Irrigation and Mining purposes, with all necessary gearing for being driven by steam power. Full particulars and estimates given on application to the above address.

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For EXPORTATION.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (23)

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(ESTABLISHED A.D. 1778),

EARNESTLY solicit the continued support of their numerous Friends, Agriculturists, Shippers, and others; the additions made to their Works during the present year, in the erection of new sets of Workshops, fitted with the best mechanical appliances for producing Machinery of the most improved construction, expeditiously and economically, justifies their soliciting increased support, while their leading reputation as Inventors and Manufacturers of FIRST CLASS Agricultural Machinery, is a sufficient guarantee that every Machine supplied from Leiston Works will prove to the entire satisfaction of the purchaser.

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STONE GRINDING MILLS.
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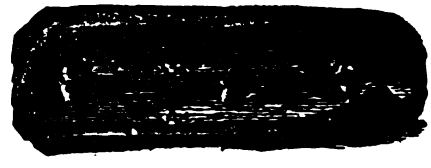
WATER POISONED BY LEADEN PIPES.



The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight.

POISONED WATER PREVENTABLE

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

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"It is impossible to conceive of anything more injurious or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha Tubing. Nothing can be better. I have also recommended it to others, who have adopted the expedient."

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AND SOLD BY THEIR

WHOLESALE DEALERS IN TOWN AND COUNTRY.

(29.)

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 6. [NEW SERIES.]

LONDON: FRIDAY EVENING, FEBRUARY 4, 1859.

PRICE FOURPENCE. BY POST 5d.

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These Counters register the number of revolutions made by an engine or other mechanism. They may be used for ascertaining the duty of Pumping Engines and Water-wheels; the revolutions on board a steam-vessel; to calculate the slip of the propeller; and in a locomotive to test the slip of the wheels.

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This is a Mechanical Telegraph, and by its peculiar construction, error or misunderstanding is rendered impossible. It is now extensively adopted, and gives great satisfaction.

How's Patent Fresh Water Apparatus for Ships' Use.

This apparatus is designed for the distillation of Fresh from Salt Water; and on long voyages, and where the supply of water is scanty, it will be found invaluable. Testimonials may be seen.

Patent Steam Pump and Fire-Engine for Ships' Use.

This Steam-pump occupies but a small space; works perfectly noiselessly, and throws an immense volume of water. An Illustrated Circular of Fresh Water Apparatus and Steam-pump combined, free on application.

How's Patent Machine for Cutting Bolts, Rods, Spindles, Wire, &c.

Simple in construction, inexpensive, occupies but little space, and will not easily get out of order.

A Pamphlet Illustrative of the above, sent free by post, on application to

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EVERY DESCRIPTION OF ENGINEERS' TOOLS, ENGINE ROOM STORES, &c., &c., SUPPLIED.

(89)

SCOTT'S
PATENT GRASS SEED SEPARATOR,

which entirely extracts the Seeds of "COUCH," "TWITCH," "SPEAR," or "HAIR" GRASS, and other impurities from

PERENNIAL AND ITALIAN RYE-GRASS, &c.,

AND

SCOTT'S PATENT CARROT SEED BEARDING

AND

CLOVER AND TREFOIL MILLING OR DRAWING MACHINE,

which effectually removes the beard from Carrot Seed, rendering it fit for sowing with facility by drill or otherwise, and by the separation of abortive or diseased grains vastly increases its vegetative per centage. By a slight modification it is applicable to the other purposes before mentioned.

These Machines were admittedly the most novel, and, at the same time, the most useful and important to the Farmer of any exhibited at the late SMITHFIELD CLUB SHOW.

They may be seen at work at the Establishment of the Manufacturer,

Mr. T. MIDDLETON, Engineer, Southwark.

Communications to be sent to the Patentee, J. SCOTT, 111 Drummond Street, Euston Square, London, N.W. (48.)

THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND'S
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Owing to the excessive demand for last season, many orders were left unexecuted. BURGESS & KEY therefore earnestly request that orders for next season (1859) be sent as soon as possible, otherwise they cannot guarantee to deliver in time.

Price £42 10s. Net Cash, at the Works, complete with Conical Screw Divider for long Grain; without the Conical Screw, £40. Extra Knife, £1 5s. If other extras are supplied they are charged for. A man sent to start the Machine, if required, on payment of his expenses.

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(ALLEN'S AMERICAN PATENT).

Before introducing this Machine to the English public, BURGESS & KEY determined to fully test its capabilities, and the all-important point—durability. One Machine cut, on the farm of Mr. C. Hall, Havering, Romford, Essex, 83 acres Grass; and the same Machine afterwards cut, on the farm of Mr. Tabrum, Bovis Hall, near Brentwood, Essex, 100 acres Grass, and 20 acres Clover. The work done was declared to be better and lower than the scythe, and at the rate of 1 acre per hour. Orders have been received from both those Gentlemen, and numerous others, for Machines for next season. Price £30.

BURGESS & KEY'S Manufactory is entirely devoted to REAPING MACHINES and MOWING MACHINES.

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FURTHER PARTICULARS AND CATALOGUES SENT ON APPLICATION. (89)

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PRICES.

No. 2 Washes 9 Shirts in from 3 to 10 minutes; or 4 Sheets in 5 minutes	£5 5 0
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And all other Articles in proportion.

J. L. HANCOCK, Sole Manufacturer and Patentee, 62 Pentonville-road, London. (89)

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Call the particular attention of

SHIP-OWNERS. SHIP-BUILDERS, AND COMMANDERS OF STEAM AND SAILING VESSELS,

to the Simple and Efficient Arrangements of their

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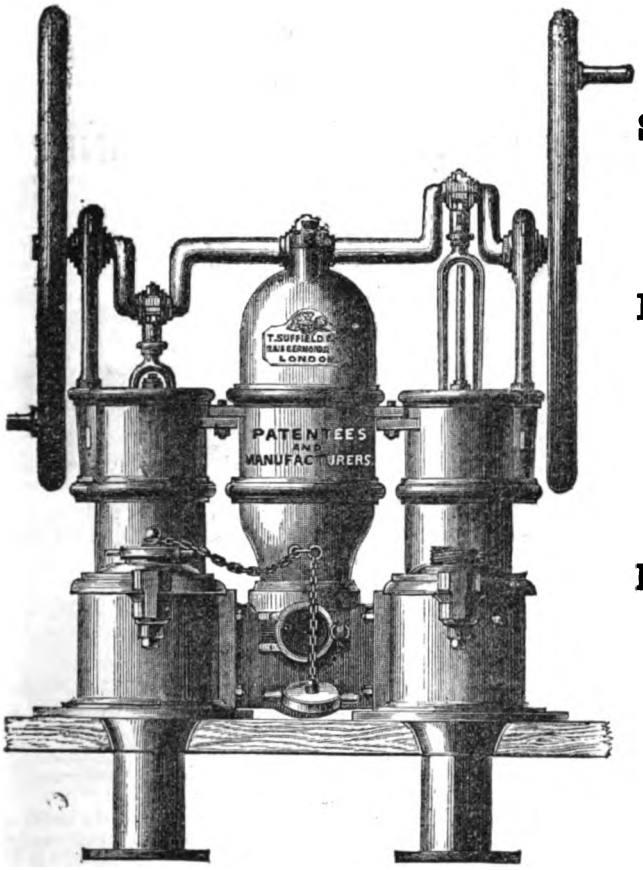

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Fixed and Portable.

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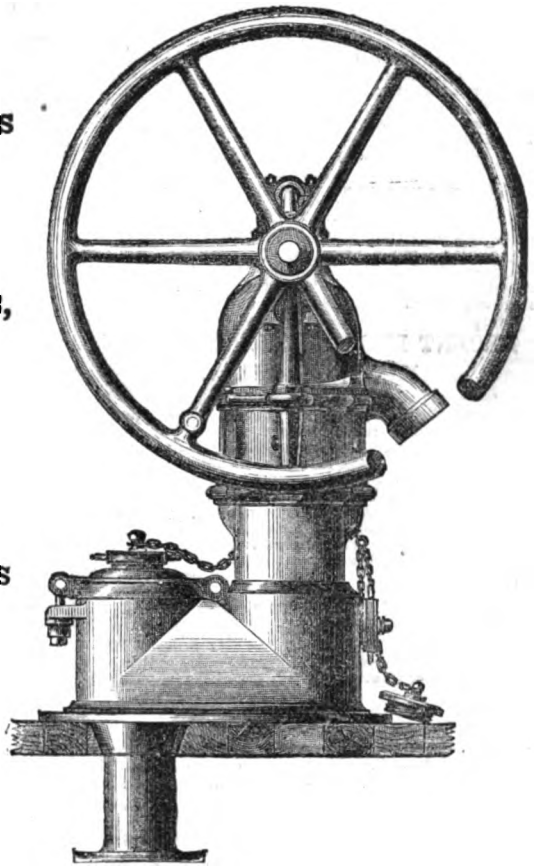

These Pumps are free from that liability to choke which is common to other Pumps, and their Working Parts are not susceptible of derangement either from wear or from being long out of use. They pass entirely through them, with ease, any substance that may enter the Suction Pipes. The Novelties in these Pumps are their adaptation to the varied duties of Ships' Pumps; the facilities they afford for Cleansing the Suction Pipes, and for Sounding or Examining the Valves; the readiness with which they may be used for Ventilating the Bilge, or for acting as a Syphon either for Watering the Ship, or for extinguishing Accidental Fires on board; the rapidity with which they can be converted into Fire Pumps, or be applied to the Washing of Decks; and their capability of Pumping from Several Compartments.

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This Day,

THE PATHFINDER: a Weekly Journal of Political, Social, and Religious Reform. Conducted by P. W. PERFITT. Published by JAMES PATTIE, 31 Paternoster-row, and by G. GLAISHER, 470 Oxford-street. (96)

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THEIR PROGRESS, MECHANICAL CONSTRUCTION, and PERFORMANCE, with the recent Practice in England and America. Illustrated by an extensive Series of Plates, and numerous Engravings on Wood. By DANIEL KINNEAR CLARK, C.E. To be completed in about 22 parts, imperial 4to, 2s. 6d. each.

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THE PROPRIETOR of a VALUABLE PATENT for Double-expansive Marine Engines (by which great economy of space and fuel is obtained) is desirous of entering into arrangements with a respectable firm for the construction of the same. An adequate portion of the patent-right would be assigned by the advertiser to any firm taking the matter up; and he would render all assistance in his power, either in London or elsewhere, amongst ship-owners (to many of whom he is well known), in obtaining contracts, &c. Unexceptionable references given. Address C. E., MECHANICS' MAGAZINE Office, 166, Fleet-street. (76)

HALKETT'S GUIDEWAY STEAM AGRICULTURE will be Exhibited at Canning-place, Kensington Toll Gate, South of Kensington Gardens, on Wednesdays, the 9th, 16th, and 23rd of February, and to private view upon previous appointment. By this system, every operation of the Farm is performed by Steam Power, the land largely increased in value, and the cost of cultivation greatly reduced. A paper read before the Society of Arts, illustrations, &c., will be forwarded upon application to the Office, 80 Chancery-lane, W.C. (104)

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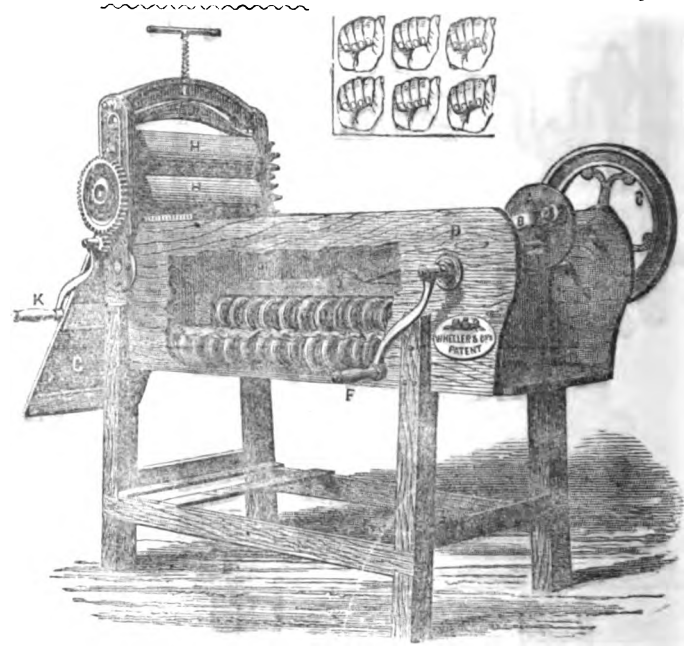

THE Improvements in these New Inventions are the non-exposure of the user's hands to the dangerous parts of the Machine, and the rapidity with which the work is done. These Machines have neither bands or wheels passing on the outside, wherein lies the liability to accident. The rubbers are the truest representation of the knuckles or hand washing yet brought out; the compensating floating rubbers work at right angles, backward and forward, in the same manner as does the hands. These Machines can be supplied with rubbers that represent a person's hand in the action of rubbing; the knuckles, finger nails, and palm of the hand being truly modelled. They are capable of Washing Clothes of every description whatsoever, the largest bedding to the most delicate piece of muslin can be washed without breaking a single thread; in fact, such is the delicacy of the action of these Machines, that the paper you are now reading can be passed between the rubbers without sustaining any injury, at the same time being thoroughly effective in cleansing. The Patentees confidently recommend these Machines to the notice of Laundresses, Heads of Families, Hotels, Emigrants, &c. So simple is the action of this Machine, that a boy or girl of 10 or 12 years of age can work it; the only skill required is to soak the clothes one hour before placing them in the Machine, placing a portion of the clothes at the handle end of the Machine; laying on the rubbers a part of them; turn the handle, and the clothes will pass through between the rubbers to the opposite end, effecting a saving of at least 50 per cent.

Prices: Washing Machines, £1 6s., £2 6s., £3 6s., £4 10s., £5 15s.; Washing, Wringing, and Mangling, £8 £10 15s., £14 14s.—Full Instructions sent with every Machine. Testimonials or References sent on application.

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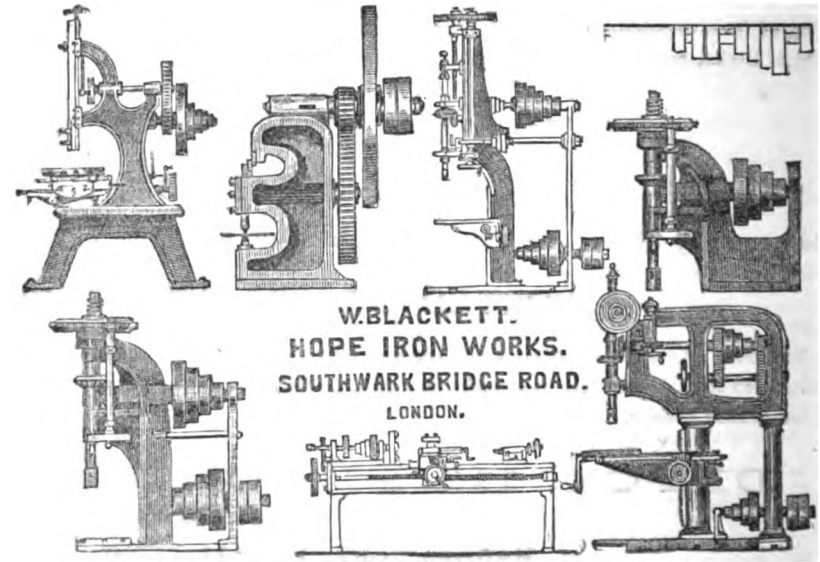

W. BLACKETT has in Stock a variety of Vertical and Horizontal Steam Engines, Boilers, and Engineers' Tools, ready for delivery on the shortest notice. Apply as above. (70)

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LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

RAILS, *North Eastern Railway.*—The directors will receive tenders for 1,000 tons of iron rails, 82lbs. to the yard; and also for 1,000 tons of 66lbs. to the yard. Forms, &c., on application to Mr. J. Bourne, engineer,, Central Station, Newcastle. Tenders to the Secretary by Thursday the 17th inst.

GUARANTEED RAILS, *North Eastern Railway.*—The directors will also receive tenders for 2,000 tons of iron rails, 82lbs to the yard, to be guaranteed for seven years. Tenders for the whole or a portion. Forms, &c., on application to the Secretary, at York. Tenders to the Secretary by Thursday the 17th inst.

RAILWAY, *Exeter and Exmouth.*—For the construction of railway from Topsham to Exmouth (about 5 miles). Plans, &c., at office of engineer, Mr. Errington, 13 Dukestreet, Westminster, London. Tenders to 10th inst.

RAILWAY CHAIRS, &c., *Lancaster.*—The directors of Lancaster and Carlisle Railway will receive tenders for about 350 tons of wrought-iron bracket chairs, and about 30 tons of wrought-iron bolts, nuts, &c. Patterns at the Castle Station, Lancaster. Tenders by the 15th inst. to the Secretary, Lancaster.

RAILWAY BUILDINGS, *Scotland.*—For erection of iron store, office buildings, &c., at Cowlairs, and house for station master, at Linlithgow, on Edinburgh and Glasgow Railway. Plans, &c., at office of Mr. Adie, engineer. Plans with Secretary on 8th inst.

BUILDINGS FOR AN AGRICULTRAL SHOW, *Ireland.*—The Dundalk Local Committee of the Royal Agricultural Improvement Society of Ireland require tenders—First, for erecting, on the site of the proposed show-yard at Dundalk, County Louth, 2,000 feet of temporary timber shedding, in such lengths as may be agreed upon, and 16 ft. wide, to be made as waterproof as possible; the contractor to remove them after the show without any extra charge. Rate per foot? Second, for supplying all the internal shed fittings (and removing same after the show) for cattle, horses, sheep, and swine. The cost of each department to be separately stated. Third, for erecting a boundary wall of timber, about 1,400 ft. long, 8 ft. high, overground, and removing same after show. Rate per 100 feet? Fourth, for supplying water at different places upon the ground, and pumping the supply of same into a tank for such time as may be required before and during the show. The contractor to furnish a plan for this item along with his tender. All the foregoing will require to be completed on the 8th of July next, under a heavy penalty. Every information connected with the timber requisites, and the plans for same, to be obtained on application at the Royal Agricultural Improvement Society's offices, Dublin, or at the office of the Secretary of the Local Committee, County Court House, Dundalk, with whom tenders must be lodged on or before the 12th inst.

LIGHTHOUSES, *Scotland.*—For execution of repairs on roofs of towers at Sander Lighthouse, Island of Sander, Clyde; according to plans, &c., by Messrs. D. & T. Stevenson, engineers. Plans, &c., in hands of J. Beith, jun., Esq., Provost of Campbelton. Tenders to Secretary of Commissioners of Northern Lighthouses, at his office in Edinburgh, by 21st inst.

SEWERS, *London.*—For laying Sewers in Poplar district as follows:—East-ferry-road, 420 feet, 3 feet 9 inches by 2 feet 6 inches—one brick; West-ferry-road, 222 feet, 3 feet 9 inches by 2 feet 6 inches—one brick; Church-path and Castor-street, 570 feet of 12 inch patent pipe, with requisite gullies, flushing boxes, manholes, &c. Plans, &c., at office of District Board of Works, East India Dock-road, until the 7th. Tenders to 8th.

SEWERS, *London.*—For construction of pipe sewers in Limehouse district for Board of Works, viz.: in Manning-street, North-street, Eastfield-street, Catherine-street, Catherine-place, Burn-street, John-street, Henry-street, Parnham-street, Edward-street, George-street, Samuel-street, James's-street, Rossetta-street, Williamstreet, and Anchor-street, in the parish of Limehouse, with other works, and for maintenance of works in repair for 12 months. Plans, &c., with form of tender, at office of the Board, White Horse-street, Commercial-road-east. Tenders at same place to 3 p.m., 8th inst. Tenders accompanied by £20 bank note.

NEW ROADS, *Burntwood.*—For forming and gravelling nine miles of new roads over Burntwood Common. Plans, &c., at Star Inn, Burntwood, near Lichfield, further information of Messrs. W. Fowler and Son, surveyors, Waterloo-street, Birmingham, to whom tenders must be sent before 21st Feb.

ROADS AND INCLOSURES, *Somersetshire.*—For construction of three miles 10 chains of roads, and erection of seven miles 50 chains of fences. Plans at house of Mr. J. Litson, Lynton. Tenders to 4th inst.

ROAD, &c., *Surbiton.*—The Surbiton Improvement Commissioners require tenders for from 100 to 200 yards of road and footpaths in Britannia-road, Surbiton-hill. Specifications, &c., at their offices, Victoria-road, Surbiton, or at offices of Mr. J. Bell, 21 Abchurch-lane, London. Tenders to 12th inst.

SEA-BATHING INFIRMARY, *Scarborough.*—For new infirmary at Scarborough. Plans, &c., at office of Mr. W. B. Stewart, architect, 10 Aberdeen-walk, Scarborough. Quantities for 5s. in stamps. Tenders by 8th inst. to Mr. R. Huie, jun., 38 Queen-street, Scarborough.

WAREHOUSE AND DWELLING-HOUSE, *Altrincham.*—For the erection of a warehouse and dwelling-house at Altrincham, for Messrs. Gaskarth. Plans at offices of Mr. M. Roscoe, architect, Bowdon.

FARMHOUSE, *Derbyshire.*—For erection of a farmhouse at Aldercar, near Alfreton, Derbyshire. Drawings, &c., at Butterley Ironworks, Ripley, and of the architect, Mr. C. H. Edwards, 4 St. James's-terrace, Camden Town. Tenders to Feb. 22.

HOUSES, *Dublin.*—For building five first-class houses in Fitzwilliam-place, Dublin. Plans, &c., with Mr. J. Maguire, architect, Kenilworth-square, South Ruthgar. Tenders to 8th Feb.

HOUSES, *Nottingham.*—For erection of four dwelling-houses and shops. Particulars at offices of Mr. F. Bakewell, architect, Thurland-street, Nottingham. No date.

Aberdeenshire.—For masons' and carpenters' works at Mayen, Bothiemay. Plans, &c., with Mr. Bonnyman, Mayen, until 19th inst., on which day materials and sites will be pointed out. Tenders to 23rd inst.

MANSE, *Scotland.*—For masons', carpenters', slaters', and plasterers' work of a manse and offices, to be built at Airdallie. Plans, &c., with Mr. Clark, Strichen. Tenders to 17th inst.

PAVING, *Rugby.*—For providing materials and paving footpaths in two streets at Rugby. Plans, &c., at office of surveyor to local board of health. Tenders to the 10th inst.

SAVINGS' BANK, *Bridgnorth.*—For alterations to the Savings' Bank, Bridgnorth, Salop. Plans, &c., at office of Mr. R. Griffiths, architect, 66 High-street, Bridgnorth. Tenders to 14th inst., to A. S. Trevor, Esq., The Vinery, Bridgnorth.

ALMSHOUSES, *London.*—For erection of New St. Pancras Almshouses. Competition limited to ratepayers. Quantities, &c., at office of the architect, Mr. H. Baker, 11 Upper Gower-street. No date.

PARSONAGE, *Ross.*—For a Parsonage-house at Hentland, near Ross, Herefordshire. Plans, &c., at the offices of Mr. Apperley, St. John-street, Hereford. Tenders to 15th Feb., to Rev. W. Poole, Hentland.

LIFT AND FORCE PUMP, *Sunderland.*—The Guardians of Sunderland Union will receive tenders (with a plan) for a lift and force pump. Tenders to Mr. N. C. Reed, clerk to guardians, by 7th Feb. Further information from Mr. Anthony Wardropper, builder, Coronation-street, Bishopwearmouth.

COAL, *The Navy.*—For supplying at Her Majesty's Naval Yard, at Trincomalee, 3,000 tons of South Wales coals. Conditions at the office, Somerset Place. Tenders to two o'clock 15th inst., address to Secretary of Admiralty, with a letter signed by two persons, engaging to become bound with the person tending in sum of £1,500 for performance of contract.

PIT SINKING, *Newcastle-on-Tyne.*—The Weardale Iron Company will receive tenders for sinking of two pits at Bishop's Close, Whitworth. Specifications, &c., at Tudhoe Iron Works; or Mr. W. Burrell, Black Prince Colliery, Tow Law. Tenders by the 23rd February.

TIMBER, *Ireland.*—For the supply at Dublin or Belfast of a large quantity of red pine or memel flooring, sawn out of St. John's battens, with two deep cuts in each, state price per square, delivered free at any railway station in Dublin or Belfast. Tenders to F. K., Timber, *General Advertiser Office*, Dublin. No date.

WATER SUPPLY PLANS, *Denbigh.*—A premium of £20 will be paid for plan for supplying the town of Denbigh, North Wales, with water, with an estimate of the expense. The population is 4,000. Information on application to Mr. R. Williams, Town Clerk, Denbigh. The plans and estimates to him by 1st March.

DESIGNS WANTED, *Birmingham.*—Twenty Guineas premium will be given for the best design for washing apparatus, machinery, and furnaces, applicable to lead ash smelting. The furnace to consume smoke. For information, apply by letter to Messrs. Herbert Mills and Co., lead merchants, 28 Bennett's Hill, Birmingham. Designs to them by 1st March.

ROAD SURVEYOR, *Scotland.*—The Turnpike and Statute Labour Road Trustees of Cupar, county Fife, will have a vacancy for a road surveyor, on the retirement, on the 6th of April, of Mr. Alexander, the present surveyor. Applications by March 1st, to the clerk of the trustees, Cupar, Fife, stating terms and containing certificates.

MANAGING ENGINEER, *Scotland.*—A manager to take charge of an extensive engineering establishment in town; thorough acquaintance with engineering necessary. Applications, with references, to No. 74, *North British Advertiser* office, Glasgow.

SURVEYOR, *Portsmouth.*—A resident surveyor for Portsmouth, under commissioners for paving, lighting, &c. Salary £60 a-year and residence at commissioners' office, or £20 in addition if he provide his own residence, and appropriate therein an office for commissioners. Printed particulars from the clerk, to whom testimonials must be sent by 14th inst., when at 7 in the morning the election will be made, and condidates must attend.

MECHANICAL DRAUGHTSMAN, *Manchester.*—A first-class draughtsman, accustomed to locomotive engine work. A liberal salary and permanent employment to a suitable person. R 22, *Guardian* office, Manchester.

PRACTICAL MECHANIC, *Hull.*—Messrs. Martin Samuelson and Co., Engineers and Iron Shipbuilders, Scott-street, Hull, want a practical mechanic to take the charge and general superintendence of engine and boiler works. He must be a good draughtsman, thoroughly acquainted with marine engineering and general machinery, and competent to make up estimates. Applicants to state salary expected.

LAND AND MINE SURVEYORS, *Manchester.*—A mining engineer, in Lancashire, is in want of an assistant competent to make surface and underground surveys, take sections of mines, make out measurements, and to make neat and correct plans, &c., &c. State age, references, and salary required. Apply to P 93, *Guardian* Office, Manchester.

ENGINEER AND MILLWRIGHT, *Kendal.*—In an engineer and millwright's establishment, a gentleman, to take active part in management. Competent to prepare working drawings and estimates for mill gearing, corn mills, water wheels, cranes, &c. Parties having extensive experience in general millwright's work only need apply. Address (by letter only), with particulars of former employment, and references, to C. G. Thompson, Esq., solicitor, Kendal.

MILL AND FORGE MANAGER, *South Staffordshire.*—A mill and forge manager for iron works in South Staffordshire. Good references required. Address by letter, N 28, *Journal* Office, Birmingham.

TO ENGINEERS, MILLWRIGHTS, MACHINISTS, &c.

VULCANIZED INDIA-RUBBER

In any of the following forms, of any size, or to Working Drawings for all MECHANICAL *purposes:—*

WASHERS for Steam and Gas Joints.
VALVES for Marine and other Steam Engines.
ENGINE-PACKING (Elastic).
PUMP-BUCKETS ,,
HOSE-PIPES.
GAS-TUBING.
SUCTION HOSE.
FIRE ENGINE AND FACTORY HOSE.
WATERPROOF CART, VAN, AND WAGGON COVERS.
MACHINE AND MILL-BANDS fo Driving all kinds of Machinery.
RAILWAY BUFFER SPRINGS.
BALL VALVES.
PUMP-PACKING (Rings or Rope).
WHEEL-TIRES (Noiseless).

N.B.—A Large Stock of the above always on hand, and any modification made to order.

Please address all communications to the Manufactory,

JAMES LYNE HANCOCK, VULCANIZED INDIA-RUBBER WORKS,
Goswell Road, London, E.C. (85)

HOBBS'S LOCKS.

The attention of Architects and Builders is respectfully invited to
HOBBS'S NEW MORTISE LOCKS,

Which are now manufactured by PATENT STEAM MACHINERY, and, while superior to any other locks in the market, are sold at a price which defies competition. The Plates are made of number "Twelve Gauge" Iron, and being so thick, the pins cannot be loosened by the constant jarring of the door. The security consists in four double-acting levers, while, to secure unusual freedom of motion and prevent the wear of the parts,

HOBBS'S PATENT FRICTIONLESS FOLLOWER

Is also applied. The retail price of these Locks is 10s., from which a liberal discount is allowed to the trade.

HOBBS'S NEW MORTISE LOCKING LATCHES FOR STREET DOORS,
Price 18s. And
HOBBS'S NIGHT LATCHES, RIM OR FLUSH, PRICE 10s.,

Are also recommended, together with every description of Lock required for house and cabinet work. Lists of Prices will be forwarded on application, post free.

N.B.—A complete Assortment of FIRE and BURGLAR-PROOF SAFES (Milner's Patent), fitted with HOBBS'S PATENT PROTECTOR LOCK, POWDER-PROOF.

ALSO, STRONG-ROOM DOORS, CASH AND DEED BOXES, ETC.

Address—Hobbs, Ashley, and Co., 76 Cheapside, E.C.
MANUFACTORY, ARLINGTON STREET, NEW NORTH ROAD. (86)

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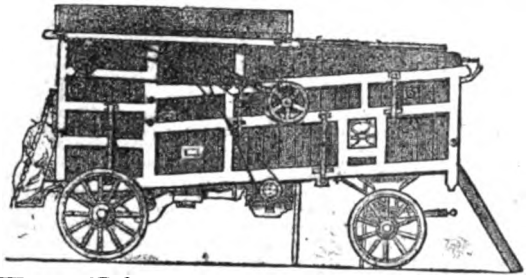
RUSTON, PROCTOR, AND CO.,

LINCOLN; AND ANCHOR ALLEY, 68 UPPER THAMES STREET, LONDON;

AGRICULTURAL ENGINEERS AND MILLWRIGHTS,

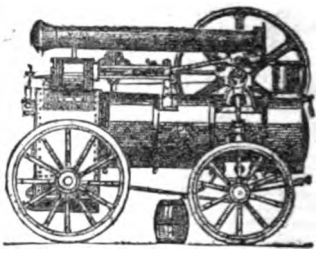


MANUFACTURE

PRIZE PORTABLE and FIXED STEAM ENGINES,
SMITH'S PATENT STEAM PLOUGHS,
PATENT PRIZE COMBINED THRASHING MACHINES, containing R. P. and Co.'s NEW PATENT CORN CLEANER,
SAWING MACHINERY, CIRCULAR and VERTICAL of all Sizes,
MILLS of all Kinds, FIXED and PORTABLE, for Grinding Bones, Flour, Linseed, Mortar, Clay, &c.
PUMPS, CRANES, CRABS, SCREW-JACKS, &c.

Illustrated Catalogues, with full Particulars and Testimonials, may be had by applying as above.

(34)



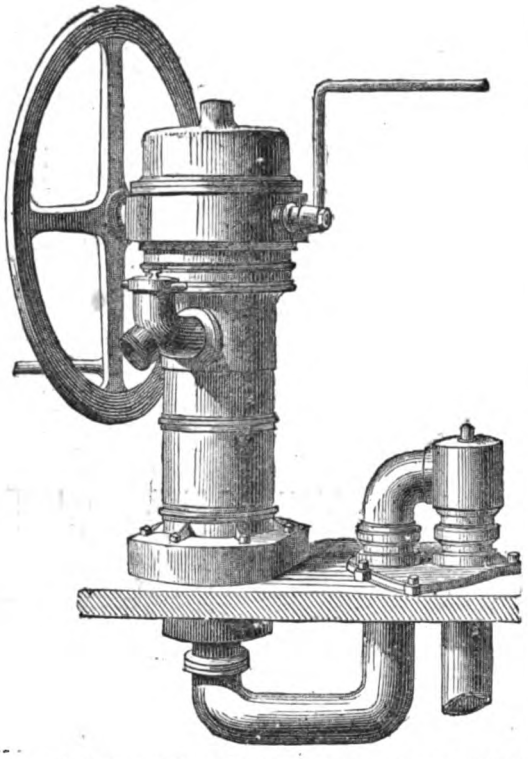
Under the Patronage of the Board of Admiralty.

SHIPS' PUMPS OF HER MAJESTY'S NAVY.

JOSIAH STONE,

Sole Manufacturer of DOWNTON'S well-known and much approved SHIPS' PUMPS, which have been used in preference to all others on board the vessels of Her Majesty's Navy, for upwards of thirty years, and have given the greatest satisfaction, effectually answering all the purposes required of any Ships' Pumps, and capable of throwing most powerful jets of water in case of fire.

These Pumps have also been most extensively used on board merchant vessels, both at home and abroad, and have been supplied to the Royal Navies of France, Prussia, Holland, Russia, Spain, and Turkey. The Pumps are portable, as they may be easily removed from the ship and put to work in a boat alongside in a few minutes. Each pump is fitted with a large foot valve plate (which may be placed in any part of the vessel most convenient), and from which communication is made to any number of distinct compartments in the vessel. In case of any of these pipes fouling, the water, by an almost momentary attachment, may be forced from the Pump downwards, so as to clear all obstructions, preventing any possibility of stoppage. The valves are of the simplest description, and being faced with ordinary leather discs, the latter may be renewed in a few minutes by the most inexperienced hands. By the peculiar construction of these Pumps, a most perfect and uninterrupted flow of water may be maintained; so uniform as to be undistinguishable from that proceeding from a cistern. The Pumps are made of several sizes, those of 7, 9, and 12 inches bore being most generally used. They may, however, be ordered of any dimensions required, and may be fitted either with one or two fly wheels. A standard, &c., is also supplied with these Pumps, to enable them, when necessary, to be used as ordinary hand-lever pumps.



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CONTRACTORS FOR FIRE-ENGINES, ETC., TO THE WAR DEPARTMENT,

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VENTILATION WITHOUT FLUES.

KUKLA'S PATENT STOVES,

At 18s., 25s., and 50s.

KUKLA'S newly-invented Deflagrator—the first and only perfect GAS STOVE. Guaranteed to burn without flue—without dust, smell, or smoke, producing a great and pure heat with the least expenditure of Gas.—*Vide Society of Arts' Journal.*

Patronised by the English and French Government.

Scientific in Principle,
Simple in Construction,
Healthy and efficient in use.

The Deflagrator Stove is cheap, portable, and suited for every situation; and from the principle on which it is constructed (viz., expanding to a sixfold volume the gas used) is capable of warming any given space more quickly and more thoroughly than any other means: while its addition forms a sure remedy for any ill-warmed or ill-ventilated apartments.

The 25s. Deflagrator warms a room of 2,000 cubic feet at a cost of 3d. per day.

The 50s. Deflagrator warms 5 to 6,000 cubic feet at a cost of 6d. per day (twelve hours).

Also, the Greenhouse Stove at 18s.

Patentee and sole Manufacturer, F. X. KUKLA, 194 Pentonville-road, London.

Country orders promptly attended to. Carriage free to any Railway in London.

Post-office Orders should be made payable to FRANCIS XAVIER KUKLA, General Office.

N.B.—Every Stove separately tested before sent out.

The New Gas Cooking Stove for 10 persons, price £3.

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TO BRASS-FOUNDERS, ENGINEERS, &c.

THE PATENT PLUMBAGO CRUCIBLE COMPANY having completed the enlargement of their premises, beg to call the attention of all users and shippers of Melting Pots to the great superiority of the PATENT CRUCIBLES, which have been used during the last three years by some of the largest melters in England and abroad. In addition to their capabilities of melting an average of from thirty-five to forty pourings; they are unaffected by change of temperature, never crack, but can be used till worn out, requiring only one annealing for several days' work, and become heated much more rapidly than ordinary pots, effecting thereby a saving of more than fifty per cent. in time, labour, fuel, and waste. The Patent Plumbago Crucible Company also manufacture and import clay crucibles, muffles, portable furnaces, sublimate pans and covers, glass-pots, all descriptions of fire-standing goods, and every requisite for the assayer and dentists. For Lists, Testimonials, &c., apply to Battersea Works, London, &c. (43

PUMPS

FOWLER & Co.

WHITEFRIARS STREET,
FLEET STREET,
— LONDON. —

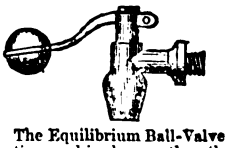
HYDRAULIC MACHINERY OF EVERY DESCRIPTION, FOR HOME USE OR EXPORT, UPON THE LARGEST, OR SMALLEST SCALE, MANUFACTURED, FIXED, OR LENT ON HIRE: AN EXTENSIVE STOCK KEPT READY FOR GENERAL PURPOSES.

(108)

HIGH-PRESSURE VALVE-COCKS,

LAMBERT'S PATENT.

Equilibrium Ball Valve. Cottage Closet Valve.



The Equilibrium Ball-Valve is simple and certain in its action, and is cheaper than the common cocks now in use.

The Cottage Valves are suitable for application to any kind of basin; and, as they shut against the pressure, no concussion in the pipes can possibly occur.

These cocks have been extensively and most successfully used in many towns, under continuous high pressure, varying from 100 to 350 feet; their efficiency and durability is, by experience, established.

THOMAS LAMBERT and SON,
Brass Founders, Short-street, New-cut, Lambeth.

(80)

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GREAT ECONOMY IN GAS

EFFECTED BY MEANS OF

HART'S PATENT

ECONOMISING GAS BURNER

AND ILLUMINATING POWER DIFFUSER,

PRICE **2s. EACH.**

THIS very simple and complete apparatus is the great desideratum of the age for gas consumers. It can be attached to any gas chandelier, stand, or bracket, in a few moments, by the most inexperienced hand. It is impossible for it to get out of repair.

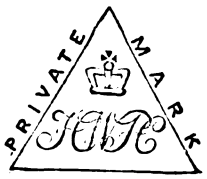
The saving effected by it is from 5 to 35 per cent., at the same time producing an illuminating power far superior to any other burner, varying from 10 to 150 per cent., as proved by experiments made with photometer (defraying its own cost in from one to three months), which must be seen to be believed, and can be demonstrated to any gas engineer, or other scientific man, at one moment's notice, on application at the Depôt,

69 FLEET STREET, LONDON.

To be had of all Gas Fitters in the Kingdom.

No Regulator of any kind required, neither will any Regulator diffuse the Illuminating Power, but, on the contrary, check its development.

NONE ARE GENUINE UNLESS



There being no other Burner before the public that does, truly and scientifically speaking, economise gas, the public are cautioned against Spurious Imitations.

BEARING PRIVATE MARK.

TESTIMONIALS.

"Polytechnic Chemical School, London.

"This is to certify, that I have carefully conducted a series of experiments with various gas burners in present use, and find that 'Hart's Patent Economising Gas Burner' is the most economical of all, producing, when compared with others, a saving of *forty per cent.* Signed this 14th day of December, 1858,

"309 Regent Street." "EDWARD J. GARDNER, Professor of Chemistry, &c., &c., &c.',

"7 Chester Street, Grosvenor Place, Pimlico.

"I have Mr. Hart's Gas Economising Burner fitted to every branch in my house, and can speak in the highest terms of its success. The light is perfectly steady, and the flame more brilliant, with perfect combustion, so that the air is by no means oppressive as formerly: the ceilings have no chance of being blackened, and the gilt frames and furniture cannot now, as before, be injured. I most warmly recommend their adoption. (Signed.)

"November 3rd, 1858." "WILLIAM V. PETTIGREW, M.D., Hon. F.R.C.S. of England, &c., &c., &c."

"Having tried Mr. Hart's Patent Gas Economising Burner, I do not hesitate to state, that it gives perfect satisfaction, and entirely dispenses with the use of any regulator whatever.

"From its perfect regulation of the pressure requisite for perfect combustion, it produces a white and steady light, without the slightest noise, *which proves its perfect combustion*:—for wherever there is a hissing, as is usual, there is a waste of gas—the gas being imperfectly burnt or 'fried'—dispensing its effluvia throughout the apartment.

"November 15th, 1858." (Signed.) "ANDREW STEINMETZ."

"Junior United Service Club, London, Secretary's Office, 21st January, 1859.

Sir,—After a long course of Experiments with your Patent Economising Gas Burners, the result of which is highly satisfactory, the Committee have decided on their adoption throughout the Club, and I herewith enclose order for same. I am, Sir, your obedient Servant,

"Mr. H. W. Hart, 69 Fleet Street." "HUBERT G. de CARTERET, Secretary."

"44 Gloucester Square, Hyde Park, January 21st, 1859.

"Major-General Moncrieff has had Mr. Hart's Patent Gas Burners fitted in his house for some weeks past, and has great pleasure in testifying to their efficiency. As far as Major-General Moncrieff can judge, they fully come up to the description given of them by the Patentee, and are very much superior to any burner Major-General Moncrieff has yet seen tried.

"To Mr. Herbert William Hart."

"176 & 177 Strand, London, W.C., January 18th, 1859.

Dear Sir,—I have much pleasure in certifying to the very satisfactory result of a trial of your Patent Gas Economising Burner.

"This Burner regulates and distributes the delivery of the gas in a manner to produce a very great amount of light, as well as to effect a considerable saving of gas, by preventing a large proportion of it from being blown through partially consumed, and which partial combustion is a double source of injury and annoyance—it soils the ceiling and deteriorates the atmosphere. I am, Dear Sir, very truly yours,

"To Mr. Hart, 69 Fleet Street." "(Signed.) SAMUEL SAINSBURY."

It is the continued remark of scientific men that HART'S PATENT ECONOMIZING GAS BURNER only requires to be known to be adopted.

Wherever there is a sufficient supply of Gas to produce a reasonable amount of light, HART'S PATENT ECONOMIZING GAS BURNER becomes an essential, obviating all objections to the use of Gas in private apartments.

HART'S PATENT ECONOMIZING GAS BURNER is considered by all scientific men to be the great desideratum of the age—the cheapest and most economical.

Hart's Patent Economising Gas Burner has been highly approved of by the Surveyor of Windsor Castle, and is now in use in various parts of that building.

To be seen in operation, and demonstrated upon at the Royal Polytechnic, Regent Street, and at the Depôt, 69 Fleet Street; also, to be seen in operation at the Royal Coloseum, Regent's Park. They are highly approved of by Dr. Bachhoffner. (123)

WATER GAUGES—WATER GAUGES.—Sir,—We find your German Gauge Tube superior to any other, and strongly recommend it. We were compelled to abandon the use of our water gauge until applying your glass tube.

WILCOX and Co., Millwall Pottery Company.

These Tubes are superior to all others; being a clear white, no mistake can arise in working. Guaranteed to stand a pressure of 500 lb.

Extensively used on all the principal lines.

To be had only of E. MOORE, 55 Upper Marylebone-street, W.; and 72 Great Titchfield-street, W.

*** Price List of Gauge Fittings, &c., on application. (98)

TO WIRE ROPE MAKERS.—ARCHIBALD SMITH is now prepared to GRANT LICENCES for the use of his PATENT ROPE MACHINERY, guaranteed to work at six times the speed of any other, and to save upwards of fifty per cent. in the cost of making. It is used by the most eminent makers, and was also in the manufacture of the Atlantic Cable.—Apply to 69 Princes-street, Leicester-square, W. (8)

Important to every man who keeps

THORLEY'S FOOD FOR CATTLE,
77, NEWGATE STREET, LONDON
Beware of spurious imitations. (49)

THE GENERAL IMPLEMENT CO.,
36 BOTHWELL STREET,
GLASGOW.
Agricultural Implements of all kinds.
MOWING & REAPING MACHINES.
Price Lists free on application.
AGENTS WANTED. (32)

ARTESIAN WELLS, BORING TOOLS, PUMPS, &c. Engineers, Architects, Surveyors, Builders or others requiring a good supply of Water may have any quantity procured by W. SPELLER, 14 York-street, Blackfriars'-road, London, where may be had any quantity of Tools for Sinking or Boring, from 2 to 20 inches diameter, and from 100 to 2,000 feet depth; also Men and Tools to bore for Railroads, Minerals, &c., in any part of the world. Boring Tools and suitable Pipes for exportation, with full instructions for their use.

Builders, Contractors, Brickmakers, Barge and Ship Builders, and others, can be supplied with Wrought or Cast Iron Pumps, Double or Single, for excavation of Deep Wells, from 3 to 14 inches in the bore, and from 6 to 130 feet in length, to work by Hand or Steam Power.

Hot-water Apparatus for Conservatories, &c., on the most economical and improved principles.

Also Manufactory for Captain John Grant's much improved Cooking Apparatus. (44)

PUMPING MACHINERY.

GWYNNE AND Co., Engineers, London, manufacture and supply the following Machinery, of the most approved construction and with all the latest improvements:—Portable and Fixed Steam-Engines and Boilers of every description; Waterwheels, Windmills, Horse and Hand-power Machines; Pumping Machinery for the Supply of Towns, Cities, and Districts, and for the Irrigation of Coffee, Cotton, Indigo, Sugar-cane, and Rice Estates, for pumping out Coffer-dams, Canals, Dry Docks, Reservoirs, &c. They also manufacture and supply the Pumping and other Machinery for Paper, Pulp, and Fulling Mills, Breweries, Distilleries, Tanneries, Starch Works, Bleaching, Dyeing, and Calico Printing Works, Chemical Works, Silk, Cotton, and Flax Mills, and Manufactories in general. All Letters not paid will be refused. Illustrated Price Lists forwarded on receipt of Six Postage Stamps.—GWYNNE AND Co., Hydraulic and Mechanical Engineers, Essex-wharf, Strand, London.

For Exportation.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (24)

BY HER MAJESTY'S ROYAL LETTERS PATENT.

PATENT SPHERICAL SELF-ADJUSTING BEARINGS, which do not heat in work. The advantages possessed by these Bearings are:—

1st. They are Self-adjusting; and, consequently, can be put down by the most ordinary Mechanic.

2nd. They are not liable to heat, even at high speeds.

3rd. They remain constantly parellel to the Spindle; and, therefore, wear equally all across the Bearing.

4th. They require only a very small quantity of oil.

Engravings and Prices forwarded on application to the Patentees.

WALLIS & HASLAM,
Engineers and Iron Founders, North Hants Iron Works, Basingstoke. (121)

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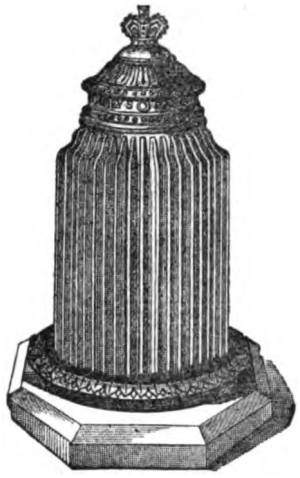


THE LONDON

WARMING AND VENTILATING COMPANY,

(LIMITED,)

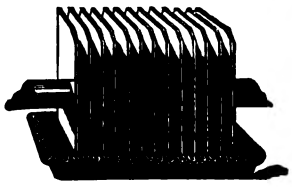
36 GREAT GEORGE STREET, Westminster, S.W.

(MANAGER—Mr. WOODCOCK.)

Churches, Greenhouses, Offices, and Buildings of every description warmed by means of a modification of the plan successfully used during the last five years by Mr. Goldsworthy Gurney in both Houses of Parliament.

Steam, Hot-water, Gas, and in open or enclosed fireplaces, Coal and Coke are equally available for the process.

The cost is less and the effect greater than that of any other known means.



The Horticulturist will find herein an instrument of new and important powers.

The apparatus may be seen in ST. PAUL'S CATHEDRAL, the various offices of the "Department of Science and Art," and in many churches and other buildings.

Particulars and Testimonials forwarded on application.

(12

CLAYTON, SHUTTLEWORTH, AND CO.,

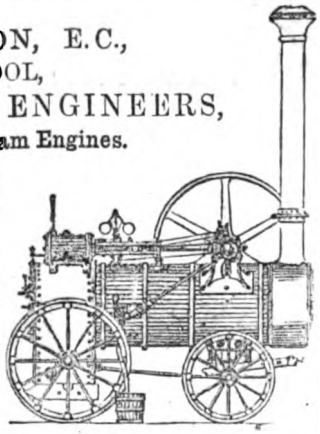
OF LINCOLN,

78 LOMBARD STREET, LONDON, E.C.,

AND 36 DALE STREET, LIVERPOOL,

AGRICULTURAL AND GENERAL ENGINEERS,

And Manufacturers of Portable and Fixed Steam Engines.



Combined Threshing Machines, which dress the corn ready for market at one operation. Grinding Mills, Saw Benches, Pumps for Irrigation and Mining purposes, with all necessary gearing for being driven by steam power. Full particulars and estimates given on application to the above address.

C. S. and Co.'s PORTABLE STEAM ENGINES are adapted for every purpose to which steam-power can be applied. When intended for winding, they are fitted with reversible link motion and winding gear. They are easy of removal, as may be seen by the engraving, and can be set to work immediately on arrival.

C. S. and Co. are now doing an extensive foreign and colonial business, and are prepared to send off engines and machinery of the before-mentioned kinds in a few days from the date of order. They would also call attention to the important *reduction in prices* made for the new year.

For Exportation.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (23)

IMPROVED MACHINERY FOR AGRICULTURISTS.

RICHARD GARRETT & SONS,

LEISTON WORKS, SAXMUNDHAM, SUFFOLK,

(ESTABLISHED A.D. 1778),

EARNESTLY solicit the continued support of their numerous Friends, Agriculturists, Shippers, and others; the additions made to their Works during the present year, in the erection of new sets of Workshops, fitted with the best mechanical appliances for producing Machinery of the most improved construction, expeditiously and economically, justifies their soliciting increased support, while their leading reputation as Inventors and Manufacturers of FIRST CLASS Agricultural Machinery, is a sufficient guarantee that every Machine supplied from Leiston Works will prove to the entire satisfaction of the purchaser.

R. G. & S. are now manufacturing the following Machines and Implements, which they guarantee to be thoroughly efficient in every respect:—

PORTABLE AND FIXED STEAM ENGINES. } From 4 to 40 Horse Power, suited for every kind of work
SELF-PROPELLING AND TRACTION ENGINES. } to which Steam Power is applied.

STONE GRINDING MILLS.
MORTAR AND PUG MILLS.
MILLWRIGHTS' WORK of all kinds.
SAWING MACHINERY, from 4 fo 20 Horse Power.
BRICK AND TILE MACHINES.

IMPROVED SETS OF FARM MACHINERY, for Large Occupations.
PORTABLE AND FIXED MACHINERY, for Thrashing and Dressing Corn.
THE PRIZE BOLTING AND OPEN-DRUM HORSE-POWER THRASHING MACHINES.
CORN DRESSING MACHINES, for Hand, Horse, Water, and Steam Power.
BARLEY AVELLING MACHINES.
CHAFF CUTTERS, for Hand, Horse, Water, and Steam Power.
PATENT TURNIP CUTTING AND PULPING MACHINES.

THE PRIZE CORN AND SEED DRILLS.
PRIZE CORN AND SEED DRILLS WITH MANURE APPARATUS.
PRIZE SEED AND MANURE DRILLS.
LIQUID, SEED, AND MANURE DROP DRILLS.
CHAMBER'S PATENT BROADCAST MANURE DISTRIBUTOR.
GARRETT'S PATENT HORSE HOE for all Crops.
PATENT REVOLVING HOES for Root Crops.
IMPROVED PLOUGHS AND REAPING MACHINES.
&c. &c. &c.

Of which full detailed particulars will be found in R. G. & SONS' ILLUSTRATED CATALOGUE, sent postage free to any address, in English, French, or German; and any of the above Machines will be shown in operation at R. G. & SONS' Farm, near the Works, on their receiving a few days' notice.

A Copy of R. G. & SONS' new COLONIAL LIST will be forwarded free to any of the Colonies, and Shippers will be supplied with these lists, with their names and addresses printed on, free of charge, by making application for the same.

ADDRESS—R. GARRETT & SONS, LEISTON WORKS, SAXMUNDHAM, SUFFOLK. (57)

WATER POISONED BY LEADEN PIPES.

"The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight. The water has cut these deep pits almost through the pipe, and not only upon the portion which we have illustrated, but has formed similar chasms throughout the centire length."—*Expositor*.

Poisoned Water Preventable.

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

From Dr. MURRAY, Hull.

"It is impossible to conceive of anything more injurious, or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha. Nothing can be better. I have also recommended it to others, who have adopted the expedient.

Resistance for Frost.

The Gutta Percha Company have been favoured with the following Letters in reference to the non-conducting properties of Gutta Percha Tubing, in the resistance of Frost.

From J. ARMSTRONG, Esq., M.D., Gravesend.

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AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 7.
[NEW SERIES.]

LONDON: FRIDAY EVENING, FEBRUARY 11, 1859.

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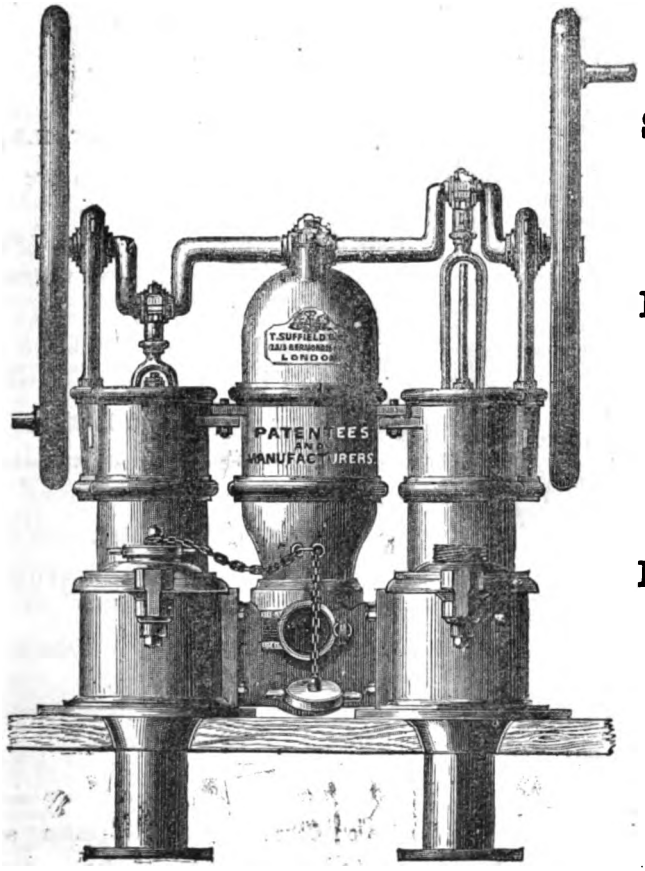

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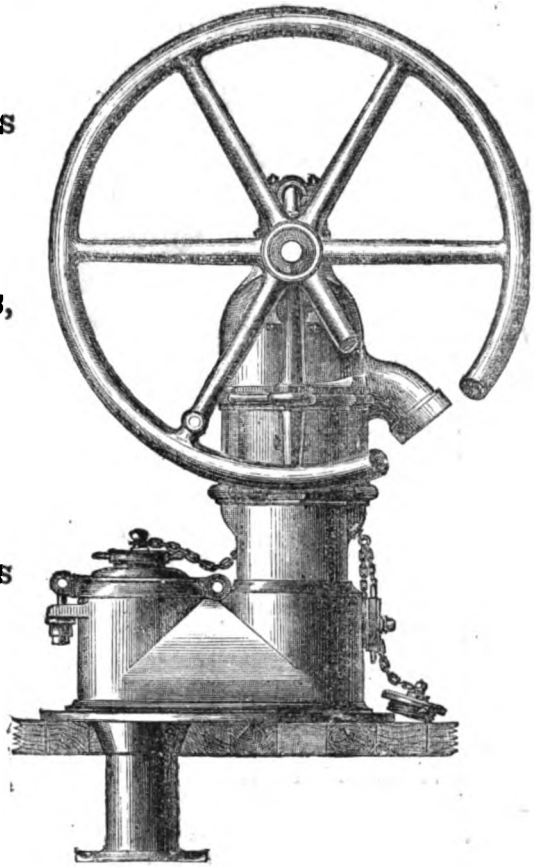

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Australian	„	114 10 0	„	115 0 0	„
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ZINC, English, Sheet	„	30 0 0			1½
QUICKSILVER	per lb.	0 2 0			1½

REMARKS.—Manufactured Iron continues firm. A slight fall has occurred in Scotch Pig-iron, and at the moment the tendency of this article is downward. Copper is firm. Lead is also firm and evinces a tendency to advance. Spelter we quote a shade lower. The general tone of business is good.

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LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

RAILWAY WORKS, *Dundalk, Enniskillen.*—Tenders for constructing branch line from Shantonah to Gaole-hill, to March 1. Drawings at Engineer's office, London-bridge.

RAILWAY STATION, *Horsham.*—The directors of London Brighton, and South Coast Railway will receive tenders for erection of new station and warehouse at Horsham. Specifications at engineer's office, London-bridge Terminus; tenders to Secretary there by noon, 24th inst.

HARBOUR, *Scotland.*—Contractors wanted for excavation and completion of a basin, and for building of a sea-wall at Elgin and Lossiemouth Harbour; plans, &c., prepared by J. Abernethy, Esq., C.E., London, and may be seen on application at the town clerk's office, Elgin, or at Harbour office, Lossiemouth. Tenders to Mr. Duff, town clerk, Elgin, to noon, 5th March.

CHURCH, *Warrington.*—For restoration and enlargement of Warrington Church, Lancashire. Plans, &c., at the architects, Messrs. Francis, 38 Upper Bedford Place, Russell Square, London; and at the vestry room, Warrington. Tenders on March 1, to Rev. Wm. Quekitt, Rectory, Warrington.

TRADES, *Government.*—The Government invite tenders for the following trades in the Woolwich Royal Engineer district, from 1st April, 1859, to 31st March, 1862:—Bricklayers, masons, paviors, carpenters, and upholsterers, plasterers, slaters, plumbers, smiths, and ironmongers, painters, glaziers, and paperhangers and gasfitters. Schedules and forms from clerk of works at Royal Engineer Office, Grand Depôt, Woolwich, to 26th inst. Tenders to director of contracts, War Office, Pall Mall, noon, 7th March, marked "Tender for Artificer's work, Woolwich district." One contract for the Woolwich district will embrace all the above trades.

COAST-GUARD STATION, *Hoylake.*—For erection of a station at Hoylake, Cheshire. Drawings, &c., at Admiralty Coast-guard Office, 18 Spring Gardens, London, or at Watch Room, Hoylake, to 19th inst. Tenders at first-named place by noon 21st, directed to Commodore Comptroller General of Coast-guard.

GOVERNMENT SCHOOLS, *Woolwich.*—For alterations, &c., to Regimental Schools, Greenhill, Woolwich. Drawings, &c., at Royal Engineer Office, Royal Artillery Barracks, to Wed., Feb. 23. Tenders to Director of Contracts, War Office, Pall Mall, to noon, 28th inst. Time for completion extended to nine months.

PRISONS, *Canterbury.*—An additional prison for Kent at Canterbury, to contain 100 cells, and also various alterations to entrance lodge and sheds in the tread-wheel yard at Canterbury county prisons. Plans, &c., at offices of Messrs. Whichcord and Blandford, architects, Maidstone, and after 21st inst. copies at county gaol, at St. Augustine's, Canterbury. Tenders to architects by 11 A.M. 2nd of March, persons tendering to be in attendance at the Courts of Justice, Maidstone, at ½ past 12 that day.

ADDITIONAL PRISON, *Maidstone.*—The justices for Kent also invite tenders for a prison to contain 140 cells, and also for various alterations to the entrance lodge, &c. Particulars and dates as in preceding notice.

SEWERAGE WORKS, *Stroud.*—The Stroud (Gloucestershire) L. B. of Health invite tenders for sundry main sewers, purifying tanks, &c. Drawings, &c., at office of Mr. J. H. Taunton, M. I. C. E., Brimscombe House, Stroud, after 16th inst. Tenders to Clerk of Board to 28th inst.

STREETS, *Tipton.*—For making two streets at Tipton. Spec. at offices of Tipton L. B. of Health, Church-st., Tipton, to which place (for the Clerk) tenders must be sent by 22nd inst.

TOWN HALL, *Folkestone.*—For new Town Hall, Council House, Court House, Cells, and Buildings, and Market Houses and Market Places, at Folkestone. Drawings, &c., at offices of Mr. J. Messenger, architect, 9 Spring Gardens, London, S.W.; or at Mr. R. T. Brockman, Town Clerk, 5 West Cliff-terrace, Folkestone.

RECTORY, *Essex.*—For new Rectory-house, Parochial-schools, and Residence, at East Mersea, Essex. Plans, &c., at Mr. Rickwood's, 98 and 99 High-st., Colchester. Tenders to Feb. 15.

SCHOOLS, *East and West Rudham.*—For erection of East and West Rudham Schools. Plans at Messrs. Clowes and Flowerden, St. Andrew's Plain, Norwich.

HOUSES, *Dorercourt.*—For alterations to two houses on Dovercourt Cliff, Essex, converting them into an hotel. Plans, &c., at office of Mr. H. Darker, architect, Dovercourt. Tenders to Feb. 19.

OFFICES, *Coventry.*—For erection of warehouses, salerooms, and out-offices, in Much Park-street, Coventry. Plans, &c., at offices of Mr. Neville, Palace-yard, Coventry. No date.

CHAPEL, *Birkenhead.*—For erection of a chapel, schoolroom, &c., in Parkfield, Birkenhead. Plans, &c., at house of Mr. R. Jones, Tranmere. Tenders to Feb. 14.

STONE REREDOS, *Suffolk.*—Sculptors and carvers may tender for a stone Reredos at Hadleigh Church, Suffolk; drawings, &c., at office of architect, 12 Bishopsgate-street Without, and Bishop's Stortford, to 15th inst.

SCHOOLS, &c., *Luton.*—For a school, teachers' residence, &c., at Caddington, near Luton, Bedfordshire. Plans, &c., at offices of H. Holyoak, architect, Luton, Bedfordshire. Tenders there by 4 on 23rd inst.

COALS, *for Malta.*—For delivering into store at H.M. Naval Yard at Malta 13,000 tons of South Wales coals for H.M. steam vessels. Conditions, &c., at Storekeeper's office, Somerset Place. Tenders to two o'clock, 18th March, when persons tending, or agents, must be in attendance. Security £4,000, two sureties.

COALS, *for Gibraltar.*—For the Naval Yard at Gibraltar 3,500 tons of South Wales coals for H.M's. steam vessels. Conditions, &c., from Storekeeper General, Somerset Place. Tenders at 2 on the 15th inst. Attendance in person or by agent. Security £1,000, two sureties.

HERTFORDSHIRE.—The Skipton L. B. of Health will receive tenders for brick sewers, pipe sewers, manholes, gullies, ventilating shafts, flushing wells, &c. Plans, &c., to 14th inst., at the office in Hereford of Mr. T. Curley, C.E., and for seven days after at office of Mr. T. Heelis, Clerk to Board, Skipton. Tenders to Clerk by 23rd inst.

COALS, *for Greenwich Hospital.*—For 2,700 tons of either of undermentioned coals:—Best coals; Stewarts, Haswell, Hettons, South Hettons, at per ton, or Silkstone coal as supplied by the Great Northern Railway, at per ton. Forms, &c., at Mr. Stewart's office, Greenwich Hospital. Tenders by noon 23rd instant, persons or agent must attend.

ARCHITECT'S PLANS, *London.*—For the enlargement of Orphan Working Schools, Haverstock Hill. A premium of £50 for the most approved plan, and £30 for the Second; or instead of premium the Author of successful plan to be employed. Particulars at the offices, 32 Ludgate Hill, London, E.C.

CAST IRON PIPES, *London.*—Estimates required for supply of light cast iron eight-inch pipe, in 6ft. and 3ft. lengths, not more that 12 lbs. to foot, with a flange half an inch deep, one-sixth of an inch thick at each end. Terms, cash, address H.N., Care of Mr. Egleton, 169 Fleet Street, London.

TEMPORARY SURVEYOR, *Swindon.*—The Swindon Union want a person to superintend the building and laying down of several brick culverts, with pipe-drains, &c. Apply, stating terms per week, with references, to Mr. Haynes, Inspector of Nuisances, Swindon, by the evening of 17th inst.

TURNTABLE, *Chester.*—The Chester General Station Committee will receive tenders for a 42-feet turntable. Plans, &c., at offices. Tenders &c., before twelve o'clock Feb. 18. The committee have on sale 200 tons of old iron; ten 15-feet turntables, one 30-feet ditto, and a quantity of brackets for supporting lamps, each 2 feet 6 inches in length. Information of R. L. Jones, gen. man.

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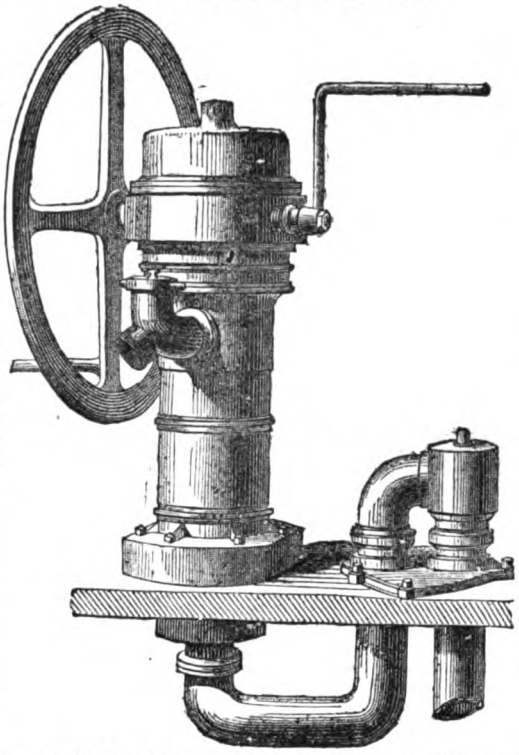

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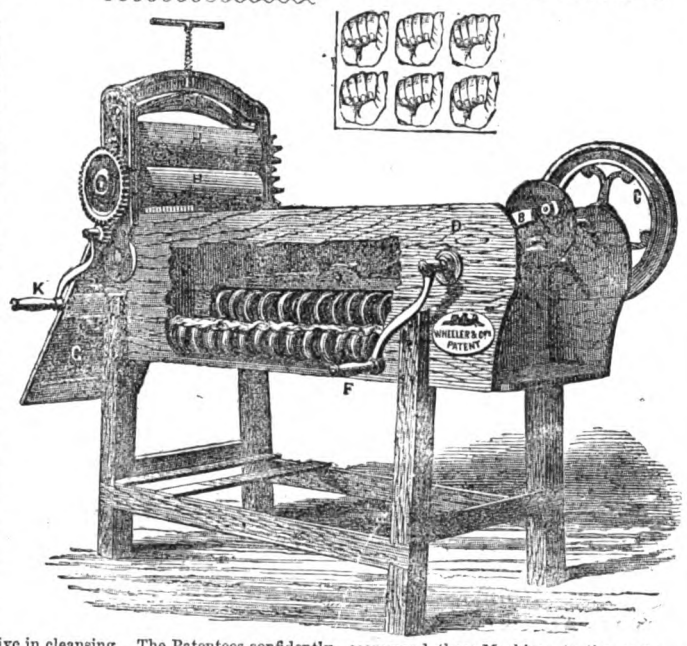

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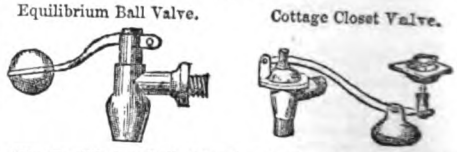

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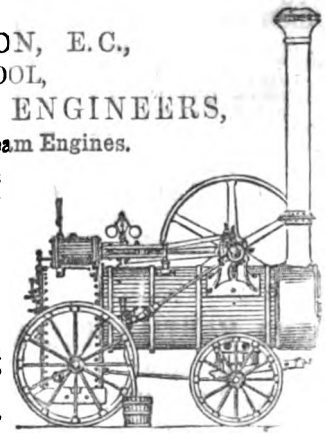
And Manufacturers of Portable and Fixed Steam Engines.



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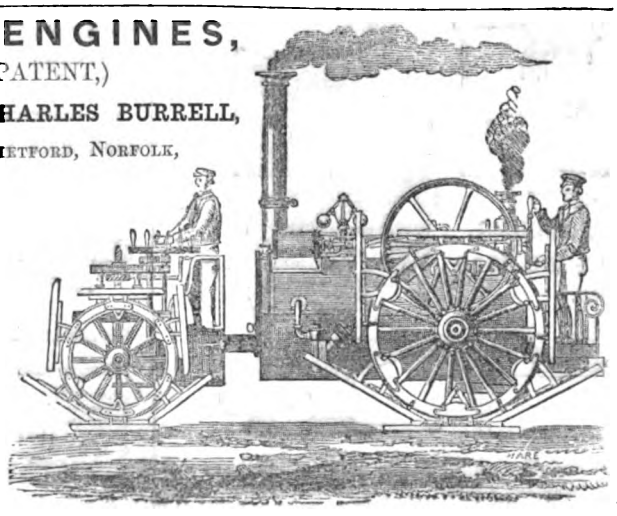

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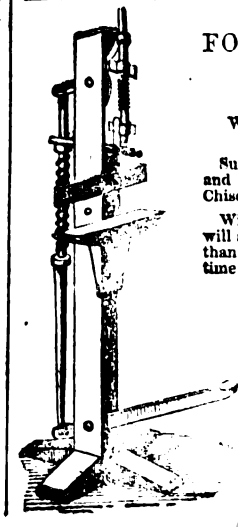

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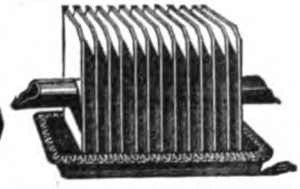

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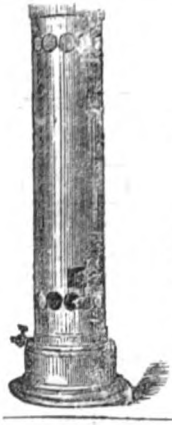

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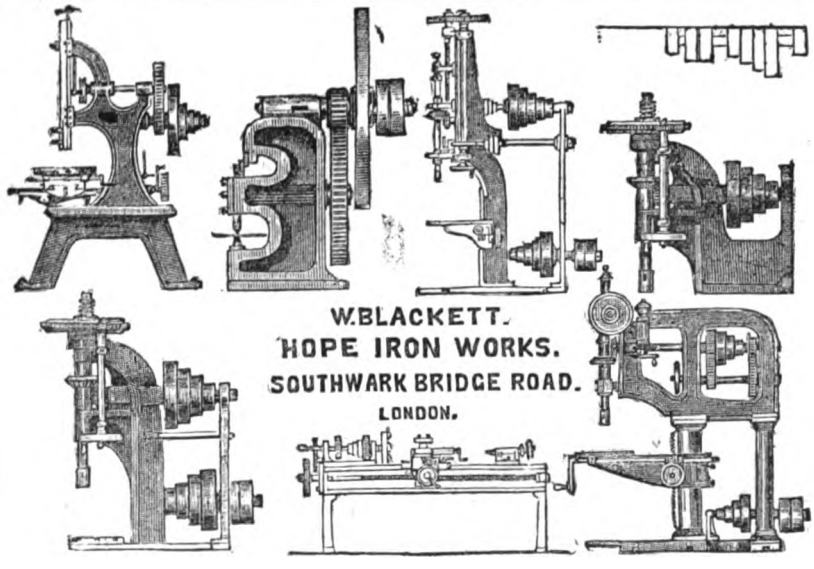

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 8. [NEW SERIES.]

LONDON: FRIDAY EVENING, FEBRUARY 18, 1859.

PRICE, WITH SUPPLEMENT, EIGHTPENCE BY POST 10d.

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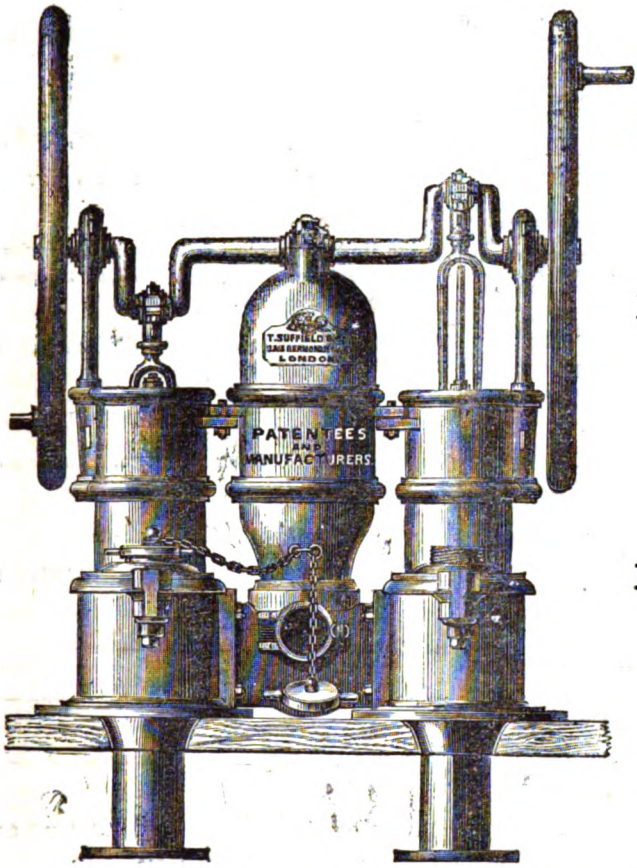

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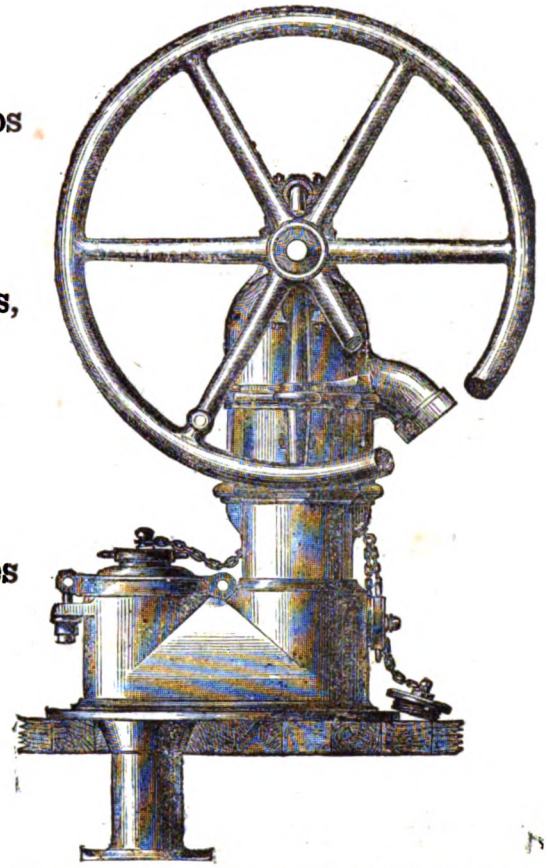

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		£ s. d.		£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N. of England	pr. ton	6 10 0	to	6 15 0	nett
Welsh Bars, in Wales	„	6 5 0	„	6 10 0	3
Staf. Bars at the Works	„	7 0 0	„	7 10 0	2½
„ Hoops	„	8 0 0	„	8 10 0	„
„ Sheets, Singles	„	8 15 0	„	9 0 0	„
„ Nail Rods	„	7 0 0	„	7 10 0	„
„ Boiler Plates	„	8 10 0	„	9 0 0	„
Scotch Pig, M.-Nos. Warrants, at Glasgow	„	2 11 6	„	2 12 0	nett
Do. No. 1, Good Brands	„	2 12 0	„	2 12 6	„
Scotch Bars	„	7 5 0	„	8 0 0	3
Swedish Bars, in London	„	13 10 0	„	14 0 0	2½
COPPER, Sheet and Sheathing	per lb.	0 1 0½			3
Tough Cake and Tile	„ ton	112 10 0			„
Best Selected	„	115 10 0			„
Australian	„	114 10 0	„	115 0 0	„
South American	„	105 0 0			„
Yellow Metal Sheathing	per lb.	0 0 10½			„
STEEL, Swedish Keg	pr. ton	20 0 0			2½
„ Faggot	„				„
TIN, English, Block	pr. cwt.	6 6 0			2½
„ Bar	„	6 7 0			
Foreign, Banca	„	6 12 0			nett
„ Straits	„	6 19 0			„
TINPLATES, Charcoal, I.C.	pr. box	1 13 0	„	1 14 0	3
Coke, I.C.	„	1 6 0	„	1 8 0	„
LEAD, Pig, English	pr. ton	23 0 0	„	23 10 0	2½
„ Spanish	„	22 10 0	„	22 15 0	„
Sheet	„	23 10 0	„	23 15 0	„
SPELTER, on the spot	pr. ton	22 7 6	„	22 10 0	nett
for arrival	„	22 6 0	„	22 7 6	„
ZINC, English, Sheet	„	30 0 0			1½
QUICKSILVER	per lb.	0 2 0			1½

REMARKS.—Our Markets continue quiet, but very steady. Prices almost without change.

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METAL AND COAL TRADES, &c.

[FROM OUR OWN CORRESPONDENT.]

State of the Iron Trade Generally—The South Staffordshire Trade in Iron and Coal—Mr. Riley's Bankruptcy—Monmouthshire and South Wales Trade—Derbyshire, Lancashire, and Yorkshire Iron and Coal Trades—Liverpool Iron Trade—Glasgow Pig Trade—Birmingham; Wolverhampton, and Sheffield Trades—Prices of Metals—Barnsley Hand Loom Trades—The Centres of the Textile Trades—The Flint Glass Makers' Dispute.

GENERALLY the iron trade continues quiet. Some of the leading houses are well employed, and orders from America continue to arrive to a fair extent, but the general account is that the demand is decidedly less active than was anticipated in the early part of the quarter; the result, as is supposed, of the fears entertained lest peace should be disturbed. There are some good orders for rails in the market for India, and also home consumption.

In South Staffordshire the iron trade still continues quiet, its position being much the same as we last reported it, without any tendency to retrogression. There is a fair amount of work in progress at the various mills and forges of the district, and the producers of the best descriptions of iron are well supplied with orders. Prices continue tolerably firm, viz., bars, £7 10s., hoops, £8 10s., and sheet-iron, from £9 to £9 10s. per ton. The demand from the United States is increasing, and there seems to be no question that as the season advances the advices from that country will be considerably augmented, especially if due regard be paid to the quality of iron manufactured. There is a good demand for first-rate hot blast mine iron, which is realizing £3 15s. per ton, excepting in some instances, where parties are pressing for cash payments. In these particular cases lower rates are accepted. Ironstone, the yield of the district, is in good demand, and is realizing, according to quality, from 15s. to 17s. per ton. In consequence of the mildness of the season, the demand for coal as far as regards domestic consumption has fallen off considerably, but the requirements for the various works is much the same as usual. The colliers still continue to agitate the question of an advance of wages, but there is not at present any prospect of their effort being attended with success.

On Friday Mr. W. T. Riley, ironmaster, late of the Mill-fields, Bilston, underwent another long examination touching his accounts in the Birmingham Bankruptcy Court. Nothing fresh was elicited. The learned commissioner deferred his decision.

In Monmouth and South Wales the demand for both coal and iron continues steady. Orders for railway iron from the continent have been received; the home enquiry for pigs is good.

In Derbyshire, Lancashire, and Yorkshire there is a steady demand for most descriptions of iron, and orders are given out more freely than a short period ago. The facilities offered by the Government for the construction of railways, appear likely to occasion a good demand for railway iron throughout the spring, and in anticipation of this state of things several manufacturers are extending their works, with a view the more readily to meet the increased demand which will be no doubt made upon them. The coal trade is brisk, but the extreme mildness of the weather occasions a slackness in the demand for household purposes. The rates are well maintained.

At Liverpool orders for manufactured iron continue to be given slowly, but makers are fairly occupied, and prices are well maintained. The price of common Welsh bars is £6 15s. to £6 17s. 6d.; Staffordshire, £7 to £7 2s. 6d.; and hoops, £8 5s. to £9 per ton. On Tuesday the following was the quotation of the Liverpool pig-iron market:—Buyers, 52s. 3d. cash; 53s. three months open; sellers, 52s. 9d. cash, and 53s. 6d. three months open.

Respecting the Scotch pig-iron, whilst a good business was done in Glasgow at the close of last week, at a fall of from 1s. to 2s., the price terminating at 51s. 3d. cash, for mixed warrants, on Tuesday business was done at 52s. 6d., one month open, closing very firm, with not much iron offering. Nos. 1 and 3, G. M. B., 53s. 3d.

The staple trades of Birmingham and Wolverhampton are not marked by any perceptible alteration since last week. The factors speak favourably of the country business, and the orders received from travellers since Christmas, if not unusually heavy, are of an average character. The foreign trade is, however, still quiet. Tin-plate, japan, and lock manufacturers are fairly employed, and hollow-ware trade shows faint signs of improvement.

From Sheffield we have the following:—"There are further signs of improvement in the general trade of the town and neighbourhood. Most of the country houses continue moderately busy in steel files, tools, and cutlery; and some of the foreign houses now receive more favourable accounts from their correspondents. We hear of instances in which recent advices from the United States have been more satisfactory than for a very considerable period. This refers chiefly to the heavy branches of the Sheffield trade. There is also, we believe, an increased and increasing demand for Britannia metal goods. For some time there has been a gradual decrease in the list of unemployed poor."

With the exception of a slight decline in spelter, there has been no alteration in the past fortnight in the quotations of metals.

Since Christmas the Barnsley linen trade has been very dull, and little work has been given out to the handloom-weavers. There are 700 or 800 of these looms in the Barnsley district, the machinery of which has cost something like £10 per loom; and most of these looms at present, and for many months past, have had very little work. The manufacturers by power are giving full employment to their weavers, and have been doing so for the last fortnight.

Upon a comparison, however, of all the accounts that we have received from Liverpool, Manchester, Leeds, Halifax, Bradford, Rochdale, Huddersfield, and Nottingham, with last week's accounts, we have no difficulty in stating that as upon the whole the textile trades are not in a worse state, and as some of them are decidedly in a better, the prospects of the iron and metal trades generally have much improved in the six days.

The flint glass trade is gradually going to Germany, owing to the dispute between the men and their employers. The latter met at Crewe on Tuesday, and invited a deputation of the men to meet them, but as they announced that certain concessions by the men would be necessary, the men refused the invitation, and the masters adjourned to the 3rd of May. The lock-out is therefore to continue three months longer.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

RAILS, *East India Railway Company.*—For 15,000 tons of rails, 130 tons of bolts and nuts, and 4,000 tons of chairs (Ransome's patent). Specifications, &c., at company's offices. Tenders by noon 18th March, at East India Railway House, Alderman's Walk, New Broad-street.

RAILWAY WORKS, *London, Brighton, and South Coast.*—For construction of first section of Shoreham, Henfield, and Mid-Sussex, a distance of about ten miles. Specifications, &c., after 21st, supplied on payment of £3. Tenders by 11 a.m., March 10 (attendance).

RAILWAY WORKS, *Guisborough.*—For construction of a portion of the Cleveland Railway (about four miles.) Plans, &c., of J. Hawkshaw, C.E., 33, Great George Street, Westminster, and at office of Messrs. Reed, Stockton-on-Tees, on the 22nd instant. Tenders at Messrs. Reed's office on Monday, 28th instant.

RAILWAY WORKS, *Scotland.*—For extension of branch to Port Carlisle Railway (about half-a-mile.) Assistant engineer will attend at British Hotel, Carlisle, Monday, 21st February, and Tuesday, 22nd, at 10 o'clock, to exhibit plant, &c., which afterwards may be seen at office of Messrs. B. and E. Blyth, 135, George-street, Edinburgh. Tenders to Secretary, Caledonian Railway, 55, Renfield-street, Glasgow, on March 1.

STEEL, *East India Company.*—The East India Company invite tenders for steel. Conditions, &c., at Secretariat office, East India House, to 11 on 22nd inst., when offers must be sent in.

COOKING APPARATUS WANTED, *West Riding Asylum, Wakefield.*—The Visiting Justices invite makers of cooking apparatus to send in plans and estimates. Information on application, by letter, to clerk of works, Asylum, Wakefield.

IRON BUILDING, *Trowbridge.*—For an iron building of three sides and roof complete. Address, Rev. J. H. W., Post-office, Trowbridge, Wilts.

PIERS, *Watchet.*—For construction of piers, &c., to plans, which may be seen at office of Watchet Harbour Commissioners, Watchet, Somerset; or at office of the engineer, J. Abernethy, Esq., 3 Parliament-street, Westminster. Tenders on 5th March, to Mr. C. E. Rowcliffe, clerk to commissioners, Stogumber, Taunton, Somerset.

PIT SINKING, *Whitworth.*—For sinking of two pits at Bishop's Close, Whitworth, for the Weardale Iron Company. Particulars, &c., at Tudhoe Iron Works, Newcastle-upon-Tyne, or of Mr. W. Burrell, Black Prince Colliery, Tow Law. Tenders on the 23rd Feb.

IRON LIGHT-HOUSE, *Scotland.*—For construction of a malleable iron beacon. Plans, &c., by Messrs. Stevenson. Plans at 84, George-street, Edinburgh, from 10 till 3. Tenders to Northern Light-house office, Edinburgh, on 21st instant.

SWORDS AND SCABBARDS, *East India Company.*—Particulars at Secretariat office, and tenders there by 11 a.m., 25th instant.

GAS RETORTS, *Walsall.*—The Walsall Improvement Commissioners want tenders for about thirty best fire-clay retorts, and bricks to fix them. Tenders to the clerk on 25th instant.

BOILER, *Watford.*—For cylindrical or Cornish boiler at Waterworks of Local Board of Health, Watford. Information of Mr. Pilbrow, C.E., Tottenham, engineer to the Board. Tenders to Board by 24th instant.

GASHOLDER TANK, *Rugby.*—For erection at works of the Rugby Gas and Coke Company, of a cast-iron gasholder tank, and for a gasholder with cols, girders, &c., according to the plans, &c., at the office of the company, Rugby. All particulars of Mr. Simpson, Gas Works, Rugby. Tenders to the Secretary on March 5.

IRON WATERING CARTS, *Stratford.*—The trustees of Middlesex and Essex turnpike roads; for repairing and keeping in repair 15 iron watering carts. May be inspected at the wharf of Messrs. Meeson and Co., at Stratford, Essex, near Bow Bridge, adjoining river Lea. Tenders at the office, Bow, Middlesex, on 24th.

MATERIALS FOR CONVICT PRISONS. For supply of timbers, deals, slates, lime, sand, bricks, lead, glass, wrought and cast iron, ironmongery, gas and water pipes, white lead, oils &c., for twelvemonths from 1st of April next to 31st of March, 1860, for Pentonville, Millbank, Brixton, Pottland, Portsmouth, Dartmouth, Chatham, Lewes, and Parkhurst prisons, and Fulham Refuge. Tenders to director of convict prisons, 45 Parliament-street, Westminster, by 6, p.m. March 14. Forms there by 24th inst.

WATERWORKS, *Wallasey.*—For a water tower, for Board of Health for Wallasey, Chester. Drawings, &c., on payment of one guinea, from Local Board, or at the offices of R. Rawlinson, Esq., C.E., 31 Parliament-street, Westminster. Tenders to office of L. B., Church-street, Egremont, Cheshire, on 24th inst.

SEWERS, *St. Martin-in-the-Fields.*—For jobbing and measured works, for sewers and drains in the parish from Lady Day next. Printed forms, &c., of Mr. Burstall, surveyor to the vestry, 15, Castle-street, Long Acre, for 5s. Tenders at the Vestry House before 4 on 3rd of March.

REGIMENTAL SCHOOLS, *Woolwich.*—For additions, &c., to Government Regimental Schools, Green Hill, Woolwich. Specifications, &c., to the 23rd inst., at Royal Engineer's office, Artillery Barracks, Woolwich. Tenders by noon on 28th inst., to Director of Contracts, War Office, Pall-mall. The time for completion extended from three to nine months.

MARKET HOUSE, *Midsomer Norton.*—For erection of a market house at Midsomer Norton. Plans, &c., of Mr. T. H. Smith, Midsomer Norton, and of Messrs. Foster and Wood, architects, Park-street, Bristol. Tenders to Feb. 28.

SCHOOLHOUSE, *Lanark.*—For masons', joiners', slaters', plumbers', and plasterers' work in a new school-house at Lanark. Plans, &c., of Mr. Ponstie, Carstairs Mains; to whom tenders, March 12.

HOUSE, *Gateshead.*—For erection of a large house at Gateshead. Plans, &c., up to the 25th inst., at offices of Mr. M. Thompson, architect, 5 Eldon-square, Newcastle-upon-Tyne.

Chelsea.—Horses, carts, and drivers, for Chelsea, from 25th March next, to 18th March, 1860; forms at office of vestry, Manor House, 111 King's-road; tenders there by 3 o'clock, 22nd inst.

ROAD SUPPLY, *Greenwich.*—For broken Guernsey granite and broken flints; particulars, &c., at turnpike gates, at clerk's, Croom's-hill, Greenwich, or of surveyor, Mr. J. R. Heward, New Cross; tenders to clerk at Green Man Inn, Blackheath, by ten, 26th Feb.

ROADS, *Bury.*—For excavating, sewering, priming, paving, &c., of 1¼ miles of turnpike road, from Strand-lane (Radcliffe) to Whitefield; plans to 22nd inst. at Mr. Slater's, Bury, Lancashire; tenders on the following day to Mr. NORRIS, clerk to board, Bury.

STONE, *Woolwich.*—Separate tenders for 10,000 or 5,000 feet super. of first class York paving. Also 500 feet of Aberdeen, Guernsey, or Devon, Heyter, or Carley hose granite kirb, and for 500 cubic yards of surface picked flints, (broken). Bond required. Particulars of Mr. Barnett, surveyor to Local Board of Health, Woolwich. Tenders at town-hall at 7 p.m., 22nd inst.

GAS ENGINEERS, *London.*—A first class gas engineer wanted by Equitable Gas Light Company. Salary £400 a-year, and residence, free of rent and taxes. Applications to company, 121, John-street, Adelphi, before 22nd instant.

RESIDENT ENGINEER, *Vale of Neath.*—The Vale of Neath Railway Company require a person to undertake the care of about 40 miles of railway. Application by letter to secretary, stated salary required, &c.

FOREMAN ENGINEER, *Dundee.*—Iron engineering establishment a general foreman to superintend the designing and construction of marine and canal engines, &c. Apply to Gourley, Brothers, and Co., Engineers and Iron Shipbuilders, Dundee.

LONDON AGENT WANTED.—To represent a manufacturing establishment, a gentleman well known to railway engineers, managers, and others. A salary and commission allowed. Address M. and Co., *Engineer* Office, 163 Strand.

SURVEYOR OF ROADS, *Newington.*—A surveyor of roads for parish of St. Mary, Newington, Surrey, at £180 per annum. Application to H. and F. Chester, clerks to Vestry, 1 Church-row, Newington-butts, by six, 21st inst.

DESIGNS, *Newcastle-under-Lyne.*—For alteration, &c., of Town-hall. Premium £20. Information with Mr. W. M. Thomas, surveyor, Newcastle. Plans to March 31st.

ROAD SURVEYOR, *Prestwich, Bury and Radcliffe Turnpike Trustees.*—A surveyor, will have entire supervision of roads. Salary £70 per annum. Applications to Mr. Norris, solicitor, Bury, Lancashire, by 2 p.m., 25th inst.

ENGINEERING DRAUGHTSMAN.—W 59, *Manchester Guardian Office.*

FOREMAN OF MECHANICS.—Apply to Wrigley and Son, Bridge Hall Mills, Bury; or at 32, Princess-street, Manchester.

PLANS FOR WORKHOUSE, *Grinstead.*—Plans, &c., for erection of a Central Union Workhouse, near Railway Station at East Grinstead. Plans, &c. forwarded to office of W.A., head clerk to guardians for East Grinstead Union, Grinstead, Essex, 3rd March.

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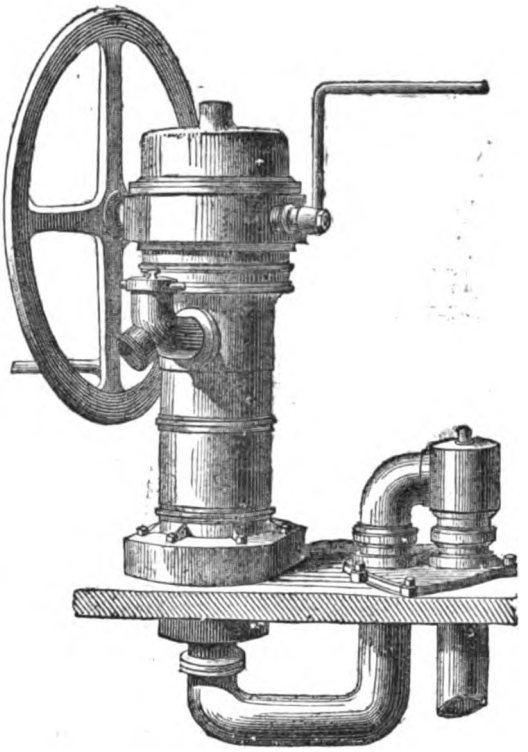
Under the Patronage of the Board of Admiralty.

SHIPS' PUMPS OF HER MAJESTY'S NAVY.

JOSIAH STONE,

Sole Manufacturer of DOWNTON'S well-known and much approved SHIPS' PUMPS, which have been used in preference to all others on board the vessels of Her Majesty's Navy, for upwards of thirty years, and have given the greatest satisfaction, effectually answering all the purposes required of any Ships' Pumps, and capable of throwing most powerful jets of water in case of fire.



These Pumps have also been most extensively used on board merchant vessels, both at home and abroad, and have been supplied to the Royal Navies of France, Prussia, Holland, Russia, Spain, and Turkey. The Pumps are portable, as they may be easily removed from the ship and put to work in a boat alongside in a few minutes. Each pump is fitted with a large foot valve plate (which may be placed in any part of the vessel most convenient), and from which communication is made to any number of distinct compartments in the vessel. In case of any of these pipes fouling, the water, by an almost momentary attachment, may be forced from the Pump downwards, so as to clear all obstructions, preventing any possibility of stoppage. The valves are of the simplest description, and being faced with ordinary leather discs, the latter may be renewed in a few minutes by the most inexperienced hands. By the peculiar construction of these Pumps, a most perfect and uninterrupted flow of water may be maintained; so uniform as to be undistinguishable from that proceeding from a cistern. The Pumps are made of several sizes, those of 7, 9, and 12 inches bore being most generally used. They may, however, be ordered of any dimensions required, and may be fitted either with one or two fly wheels. A standard, &c., is also supplied with these Pumps, to enable them, when necessary, to be used as ordinary hand-lever pumps.

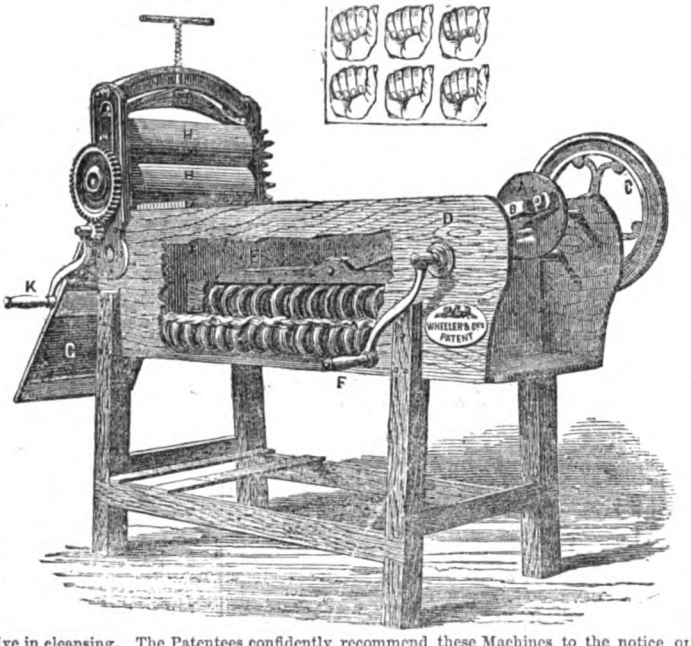
JOSIAH STONE, Engineer, Manufacturer of all descriptions of PUMPS and FIRE ENGINES for Land and Ships' Use; Brass and Iron Founder and Finisher, Nail and Rivet Maker, &c.

CONTRACTORS FOR FIRE-ENGINES, ETC., TO THE WAR DEPARTMENT,

RAILWAY STATION, DEPTFORD, AND 12 GARLICK HILL, CITY, E.C.

(97)

T. WHEELER AND CO.'S
"OXONIAN KNUCKLE WASHING MACHINE."



THE Improvements in these New Inventions are the non-exposure of the user's hands to the dangerous parts of the Machine, and the rapidity with which the work is done. These Machines have neither bands or wheels passing on the outside, wherein lies the liability to accident. The rubbers are the truest representation of the knuckles or hand washing yet brought out; the compensating floating rubbers work at right angles, backward and forward, in the same manner as does the hands. These Machines can be supplied with rubbers that represent a person's hand in the action of rubbing; the knuckles, finger nails, and palm of the hand being truly modelled. They are capable of Washing Clothes of every description whatsoever, the largest bedding to the most delicate piece of muslin can be washed without breaking a single thread; in fact, such is the delicacy of the action of these Machines, that the paper you are now reading can be passed between the rubbers without sustaining any injury, at the same time being thoroughly effective in cleansing. The Patentees confidently recommend these Machines to the notice of Laundresses, Heads of Families, Hotels, Emigrants, &c. So simple is the action of this Machine, that a boy or girl of 10 or 12 years of age can work it; the only skill required is to soak the clothes one hour before placing them in the Machine, placing a portion of the clothes at the handle end of the Machine; laying on the rubbers a part of them; turn the handle, and the clothes will pass through between the rubbers to the opposite end, effecting a saving of at least 50 per cent.

Prices: Washing Machines, £1 6s., £2 6s., £3 6s., £4 10s., £5 15s.; Washing, Wringing, and Mangling, £8 £10 15s., £14 14s.—Full Instructions sent with every Machine. Testimonials or References sent on application.

MANUFACTORY, ALBION WORKS, PARK END STREET, OXFORD (114)

TO BRASS-FOUNDERS, ENGINEERS, &c.

THE PATENT PLUMBAGO CRUCIBLE COMPANY having completed the enlargement of their premises, beg to call the attention of all users and shippers of Melting Pots to the great superiority of the PATENT CRUCIBLES, which have been used during the last three years by some of the largest melters in England and abroad. In addition to their capabilities of melting an average of from thirty-five to forty pourings; they are unaffected by change of temperature, never crack, but can be used till worn out, requiring only one annealing for several days' work, and become heated much more rapidly than ordinary pots, effecting thereby a saving of more than fifty per cent. in time, labour, fuel, and waste. The Patent Plumbago Crucible Company also manufacture and import clay crucibles, muffles, portable furnaces, sublimate pans and covers, glass-pots, all descriptions of fire-standing goods, and every requisite for the assayer and dentists. For Lists, Testimonials, &c., apply to Battersea Works, London, &c. (43

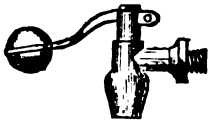
PUMPS
FOWLER & Co.
WHITEFRIARS STREET,
FLEET STREET,
— LONDON. —

HYDRAULIC MACHINERY OF EVERY DESCRIPTION, FOR HOME USE OR EXPORT, UPON THE LARGEST, OR SMALLEST SCALE. MANUFACTURED, FIXED, OR LENT ON HIRE: AN EXTENSIVE STOCK KEPT READY FOR GENERAL PURPOSES.

(108)

HIGH-PRESSURE VALVE-COCKS,
LAMBERT'S PATENT.

Equilibrium Ball Valve. Cottage Closet Valve.



The Equilibrium Ball-Valve is simple and certain in its action, and is cheaper than the common cocks now in use.

The Cottage Valves are suitable for application to any kind of basin; and, as they shut against the pressure, no concussion in the pipes can possibly occur.

These cocks have been extensively and most successfully used in many towns, under continuous high pressure, varying from 100 to 350 feet; their efficiency and durability is, by experience, established.

THOMAS LAMBERT and SON,

Brass Founders, Short-street, New-cut, Lambeth.

(86)

PUMPING MACHINERY.

GWYNNE AND Co., Engineers, London, manufacture and supply the following Machinery, of the most approved construction and with all the latest improvements:—Portable and Fixed Steam-Engines and Boilers of every description; Waterwheels, Windmills, Horse and Hand-power Machines; Pumping Machinery for the Supply of Towns, Cities, and Districts, and for the Irrigation of Coffee, Cotton, Indigo, Sugar-cane, and Rice Estates, for pumping out Coffer-dams, Canals, Dry Docks, Reservoirs, &c. They also manufacture and supply the Pumping and other Machinery for Paper, Pulp, and Fulling Mills, Breweries, Distilleries, Tanneries, Starch Works, Bleaching, Dyeing, and Calico Printing Works, Chemical Works, Silk, Cotton, and Flax Mills, and Manufactories in general. All Letters not paid will be refused. Illustrated Price Lists forwarded on receipt of Six Postage Stamps.—GWYNNE AND Co., Hydraulic and Mechanical Engineers, Essex-wharf, Strand, London.

For Exportation—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (24)

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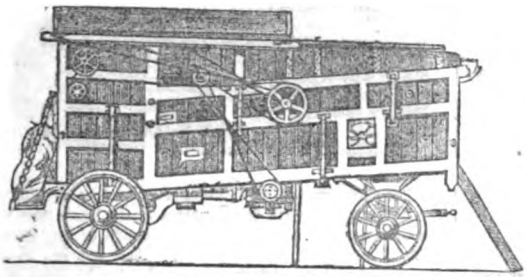
RUSTON, PROCTOR, AND CO.,

LINCOLN; AND ANCHOR ALLEY, 68 UPPER THAMES STREET, LONDON;

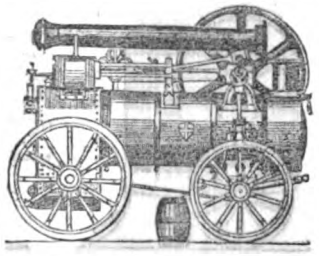
AGRICULTURAL ENGINEERS AND MILLWRIGHTS,



MANUFACTURE

PRIZE PORTABLE and FIXED STEAM ENGINES,
SMITH'S PATENT STEAM PLOUGHS,
PATENT PRIZE COMBINED THRASHING MACHINES, containing R. P. and Co.'s NEW PATENT CORN CLEANER,
SAWING MACHINERY, CIRCULAR and VERTICAL of all Sizes,
MILLS of all Kinds, FIXED and PORTABLE, for Grinding Bones, Flour, Linseed, Mortar, Clay, &c.
PUMPS, CRANES, CRABS, SCREW-JACKS, &c.

Illustrated Catalogues, with full Particulars and Testimonials, may be had by applying as above. (34)



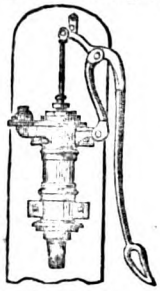
JOHN WARNER AND SONS,

8 CRESCENT, JEWIN STREET, LONDON.

HYDRAULIC ENGINEERS, BRASS AND BELL FOUNDERS,

PATENTEES OF IMPROVEMENTS IN PUMPS.

Patent Vibrating Standard Lift and Force Pumps.



PATENT CAST-IRON PUMP fitted with J. Warner and Sons' Patent Bucket and Sucker, which cannot clog in action, for Farms, Cottages, and Wells, not exceeding 28 feet.

Dia.	Height.	£	s.
2½ in. short	1 ft. 7 in.	1	10
2½ in. long	3 ,, 3 ,,	1	14
3 ,,	6 ,, 6 ,,	2	8
3½ ,,	3 ,, 6 ,,	3	3
4 ,,	3 ,, 6 ,,	3	3
2½ ,,	3 ,, 6 ,,	3	3
2½ in. short, with 15 feet of Lead Pipe attached, ready for fixing		2	14
2½ in. long. do. do.		2	18

PATENT BRASS LIFT AND FORCE PUMP, on Plank, for House purposes, supply of Cisterns, &c.

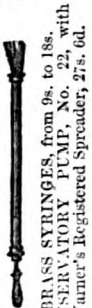
	£	s.
2½ inch	6	0
3 ,,	7	5
3½ ,,	8	0

A lighter Pump of 3 inches diameter, can be supplied if required 5 15

IMPROVED LIQUID MANURE OR GENERAL PORTABLE PUMP.

These Pumps are fitted with J. Warner and Son's Patent Bucket and Sucker, and cannot clog in action. The Barrel is of Galvanized Iron, not likely to corrode, and can be raised or lowered at pleasure. The legs will fold together, and the whole may be carried on shoulder to any pond or tank required.

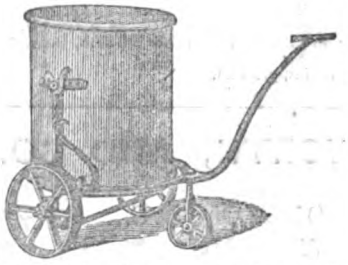
4½ in. Liquid Manure Pumps, with legs, £3 3s.; 1¼ in. Gutta Percha Suction Pipe, 1s. 11d. per foot; 2 in. Flexible Rubber and Canvass Suction Pipe, on Wires, 3s. 3d. per foot. The Barrel is 27½ inches long, and the legs are 5 feet high. Larger sizes of the above if required.



BRASS SYRINGES, from 9s. to 18s.
CONSERVATORY PUMP, No. 22, with Warner's Registered Spreader, 27s. 6d.

Galvanized Iron Tub GARDEN ENGINE, with Warner's Registered Spreader, is strongly recommended for durability and low price, viz., £2 19s., to hold Ten Gallons. Larger sizes, in either wood or iron.

WARNER'S SWING WATER-BARROW.
(To hold Thirty Gallons), £3 3s.,



is intended for all large Establishments where much watering is done by the watering-pot. By its use much time and labour of the Gardener are saved, particularly where the Tank, Pond, or Pump is at a distance from the garden.

MUSICAL SHEEP BELLS, with Straps, in sets of 6, 19s.; ditto, in sets of 8, 25s.; ditto, in sets of 12, 38s.

WARNER'S CATTLE AND SHEEP BELLS, in sets of 6, with Straps, 13s. per set.

Bells for Churches, Chapels, Colleges, Schools, Turret Clocks, &c., cast for any size, note, or weight, singly or in peals. Tuned by machinery. Stocked and wheeled ready for fixing. Old Bells re-cast or taken in exchange.

The great 16-ton Bell, for the Houses of Parliament, was made by JOHN WARNER and SONS, 1856, under their Patent.

May be obtained of any Ironmonger or Plumber, in town and Country; or of the Patentees and Manufacturers, as above. (30)

VOKINS & HURD,

SEYMOUR HOUSE, JUBILEE PLACE, CHELSEA.

HOT-HOUSE BUILDERS

AND

Hot-Water Apparatus Manufacturers.

Plans and Estimates forwarded on Application. (149)

THE SILVERTON INDIA-RUBBER WORKS,

OPPOSITE

H. M. DOCKYARD, WOOLWICH.

INDIA-RUBBER MANUFACTURES

WITH ALL

RECENT IMPROVEMENTS.

Warehouses, 3 and 4 Bishopsgate Within, E.C. (145)

CAUTION.

TO ARCHITECTS AND BUILDERS.—In consequence of numerous complaints, the Patentee begs to inform the above, that all genuine

SMITH'S PATENT DOOR SPRINGS,

For Swing Doors, are stamped with Name and Address, thus—

SMITH, PATENTEE, 69 PRINCES STREET, LEICESTER SQUARE, LONDON,

and that Springs thus marked are warranted.

SMITH'S PATENT WEATHER-TIGHT CASEMENT FASTENING AND SILL-BARS

are admitted by all to be the most perfect invention for the purpose. Diagrams and List of Prices on application. (143)

THE GENERAL IMPLEMENT CO.,

36 BOTHWELL STREET,

GLASGOW.

Agricultural Implements of all kinds.

MOWING & REAPING MACHINES.

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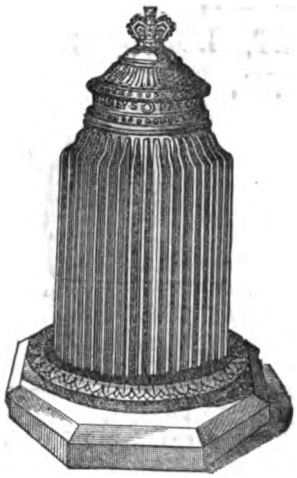

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(LIMITED,)

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(MANAGER—Mr. WOODCOCK.)

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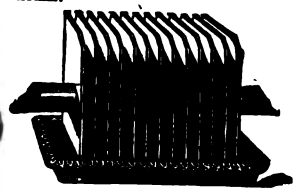

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(12)

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PYRO-PNEUMATIC FIRE-LUMP WARMING AND VENTILATING STOVE GRATES,

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KUKLA'S newly-invented Deflagrator—the first and only perfect GAS STOVE. Guaranteed to burn without flue—without dust, smell, or smoke, producing a great and pure heat with the least expenditure of Gas.—*Vide Society of Arts' Journal.*

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The New Gas Cooking Stove for 10 persons, price £3.

(103)

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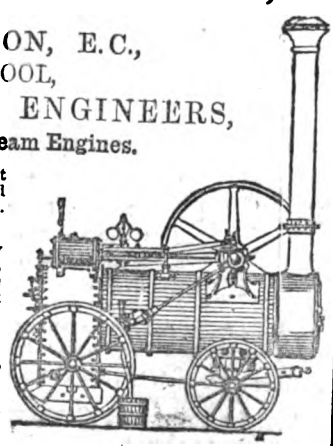

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(23)

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"The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight. The water has cut these deep pits almost through the pipe, and not only upon the portion which we have illustrated, but has formed similar chasms throughout the entire length."—*Expositor.*

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The Gutta Percha Company have been favoured with the following letter,

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Toilet-trays,
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Submarine and Subterranean Telegraph Wires Insulated with Gutta Percha.

The Gutta Percha Company, Patentees,

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(54)

Published by RICHARD ARCHIBALD BROOMAN, at the MECHANICS' MAGAZINE Office, 166 Fleet-street, in the Parish of St. Dunstan's-in-the-West, in the County of Middlesex; and printed by JAMES JUDD and HENRY ALEXANDER GLASS, of 14 Holford-square, Pentonville, in the County of Middlesex, at their Office, 38A New Bridge-street, in the Parish of St. Anne's Blackfriars, in the City of London.—Friday, February 13 1829.

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 9. [NEW SERIES.]

LONDON: FRIDAY EVENING, FEBRUARY 25, 1859.

PRICE, FOURPENCE. BY POST 5d.

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PUBLIC EXAMINATIONS in ELEMENTARY DRAWING.—PUBLIC EXAMINATIONS in DRAWING, conducted by the SCIENCE and ART DEPARTMENT, will be held in the month of March next, at the District Schools of Art, at

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PERENNIAL AND ITALIAN RYE-GRASS, &c.,

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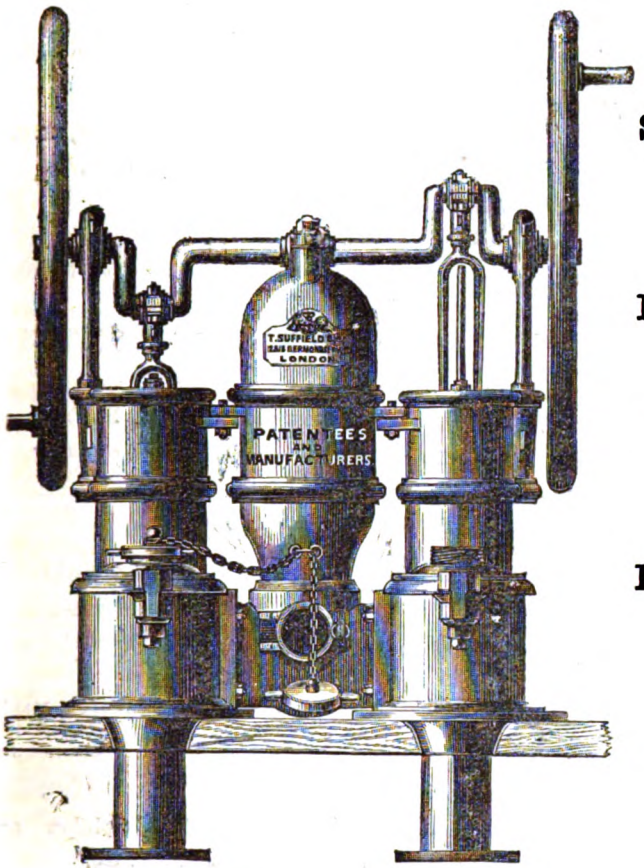

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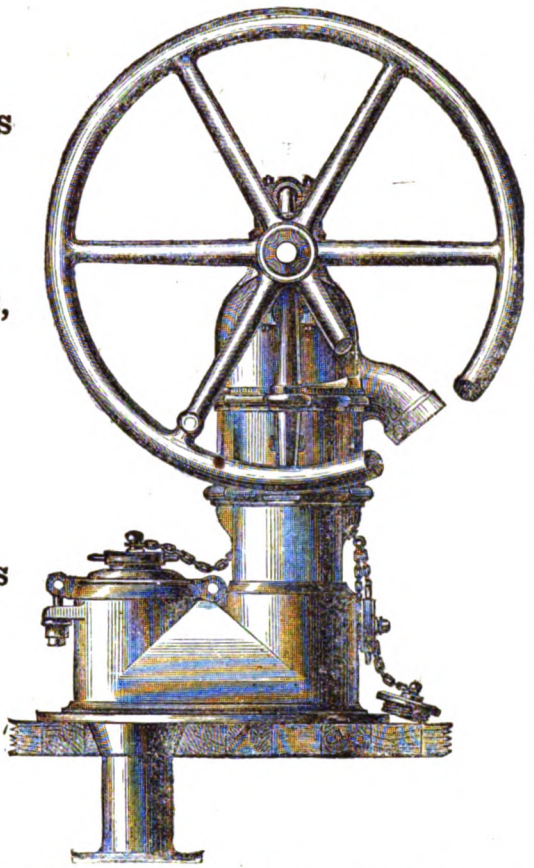

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PRICES CURRENT OF METALS.

London, 25th Feb., 1859.

		£ s. d.		£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N.					
of England	pr. ton	6 10 0	to	6 15 0	nett
Welsh Bars, in Wales	,,	6 5 0	,,	6 10 0	3
Staf. Bars at the Works	,,	7 0 0	,,	7 10 0	2½
,, Hoops	,,	8 0 0	,,	8 10 0	,,
,, Sheets, Singles	,,	8 15 0	,,	9 0 0	,,
,, Nail Rods	,,	7 0 0	,,	7 10 0	,,
,, Boiler Plates	,,	8 10 0	,,	9 0 0	,,
Scotch Pig, M.-Nos. Warrants, at Glasgow	,,	2 11 6			nett
Do. No. 1, Good Brands	,,	2 11 0	,,	2 12 6	,,
Scotch Bars	,,	7 5 0	,,	8 0 0	3
Swedish Bars, in London	,,	3 10 0	,,	14 0 0	2½
COPPER, Sheet and Sheathing	per lb.	0 1 0½			3
Tough Cake and Tile	,, ton	112 10 0			,,
Best Selected	,,	115 10 0			,,
Australian	,,	114 10 0	,,	115 0 0	,,
South American	,,	105 0 0			,,
Yellow Metal Sheathing	per lb.	0 0 10½			,,
STEEL, Swedish Keg	pr. ton	20 0 0			2½
,, Faggot	,,				,,
TIN, English, Block	pr. cwt.	6 6 0			2½
,, Bar	,,	6 7 0			
Foreign, Banca	,,	6 12 0			nett
,, Straits	,,	6 10 0			,,
TINPLATES, Charcoal, I.C.	pr. box	1 13 0	,,	1 14 0	3
,, Coke, I.C.	,,	1 6 0	,,	1 8 0	,,
LEAD, Pig, English	pr. ton	23 0 0	,,	23 10 0	2½
,, Spanish	,,	22 10 0	,,	22 15 0	,,
,, Sheet	,,	23 10 0	,,	23 15 0	,,
SPELTER, on the spot	pr. ton	22 5 0	,,	22 7 6	nett
,, for arrival	,,	22 5 0	,,	22 7 6	,,
ZINC, English, Sheet	,,	30 0 0			1½
QUICKSILVER	per lb.	0 2 0			1½

REMARKS.—We have had a very quiet week in Metals, and no alteration of any moment to be noted in prices.

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METAL AND COAL TRADES, &c.

[FROM OUR OWN CORRESPONDENT.]

Board of Trade Returns: Export of Metals and Machinery—The Iron Trade in the Past Week in South Staffordshire and other Districts—Coal and the Colliers of South Staffordshire, Wales, and the North—Scotch Iron Trade—Attempt to Resuscitate the Whitby Iron Company—The General Hardware Districts and their Trade.

THE Board of Trade Returns for December, which have been issued only since our last, show that India took the largest amount of British manufactures during the year 1858, the United States ranking second in this respect, and the Australian colonies third. Among the articles which show an increase in the year's exports, as compared with 1857, are machinery, cast iron, and brass manufactures. Annexed is the declared value of the prominent metalliferous products of Great Britain, with coal and culm exported in 1858, compared with the quantity exported in the two preceding years:—

	1856.	1857.	1858.
Coals and Culm	2,826,582	3,210,661	3,052,753
Hardwares and cutlery	3,767,598	4,016,230	3,280,466
Machinery: steam engines	819,067	1,069,269	1,096,288
,, other sorts	1,897,386	2,814,420	2,507,701
Metals: pig iron	1,385,118	1,609,115	1,101,118
,, bar & rod iron	6,217,524	6,262,605	5,223,840
,, iron wire	195,034	242,087	208,444
,, cast iron	712,177	753,334	820,924
,, wrought-iron	3,720,433	3,790,356	3,291,938
,, steel	735,823	748,579	589,781
,, copper, unwrought	673,224	852,055	696,523
,, copper: sheets and nails, including yellow metal	1,664,648	1,673,186	1,620,447
,, other wrought copper	189,181	454,855	381,866
,, brass	121,206	143,953	155,293
,, lead	582,269	549,523	459,656
,, tin plates	1,407,906	1,500,116	1,351,193

The increased exportation of steam engines was chiefly to Russia and Spain, but extended also to India and Australia; while the shipments of other descriptions of machinery diminished in respect of Spain, Holland, and India. The falling off in pig-iron was general, and amounted in the case of Russia to more than one-half. The iron trade of the year may be thus summarised:—

	Pig Iron.	*Bar and Rod Iron.*	*Wrought Iron.*
Prussia	£107,653	—	—
Holland	302,683	£171,624	£158,391
France	194,383	171,753	—
Hanse Towns	—	81,672	—
Sardinia	—	99,082	—
India	—	1,141,420	576,443
Australia	—	149,107	349,599
United States	149,077	663,753	297,975
British North America	28,327	375,303	220,395
Other countries	318,995	2,364,126	1,689,135

The increased exportation of cast-iron is referrable to the demand from Egypt, the United States, and India. Copper and yellow metal sheathing declined, but there was a very large increase in the orders executed for India. The decline in the tin-plate trade was general.

Respecting the iron trade of the country generally it may be stated that fewer orders have come to hand this week than last. The Welsh and North of England firms who have laid themselves out for the rail trade, are more active than the districts dependent upon the general commercial demand. The orders from the States, however, received since our last, have been of as great value as was expected, and the advices thence continue favourable. The existing tariff, it is confidently asserted, will remain unaltered this year. Home orders very sluggish; for the Continent scarcely anything doing. On account principally of the United States demand, the steel houses are in tolerably full operation. Prices of first-class iron remain firm. Makers of less repute are not indisposed to give way a little. The real value of good hot blast pigs cannot be said to be more than £3 10s. At this rate they may be bought for present necessities.

South Staffordshire coal of domestic samples is less active; for manufacturing uses, however, there continues tolerable activity. Stocks are closely worked up. Some of the colliers in that district have struck for an advance of 6d. per day. They are almost confined to Wednesbury and Darlaston, where about 1,000 colliers and stone cutters are "out;" their prospects of obtaining the advance are very slender.

On Saturday about 30 colliers at the mine of Messrs. Stott, Dearden, and Co., Smallbridge, Rochdale, turned out for an advance of 1s. per score tubs. There are now five colliery turn-outs in that locality.

There is an active shipment of rails and coal going forward from Cardiff, the coal and ironmasters of which locality are experiencing an advantage over their brethren at Newport, in consequence of the somewhat restrictive port dues of the latter town. They are such as to induce one of the iron and coal masters of Newport to prepare, it is reported, to transmit to Liverpool by rail instead of by water.

The past week's shipments from Glasgow have been a falling off as compared with the corresponding week last year, of 3,174 tons, the figures being 7,226 tons this year against 10,400 last year. In Glasgow, on Tuesday, No. 1 was quoted at from 50s. 6d. to 50s. 9d.; Mixed Nos., warrants, 51s. 6d. to 51s. 7½d.; Mixed Nos., maker's iron, 50s. 6d. to 50s. 9d.; No. 3, 50s. 6d. to 50s. 9d. Market quiet and steady.

An attempt is being made to resuscitate the Whitby Iron Company, which was destroyed by a landslip. The proposal is to issue preference shares, which are expected to be taken readily by the old shareholders.

In the hardware trades of Birmingham, Sheffield, Wolverhampton, and other towns, there is a feeling on most hands of disappointment at the state of the trade, which is by no means what, at the beginning of the year, it was confidently expected it would be. Travellers report a desire to purchase as existing amongst the country shopkeepers, with, however, an indecision which prevents them from doing so, owing to the fear that England will, before long, be embroiled in a continental war, with a consequent suspension of trade.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers

CAST-IRON GIRDER BRIDGE.—Over river Weaver, Nantwich. Plans, &c., of T. Bower, jun., architect, Town Hall, Nantwich. Tenders March 2.

GAS WORKS.—Separate tenders for buildings and iron plant for new works for Eltham Gas Light and Coke Co., on Eltham Green, Kent. Plans, &c., Mr. Haworth, surveyor, Eltham. Tenders March 9.

CAST-IRON WATER WHEEL, *Thornton, near Pickering, Yorkshire.*—Construction and erection of, with shafting, &c., at Thornton Paper Mills. Plans, &c., Mr Marsden's warehouse, 53 Orchard-street, Sheffield, until March 1. Tenders March 10.

GAS, *Tutbury.*—Town lighting district. Tenders for supply for one year, to be sent to the Church Sunday School-room, Monday, 7th March. Particulars of Mr. Barber, secretary.

WIDENING MILL BRIDGE, *Acton Trussel, Stafford.*—Plans, &c., County Surveyor, "The Hollies," Stafford, to March 3. Tenders March 7.

CONSTRUCTION OF A MAIN SEWER, *Warrington.*—Drawings and specifications from Mr. B. Payne Coxon, Borough engineer, on and after 23rd inst. Tenders to chairman of Paving Committee, at Town Hall, by 7th March.

RAILWAY, *North British.*—Station-house and office at Leith. Plans, &c., Mr. J. Jopp, C.E., 118 George-street, by 1st of March. Tenders, March 7.

HARBOUR, *Scotland.*—Additional basin and a sea wall at Elgin and Lossiemouth Harbour. Plans, &c., by Mr. Abercrothy, C.E., Sondon, at the Town Clerk's office, Elgin, or at Harbour Office, Lossiemouth. Tenders with the Town Clerk, March 5.

WATERWORKS, *Glasgow Corporation.*—Several large valves and sluices required at the Mugdock Reservoir. Drawings, &c., of Mr. J. P. Bakeman, engineer, 154 St. Vincent-street, Glasgow, and Little George-street, Westminster. Tendered, March 1.

GASHOLDER, *Omagh.*—Metal tank of 27½ ft. diameter by 10 ft. 3 in. deep. Plans with the manager of the works. Tenders, March 2; works to be completed before July 1.

RIGA FIR TIMBER AND HAND MASTS, *Navy.*—To Her Majesty's Dockyards, with Dantzic Fir Timber and Deck Deals and Norway Spars. Tenders to 2 o'clock March 15, Somerset Place.

HAMMOCKS, *Navy.*—50,000 bleached sacking hammocks at Deptford Dockyard. Tenders to 2 o'clock, March 8, Somerset Place, where pattern.

GALLIPOLI OIL, *Navy.*—30,000 gallons at Woolwich Dockyard. Tenders 2 o'clock, March 8, Sec. Ad. Somerset Place, where forms.

COAL, *Navy.*—400 tons of South Wales, at Bathurst, river Gambia. Tenders March 8.

ROADS, *Strand District.*—Paving granite kerb-channels, and dressed granite, &c; also relaying the carriage ways and foot ways. Printing forms at 5 Tavistock-place, Covent Garden. Tenders to March 2.

ROAD, &c., *Worcester to Leigh.*—Widening road and building earth-house at the Carthouse, Hamlet of Brandsford, Worcestershire. Plans of Mr. Martin Curther Sansome-place, Worcester. Tenders to March 1

PAVING, *Holborn District.*—Removing carriage way, pavin Goswell-street, and re-laying with Aberdeen granite cubes. Specifications, &c., with Mr. Lewis H. Isaacs, C.E., surveyor, at the office of the Board of Works, Little Gray's-Inn-lane. Tenders to 28th inst.

REMOVING DUST, &c., *Holborn District.*—Removing dust and ashes, and secondly, carting away the slop and street sweepings. Apply to Mr. Lewis H. Isaacs, as a ... Tenders to 28th inst.

SEWER MATERIALS AND JOBBING, *Holborn District.*—For twelve months. Particulars of Mr. Lewis. Tenders to Feb. 28.

THE SAME, *St. Martin's-in-the-Fields.*—From Lady-Day next. Particulars of Mr. Burstall, surveyor, 15 Castle-street, Longacre, for 5s. Tenders to March 3.

Strand District.—For three years. Forms at 5 Tavistock-street, Covent-garden, for 10s. 6d. Tenders to March 2.

Whitechapel District.—For cleansing the streets and gullies, removing the dust, &c., watering roads and streets. Forms of tender at the office, 15 Great Alie-st., Whitechapel. Tenders before four, 7th of March.

Parish of St. George, Hanover-square.—Masons' and paviors' works, and furnishing horses and carts for day work, removing dust, providing drain pipes, &c. Forms of E. C. Richman, surveyor, 43 Lower Belgrave-place, between nine and eleven in the morning. Tenders there or at Board Room, Mount-street, Grosvenor-square, 5th March.

ALTERATIONS, *Clay Hill, Bushey, Herts.*—To a house and premises. Plans, &c., of Thomas Lavender, architect and surveyor, Watford, Herts. Tenders there by noon 28th inst.

CHURCH, *Welburn, near Castle Howard, Yorkshire.*—Plans at the Boys' School there. Tenders to Feb. 28.

CEMETERY CHAPEL, *Tong.*—Cemetery chapel and entrance lodge, township of Tong. Plans, &c., of Messrs. Mallinson and Healey, architects, Tyrrel-street, Bradford. Tenders to March 3.

LOCK-UP AND COURT ROOM, *Ingleton.*—Plans with the Superintendent of Police there. Tenders to March 3.

WORKHOUSE, *Leeds.*—Slaters', plumbers', glaziers', painters' work. Drawings, &c., of Messrs. Perkin and Backhouse, architects, Exchange-buildings, Leeds, to March 1. Tenders, March 2.

WAREHOUSE AND DRYING SHED, *Warrington.*—Drawings and all particulars after 24th, at the office of Mr. J. Woolstencroft, architect, 23 Pall-mall, Manchester. Tenders to 5th March.

HOUSES, *Leeds.*—One house and shop and six cottages adjoining. Plans at the Lamb Inn, Kirkgate, to 28th inst. No date.

HOUSE, *Clay Hill, Bushey, Herts.*—Alterations, additions, and repairs. Plans, &c., of Mr. Lavender, architect and surveyor, Watford. Tenders to noon, on 28th inst.

GARDENER'S HOUSE, *Ellonoastle, Aberdeenshire.*—Masons', carpenters', slaters', and plasterers' work. Plans, &c., with T. F. Jameson, Langley-cottage, Ellon. Tenders to 28th inst.

DWELLING HOUSE, *Priestwells, Parish of Insch, Aberdeenshire.*—Mason, carpenter, slater, and plaster work. Plans of overseer at the farm. Tenders to March 4.

STABLES AND COACH-HOUSE, *Strickenhouse, Aberdeenshire.*—Masons', wrights', carpenters', plasterers', slaters', and plumbers' work. Plans at same place. Tenders to March 1.

HOUSE, *Windsor.*—A house at Windsor, designed for dwellings for labourers' families. Plans, &c., of Wm. Towers, secretary to Windsor Royal Society, to whom tenders before the 1st March.

FARM HOUSE, *Sleaford, Lincolnshire.*—On Timberland Farm. Drawings, &c., at Mr. Payne's, Saxilby, near Lincoln, to whom tenders on March 2.

CHURCH, *Aldershot.*—For enlarging, &c., parish church, Aldershot, Hants. Plans, &c., up to evening of 19th inst. (to-morrow), at offices of Messrs. Eggar, architects, Farnham, Surrey. Tenders to Building Committee, care of Rev. J. Bennett, the parsonage, Aldershot, by 3 o'clock 1st March.

PLANS FOR A WORKHOUSE, *Blackburn.*—Workhouse, for 700 people, to cost £12,000; £50 for the best plans. Particulars, &c., from the clerk of the guardians, to whom plans on the 1st April,

DRAUGHTSMAN, *Birmingham.*—To make finished and detail drawings of railway carriages, &c. Letters to Messrs. J. Wright and Sons, Saltley Works, Birmingham.

ENGINEERS.—A thorough practical engineer, apply personally to G. Buchanan & Co., Colonial and Sugar Machinery Engineers, 25 Bucklersbury, E.C.

SECOND-HAND CONTRACTOR'S RAILS.—Flange pattern, 35 to 40 lbs. per yard, delivered at a port on south or west coast. Lawrie and Hagger, 33 Lombard-street, E.C.

PUMPS WANTED.—Cast iron flange-pipes, about 15 in diameter. B. T., Chadborn, Pinxton, near Alfreton, Derbyshire.

STATIONARY ENGINE, of 30-horse power, to drain a mine in Devon. James G. Smither, Falcon-court, 32 Fleet-street E.C.

TRAVELLER, to sell wire, rope, and colliery stores in mining districts. "N. X.," 26 Fleet-street.

LEAD SMELTER.—An under-manager. "V. D. R.," Post-office, Liverpool.

MINE CAPTAIN.—One who speaks Welsh, to take management of a copper-mine in Wales. "B. B.," 26 Fleet-street.

CLERK OF WORKS, *Wells.*—To superintend the construction of 2,600 yards of sewers in Wells. Salary, £2 per week, 3 months certain. Particulars from the town clerk, to whom offers on the 1st March.

PERMANENT CLERK OF WORKS.—Apply to Messrs. Beadel, Son, and Chancellor, architects, Chelmsford.

SURVEYOR AND DRAUGHTSMAN.—To "T. A. B.," Mrs. Jones, ironmonger, Mardol Head, Shrewsbury.

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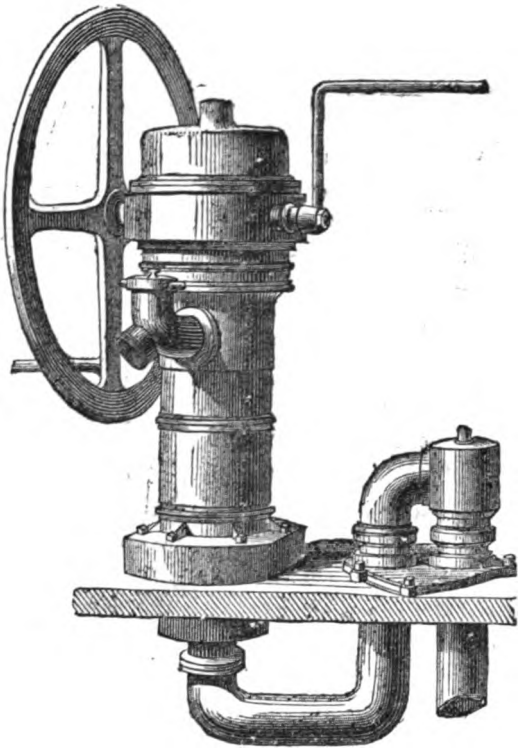
Under the Patronage of the Board of Admiralty.

SHIPS' PUMPS OF HER MAJESTY'S NAVY.

JOSIAH STONE,

Sole Manufacturer of DOWNTON'S well-known and much approved SHIPS' PUMPS, which have been used in preference to all others on board the vessels of Her Majesty's Navy, for upwards of thirty years, and have given the greatest satisfaction, effectually answering all the purposes required of any Ships' Pumps, and capable of throwing most powerful jets of water in case of fire.



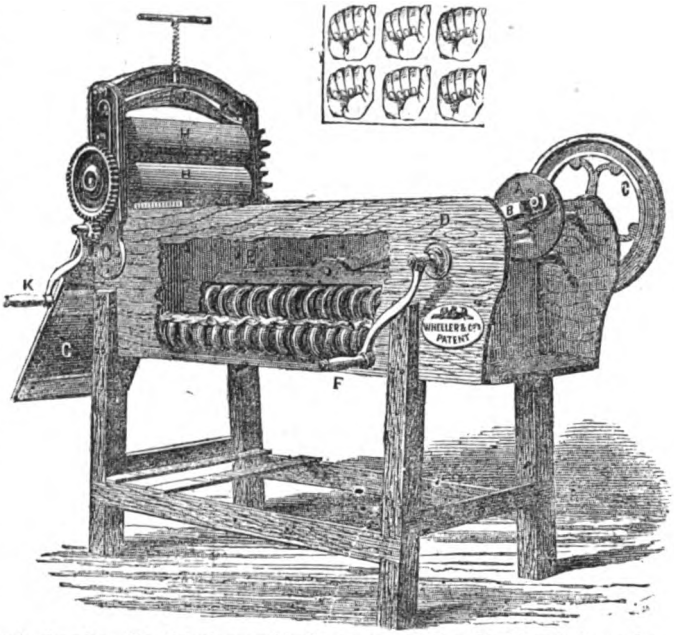
These Pumps have also been most extensively used on board merchant vessels, both at home and abroad, and have been supplied to the Royal Navies of France, Prussia, Holland, Russia, Spain, and Turkey. The Pumps are portable, as they may be easily removed from the ship and put to work in a boat alongside in a few minutes. Each pump is fitted with a large foot valve plate (which may be placed in any part of the vessel most convenient), and from which communication is made to any number of distinct compartments in the vessel. In case of any of these pipes fouling, the water, by an almost momentary attachment, may be forced from the Pump downwards, so as to clear all obstructions, preventing any possibility of stoppage. The valves are of the simplest description, and being faced with ordinary leather discs, the latter may be renewed in a few minutes by the most inexperienced hands. By the peculiar construction of these Pumps, a most perfect and uninterrupted flow of water may be maintained; so uniform as to be undistinguishable from that proceeding from a cistern. The Pumps are made of several sizes, those of 7, 9, and 12 inches bore being most generally used. They may, however, be ordered of any dimensions required, and may be fitted either with one or two fly wheels. A standard, &c., is also supplied with these Pumps, to enable them, when necessary, to be used as ordinary hand-lever pumps.

JOSIAH STONE, Engineer, Manufacturer of all descriptions of PUMPS and FIRE ENGINES for Land and Ships' Use; Brass and Iron Founder and Finisher, Nail and Rivet Maker, &c.

CONTRACTORS FOR FIRE-ENGINES, ETC., TO THE WAR DEPARTMENT,

RAILWAY STATION, DEPTFORD, AND 12 GARLICK HILL, CITY, E.C. (97)

T. WHEELER AND CO.'S
"OXONIAN KNUCKLE WASHING MACHINE."



THE Improvements in these New Inventions are the non-exposure of the user's hands to the dangerous parts of the Machine, and the rapidity with which the work is done. These Machines have neither bands or wheels passing on the outside, wherein lies the liability to accident. The rubbers are the truest representation of the knuckles or hand washing yet brought out; the compensating floating rubbers work at right angles, backward and forward, in the same manner as does the hands. These Machines can be supplied with rubbers that represent a person's hand in the action of rubbing; the knuckles, finger nails, and palm of the hand being truly modelled. They are capable of Washing Clothes of every description whatsoever, the largest bedding to the most delicate piece of muslin can be washed without breaking a single thread; in fact, such is the delicacy of the action of these Machines, that the paper you are now reading can be passed between the rubbers without sustaining any injury, at the same time being thoroughly effective in cleansing. The Patentees confidently recommend these Machines to the notice of Laundresses, Heads of Families, Hotels, Emigrants, &c. So simple is the action of this Machine, that a boy or girl of 10 or 12 years of age can work it; the only skill required is to soak the clothes one hour before placing them in the Machine, placing a portion of the clothes at the handle end of the Machine; laying on the rubbers a part of them; turn the handle, and the clothes will pass through between the rubbers to the opposite end, effecting a saving of at least 50 per cent.

Prices: Washing Machines, £1 6s., £2 6s., £3 6s., £4 10s., £5 15s.; Washing, Wringing, and Mangling, £8 £10 10s., £14 14s.—Full Instructions sent with every Machine. Testimonials or References sent on application.

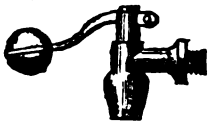
MANUFACTORY, ALBION WORKS, PARK END STREET, OXFORD (114)

TO BRASS-FOUNDERS, ENGINEERS, &c.

THE PATENT PLUMBAGO CRUCIBLE COMPANY having completed the enlargement of their premises, beg to call the attention of all users and shippers of Melting Pots to the great superiority of the PATENT CRUCIBLES, which have been used during the last three years by some of the largest melters in England and abroad. In addition to their capabilities of melting an average of from thirty-five to forty pourings; they are unaffected by change of temperature, never crack, but can be used till worn out, requiring only one annealing for several days' work, and become heated much more rapidly than ordinary pots, effecting thereby a saving of more than fifty per cent. in time, labour, fuel, and waste. The Patent Plumbago Crucible Company also manufacture and import clay crucibles, muffles, portable furnaces, sublimate pans and covers, glass-pots, all descriptions of fire-standing goods, and every requisite for the assayer and dentists. For Lists, Testimonials, &c., apply to Battersea Works, London, &c. (43

HIGH-PRESSURE VALVE-COCKS, LAMBERT'S PATENT.

Equilibrium Ball Valve. Cottage Closet Valve.



The Equilibrium Ball-Valve is simple and certain in its action, and is cheaper than the common cocks now in use.

The Cottage Valves are suitable for application to any kind of basin; and, as they shut against the pressure, no concussion in the pipes can possibly occur.

These cocks have been extensively and most successfully used in many towns, under continuous high pressure, varying from 100 to 350 feet; their efficiency and durability is, by experience, established.

THOMAS LAMBERT and SON,

Brass Founders, Short-street, New-cut, Lambeth. (80)

PUMPING MACHINERY.

GWYNNE AND Co., Engineers, London, manufacture and supply the following Machinery, of the most approved construction and with all the latest improvements:—Portable and Fixed Steam-Engines and Boilers of every description; Waterwheels, Windmills, Horse and Hand-power Machines; Pumping Machinery for the Supply of Towns, Cities, and Districts, and for the Irrigation of Coffee, Cotton, Indigo, Sugar-cane, and Rice Estates, for pumping out Coffer-dams, Canals, Dry Docks, Reservoirs, &c. They also manufacture and supply the Pumping and other Machinery for Paper, Pulp, and Fulling Mills, Breweries, Distilleries, Tanneries, Starch Works, Bleaching, Dyeing, and Calico Printing Works, Chemical Works, Silk, Cotton, and Flax Mills, and Manufactories in general. All Letters not paid will be refused. Illustrated Price Lists forwarded on receipt of Six Postage Stamps.—GWYNNE AND Co., Hydraulic and Mechanical Engineers, Essex-wharf, Strand, London.

For Exportation.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (24)

PUMPS
FOWLER & Co.
WHITEFRIARS STREET,
FLEET STREET,
— LONDON. —
HYDRAULIC MACHINERY
OF EVERY DESCRIPTION,
FOR HOME USE OR EXPORT,
UPON THE LARGEST,
OR SMALLEST SCALE,
MANUFACTURED, FIXED, OR
LENT ON HIRE:
AN EXTENSIVE STOCK KEPT
READY FOR GENERAL PURPOSES.

(108)

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FOWLER'S PATENT STEAM PLOUGH.

This Implement obtained

THE FIVE HUNDRED POUNDS PRIZE

AT THE ROYAL AGRICULTURAL SOCIETY'S SHOW, JULY, 1858, AT CHESTER,

(AFTER THREE YEARS' COMPETITION,)

And has also obtained

THREE HUNDRED AND SEVENTY FIVE POUNDS AT VARIOUS OTHER AGRICULTURAL SHOWS IN THE UNITED KINGDOM.

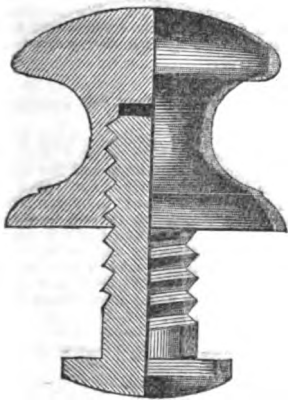
THE WINDLASS CAN BE FITTED TO ANY AGRICULTURAL ENGINE.

FOR FURTHER PARTICULARS, PRICES, AND CATALOGUES, APPLY TO

JOHN FOWLER, Jun., 28 Cornhill, London, E.C. (156)

JOHN DIXON & SONS.

ENGLISH TIMBER MERCHANTS, CONTRACTORS,



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KEY'S TRENAILS BOBBIN

AND ROLLERS;

Also,

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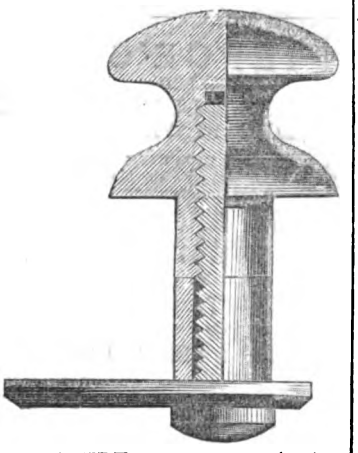
PATENT COMMODE KNOBS

AND HANDLES;

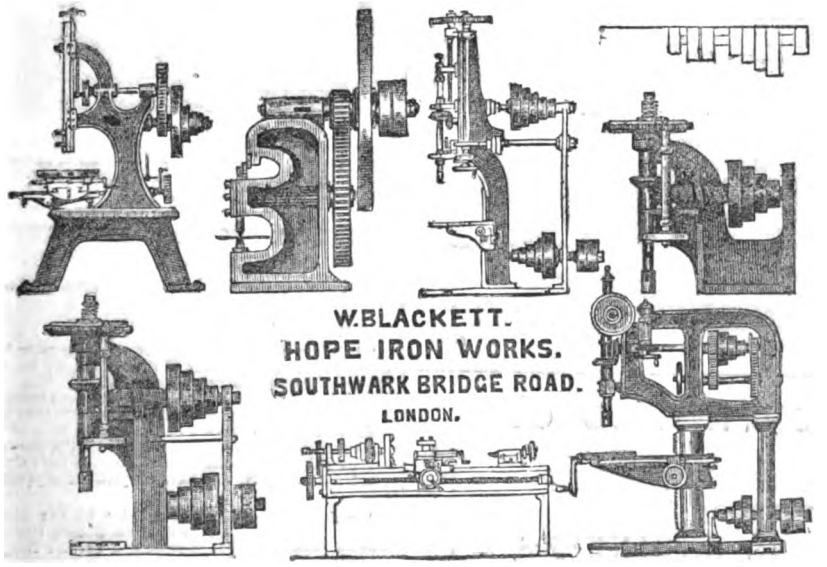
And

ODLFIELD & DIXON'S

PATENT GAS BURNER.



STEETON, NEAR KEIGHLEY, YORKSHIRE. (154)



W. BLACKETT has in Stock a variety of Vertical and Horizontal Steam Engines, Boilers, and Engineers' Tools, ready for delivery on the shortest notice. Apply as above. (70)

THE PATENT CARVING WORKS.—(JORDAN'S PATENT.)—A considerable reduction in the cost of Wood Carving is effected by the aid of the Patented Machinery, as by it the work is roughed out with great accuracy and expedition (the cutters making 7,000 revolutions per minute), while the finishing of the more minute parts is carried out by hand labour, so that the result shows precisely the same amount of artistic excellence as if it had been executed entirely by hand.

The trade supplied with Carving in the rough, or finished.

COX & SON, Belvedere-road, Lambeth. (119)

WANTED TO PURCHASE, one of CANTELO'S INCUBATING MACHINES. Must be in good working order. A new one preferred. Address, with full particulars, A. Z., MRS. BARNETT'S, 47 Queen's Road, Brighton. (120)

"Everybody likes good Beer,
But everybody don't know where to get it."

VICTORIA PALE ALE IS THE BEST DINNER ALE OF THE DAY, 18 Gallons, 20s., 9 ditto, 10s.

HOUSEHOLD ALE, Brewed expressly for Private Families, 1s. per Gallon.

DOUBLE STOUT, 13s. 6d. per Nine-Gallon Cask. This is a generous beverage, and is strongly recommended to persons who require a nourishing diet.

HENRY LOVIBOND, Cannon Brewery, Chelsea. (134)

MECHANICAL, ENGINEERING, AND PATENT DRAWINGS and TRACINGS.—Drawing and Engraving on Stone. Estimates given.

W. H. BOWERS, 20 Bartlett's-buildings, Holborn. (128)

VOKINS & HURD,

SEYMOUR HOUSE, JUBILEE PLACE, CHELSEA.

HOT-HOUSE BUILDERS

AND

Hot-Water Apparatus Manufacturers.

Plans and Estimates forwarded on Application. (149)

THE SILVERTON INDIA-RUBBER WORKS,

OPPOSITE

H. M. DOCKYARD, WOOLWICH.

INDIA-RUBBER MANUFACTURES

WITH ALL

RECENT IMPROVEMENTS.

Warehouses, 3 and 4 Bishopsgate Within, E.C. (145)

THE GENERAL IMPLEMENT CO.,

36 BOTHWELL STREET,

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Agricultural Implements of all kinds.

MOWING & REAPING MACHINES.

Price Lists free on application.

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WATER GAUGES—WATER GAUGES.—Sir,—We find your German Gauge Tube superior to any other, and strongly recommend it. We were compelled to abandon the use of our water gauge until applying your glass tube.

WILCOX and Co., Millwall Pottery Company.

These Tubes are superior to all others; being a clear white, no mistake can arise in working. Guaranteed to stand a pressure of 500 lb.

Extensively used on all the principal lines.

To be had only of E. MOORE, 55 Upper Marylebone-street, W.; and 72 Great Titchfield-street, W.

*** Price List of Gauge Fittings, &c., on application. (98)

BY HER MAJESTY'S ROYAL LETTERS PATENT.

PATENT SPHERICAL SELF-ADJUSTING BEARINGS, which do not heat in work. The advantages possessed by these Bearings are:—

1st. They are Self-adjusting; and, consequently, can be put down by the most ordinary Mechanic.

2nd. They are not liable to heat, even at high speeds.

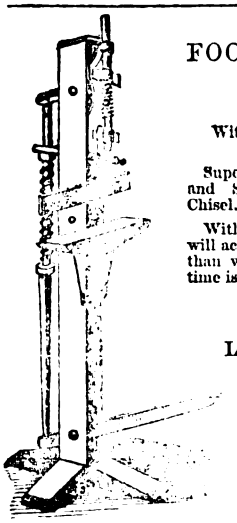
3rd. They remain constantly parellel to the Spindle; and, therefore, wear equally all across the Bearing.

4th. They require only a very small quantity of oil.

Engravings and Prices forwarded on application to the Patentees.

WALLIS & HASLAM,

Engineers and Iron Founders, North Hants Iron Works, Basingstoke. (121)



FOOT MORTISING MACHINES,

With set of Chisels, for £9.

Superior to any in use for Doors and Sashes, with self-reversing Chisel.

With this Machine the workman will acomplish one-third more work than with any other in use, as no time is lost in shifting the Chisel.

For Sale by

L. D. OWEN & CO.,

Importers of

WOOD-WORKING MACHINES,

192 Tottenham-court-road (101)

HALKETT'S GUIDEWAY STEAM AGRICULTURE will be Exhibited at Canning-place, Kensington Toll Gate, South of Kensington Gardens, on Wednesdays, the 9th, 16th, and 23rd of February, and to private view upon previous appointment. By this system, every operation of the Farm is performed by Steam Power, the land largely increased in value, and the cost of cultivation greatly reduced. A paper read before the Society of Arts, illustrations, &c., will be forwarded upon application to the Office, 80 Chancery-lane, W.C. (104)

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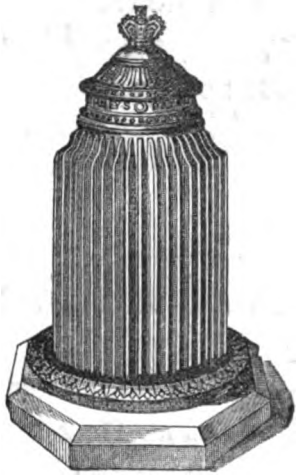


THE LONDON

WARMING AND VENTILATING COMPANY,

(LIMITED,)

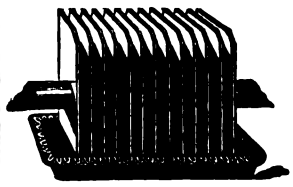
36 GREAT GEORGE STREET, Westminster, S.W.

(MANAGER—Mr. WOODCOCK.)

Churches, Greenhouses, Offices, and Buildings of every description warmed by means of a modification of the plan successfully used during the last five years by Mr. Goldsworthy Gurney in both Houses of Parliament.

Steam, Hot-water, Gas, and in open or enclosed fireplaces, Coal and Coke are equally available for the process.

The cost is less and the effect greater than that of any other known means.



The Horticulturist will find herein an instrument of new and important powers.

The apparatus may be seen in ST. PAUL'S CATHEDRAL, the various offices of the "Department of Science and Art," and in many churches and other buildings.

Particulars and Testimonials forwarded on application.

(12)

PIERCE'S

UNRIVALLED

PYRO-PNEUMATIC FIRE-LUMP WARMING AND VENTILATING STOVE GRATES,

WITH the cheerful, open fire, producing healthful warmth, with continuous Self-acting Ventilation, for Churches, Schools, Public Buildings, Banking Houses, &c. These Grates are manufactured solely by PIERCE, the Inventor, for which he received the Prize Medals of London in 1851, and of Paris in 1855.

PRICE, from £7 10s.

ILLUSTRATED CATALOGUE, with Prices and Estimates for Work, furnished on application to the Inventor and Sole Manufacturer.

Also his

IMPROVED COTTAGER'S GRATE,

For Warming Two Rooms with only One Fire. Prices, 30s. and 35s.

PIERCE, No. 5 JERMYN STREET, REGENT STREET.

(111)

VENTILATION WITHOUT FLUES.

KUKLA'S PATENT STOVES,

At 18s., 25s., and 50s.

KUKLA'S newly-invented Deflagrator—the first and only perfect GAS STOVE. Guaranteed to burn without flue—without dust, smell or smoke, producing a great and pure heat with the least expenditure of Gas.—*Vide Society of Arts' Journal.*

Patronised by the English and French Government.

Scientific in Principle,
Simple in Construction,
Healthy and efficient in use.

The Deflagrator Stove is cheap, portable, and suited for every situation; and from the principle on which it is constructed (viz., expanding to a sixfold volume the gas used) is capable of warming any given space more quickly and more thoroughly than any other means: while its addition forms a sure remedy for any ill-warmed or ill-ventilated apartments.

The 25s. Deflagrator warms a room of 2,000 cubic feet at a cost of 3d. per day.

The 50s. Deflagrator warms 5 to 6,000 cubic feet at a cost of 6d. per day (twelve hours).

Also, the Greenhouse Stove at 18s.

Patentee and sole Manufacturer, F. X. KUKLA, 194 Pentonville-road, London.

Country orders promptly attended to. Carriage free to any Railway in London.

Post-office Orders should be made payable to FRANCIS XAVIER KUKLA, General Office.

N.B.—Every Stove separately tested before sent out.

The New GAS COOKING STOVE for 10 persons, price £3.

(103)

CLAYTON, SHUTTLEWORTH, AND CO.,

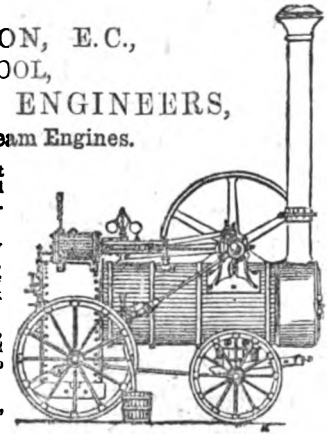
OF LINCOLN,

78 LOMBARD STREET, LONDON, E.C.,

AND 36 DALE STREET, LIVERPOOL,

AGRICULTURAL AND GENERAL ENGINEERS,

And Manufacturers of Portable and Fixed Steam Engines.



Combined Threshing Machines, which dress the corn ready for market at one operation. Grinding Mills, Saw Benches, Pumps for Irrigation and Mining purposes, with all necessary gearing for being driven by steam power. Full particulars and estimates given on application to the above address.

C. S. and Co.'s PORTABLE STEAM ENGINES are adapted for every purpose to which steam-power can be applied. When intended for winding, they are fitted with reversible link motion and winding gear. They are easy of removal, as may be seen by the engraving, and can be set to work immediately on arrival.

C. S. and Co. are now doing an extensive foreign and colonial business, and are prepared to send off engines and machinery of the before-mentioned kinds in a few days from the date of order. They would also call attention to the important *reduction in prices* made for the new year.

For Exportation.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (23)

IMPORTANT TO MANUFACTURERS, MILL OWNERS, &c.

GUTTA PERCHA MILL BANDS.

THE GUTTA PERCHA COMPANY beg to state that the increasing demand for the Gutta Percha Strapping for Driving-bands, Lathe-straps, &c., fully justifies the strong recommendations they have everywhere received.

Their durability and strength—permanent contractability and uniformity of substance—their non-susceptibility of injury from contact with oils, grease, acids, alkalies, or water—and the facility with which the only joint required can be made in bands of from 200 to 300 feet long—render them superior to leather for almost all working purposes, and decidedly more economical.

TESTIMONIALS.

IMPORTANT ANNUAL SAVING.

From TRUMAN, HANBURY, BUXTON, & Co., Brewery, London.

"In reply to your inquiry, we have much pleasure in bearing our testimony to the advantages, both as regards economy and saving of time, effected by the use of your Patent Gutta Percha Bands in lieu of Leather Straps. The stoppage of one portion of our works through the failing of the leather strap used to be of daily occurrence—but with this annoyance we are now never troubled. We have had these straps in operation for nearly three years, and are assured by our Engineer that *they effect a saving to us of at least* THIRTY POUNDS *a year.*"

From JAMES ABERNETHY & Co., Fury Hill Foundry Aberdeen.

"We have now had Gutta Percha Bands working here *for three years.* One of them has been driving the fan blast for our smith's shop for all that time, and for anything we see, may drive it as long again. The speed of the fan is but 1,200 per minute. We have used them with complete satisfaction, driving circular saws, and in some cases where leather bands would have been quite inapplicable from damp. We have uniformly endeavoured to have the drums and pulleys so proportioned to the strain, as that there is no chance of the band slipping; and with this precaution, and taking care in using *cross bands that they do not rub,* we are quite satisfied that they are superior in every respect to leather—stronger at the same weight, and keeping quite straight in working—requiring no lacings, and very seldom any repairs."

WATER POISONED BY LEADEN PIPES.

The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight.

POISONED WATER PREVENTABLE

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

From Dr. MURRAY, Hull.

"It is impossible to conceive of anything more injurious or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha Tubing. Nothing can be better. I have also recommended it to others, who have adopted the expedient."

A variety of Gutta Percha Articles, such as Mill Bands, Tubing, Sheet, Soles, Pump Buckets, Bosses, Union Joints, Bottles, Bowls, Flasks, Curtain and Cornice Rings, Solid Frames, Galvanic Batteries, &c., &c.

MANUFACTURED BY THE

Gutta Percha Company, Patentees,

18 WHARF ROAD, CITY ROAD, LONDON,

AND SOLD BY THEIR

WHOLESALE DEALERS IN TOWN AND COUNTRY.

(29.)

Published by RICHARD ARCHIBALD BROOMAN, at the MECHANICS' MAGAZINE Office, 166 Fleet-street, in the Parish of St. Dunstan's-in-the-West, in the County of Middlesex; and printed by JAMES JUDD and HENRY ALEXANDER GLASS, of 14 Holford-square, Pentonville, in the County of Middlesex, at their Office, 38A New Bridge-street, in the Parish of St. Anne's Blackfriars, in the City of London.—Friday, February 25, 1859.

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. I.—NO. 10. [NEW SERIES.] LONDON: FRIDAY EVENING, MARCH 4, 1859. PRICE, FOURPENCE. BY POST 5d.

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SOCIETY OF ARTS.—The Eleventh Annual Exhibition of Inventions will open on the 25th day of April, 1859. The days fixed for receiving articles intended for exhibition are Thursday the 7th, Friday the 8th, and Saturday the 9th April. No charge is made for space, and the Exhibition is Free.

Intending exhibitors should communicate at once with the Secretary. By order,

P. LE NEVE FOSTER,
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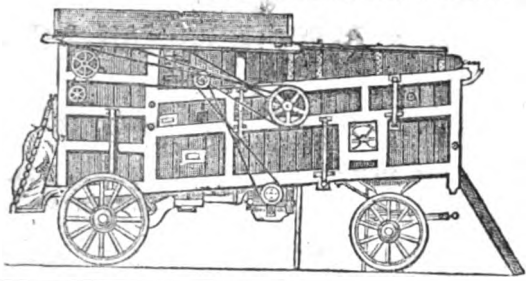

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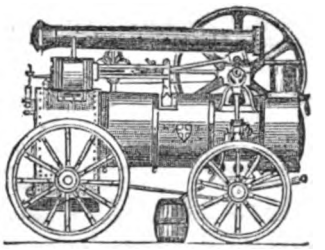

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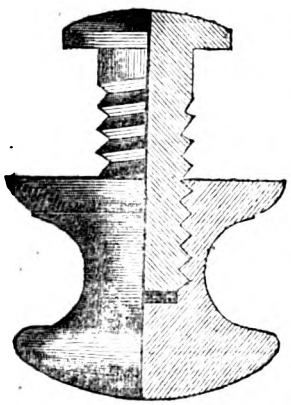

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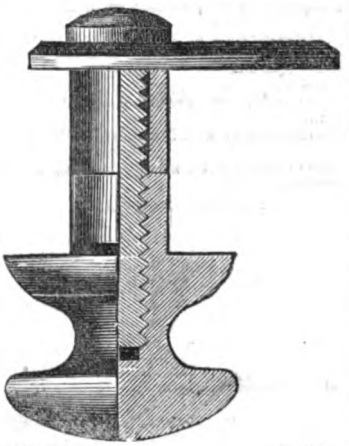

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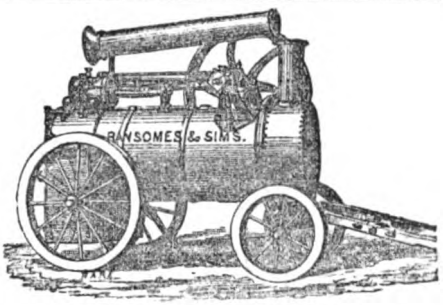

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Messrs. Sale, Worthington, and Shipman, Manchester.

AUDITORS:

Messrs. Child, Fitzgerald, and Taylor, 63 King-street, Manchester.
Mr. C. H. Minchin, 59 King-street, Manchester.

CHIEF ENGINEER—R. B. Longridge.

SECRETARY—Jonathan Cox.

This Company has been established to supply a recognised want existing in an important section of the mercantile community, by applying the principles of insurance, combined with efficient inspection, to steam boilers.

The numerous explosions of steam boilers that have taken place during the last four years have proved the necessity of scientific supervision, which if not voluntarily adopted by the employers of steam power, will doubtless be eventually forced upon them by Government interference.

It being evidently the interest of the Company to prevent accidents to the boilers insured by them, they have been careful to select the highest engineering talent, and such as is known to be specially valuable in this particular department of the profession. Should such accidents, however, unfortunately occur, the insured will not suffer pecuniary loss in addition to other inconvenience.

The Company appeal confidently for the support of all employers of steam boilers, not only on the ground of the wisdom and prudence that induce the careful manufacturer to insure his property generally, but on the still higher one of assisting in the prevention of the fearful sacrifices of human life that are almost sure to be consequent upon accidents of this nature.

The Company insure boilers of every description, and also any damage arising to buildings and property from their explosion; exclusive, however, of fire risks, and destruction of ships by marine boiler explosions.

They also assure the lives of workmen and others to a limited amount per head.

Where boilers sustain injury from accidental causes, though explosions may not actually ensue, the damage will be made good, or the amount thereof paid, by the Assurance Company, according to valuation.

The owners of boilers who may not wish to insure their full value, are at liberty to take policies for not less than £100 on each separate boiler, thus securing inspection and an assurance of £100 on each boiler, at a premium varying from 15s. upwards.

A "Registration of Steam Boilers" has also been established, on the principle adopted at Lloyd's in the case of ships. New boilers are examined and tested by the officers of the Company previous to leaving the works of the makers, and certificates issued according to their classification.

The Inspectors will, if required, indicate the engines of the insured, and advice will be given by the chief engineer of the Company in all matters relating to the economical use of steam power.

TABLE OF PREMIUMS FOR BOILERS.

		Pressure per square inch to which safety valves are loaded.			
		lb.	lb.	lb.	lb.
Class	Above	—	20	40	60
	and not exceeding	20	40	60	—
		Per cent. per annum.			
A	...Premium	0¾	1	1¼	1½
B	...Premium	1	1¼	1½	1¾
C	...Premium	1¼	1½	1¾	2
D	...Premium	1½	1¾	2	2¼

LIFE.

Enginemen, Stokers, and all persons attendant upon Boilers or Engines.—To insure £100 on each life lost by boiler explosion, £1 per annum, inclusive of Government duty.

Workpeople employed in mills or works generally (exclusive of those above specified).—To insure £50 on each life lost by boiler explosion, one shilling per head per annum on the whole number employed in such mills or works, inclusive of Government duty.

Cases of extra risk taken at increased premiums.

BUILDINGS AND OTHER PROPERTY.

Buildings, machinery, &c., are insured against damage from boiler explosions, at specific rates, from 1s. to 7s. per cent., according to Surveyor's report.

By order,
J. COX, Secretary. (173)

TO WIRE ROPE MAKERS.—ARCHIBALD SMITH is now prepared to GRANT LICENCES for the use of his PATENT ROPE MACHINERY, guaranteed to work at six times the speed of any other, and to save upwards of fifty per cent. in the cost of making. It is used by the most eminent makers, and was also in the manufacture of the Atlantic Cable.—Apply to 69 Princes-street, Leicester-square, W. (8)

TO INVENTORS AND PATENTEES.

MESSRS.

ROBERTSON, BROOMAN, & Co.,

Civil Engineers

AND PATENT AGENTS,

(ESTABLISHED 1823,)

166 FLEET STREET, LONDON, E.C.

Undertake to obtain Patents for Inventions

In the United Kingdom and Foreign Countries and the transaction generally of all Business relating to PATENTS.

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Specifications Drawn and Revised.

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Provisional Protection for Six Months (the preliminary step in securing a Patent), obtained for the United Kingdom at a cost of £10 10s. Personal attendance in London not necessary.

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Messrs. Robertson, Brooman, and Co. undertake (upon Commission) Orders for all Engineering Constructions, Railways, Locomotive and other Steam Engines, &c., &c.

Messrs. Robertson, Brooman, and Co.,

Have Correspondents in France, Belgium, Holland, Austria, Prussia, Portugal, United States, and other Foreign Countries.

ROBERTSON, BROOMAN, & Co.,

"MECHANICS' MAGAZINE" & PATENT OFFICE,

166 FLEET STREET, LONDON, E.C. (16)

VITRIFIED BLUE BRICKS are delivered at the Nine Elms Station, London, at 80s. per 1,000.—Address, G. H. OGSTON, J. M. Paine's Silica Works, Farnham, Surrey. (36)

CAUTION.

TO ARCHITECTS AND BUILDERS.—In consequence of numerous complaints, the Patentee begs to inform the above, that all genuine

SMITH'S PATENT DOOR SPRINGS,

For Swing Doors, are stamped with Name and Address, thus—

SMITH, PATENTEE, 69 PRINCES STREET, LEICESTER SQUARE, LONDON,

and that Springs thus marked are warranted.

SMITH'S PATENT WEATHER-TIGHT CASEMENT FASTENING AND SILL-BARS

are admitted by all to be the most perfect invention for the purpose. Diagrams and List of Prices on application. (145)

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PRICES CURRENT OF METALS.

London, 3rd March, 1859.,

	£ s. d.	£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N. of England ..... pr. ton	6 10 0 to	6 15 0	nett
Welsh Bars, in Wales .. „	6 0 0 „	6 5 0	3
Staf. Bars at the Works „	7 0 0 „	7 10 0	2½
„ Hoops ..... „	8 0 0 „	8 10 0	„
„ Sheets, Singles .. „	8 15 0 „	9 0 0	„
„ Nail Rods..... „	7 0 0 „	7 10 0	„
„ Boiler Plates .... „	9 10 0 „	9 0 0	„
Scotch Pig, M.-Nos. Warrants, at Glasgow..... „	2 11 6	2 12 0	nett
Do. No. 1, Good Brands „	2 12 6 „	2 13 0	„
Scotch Bars ..... „	7 15 0 „	8 0 0	2½
Swedish Bars, in London „	11 10 0 „	14 0 0	2½
COPPER, Sheet and Sheathing per lb.	0 1 0½		3
Tough Cake and Tile „ ton	112 11 0		„
Best Selected..... „	115 11 0		„
Australian ..... „	114 11 0 „	115 0 0	„
South American .... „	105 0 0		„
Yellow Metal Sheathing..... per lb.	0 0 10½		„
STEEL, Swedish Keg ..... pr. ton	20 0 0		2½
„ Faggot ..... „			„
TIN, English, Block ..... pr. cwt.	6 6 0		2½
„ Bar..... „	6 7 0		
Foreign, Banca ..... „	6 12 0		nett
„ Straits..... „	6 10 0		„
TINPLATES, Charcoal, I.C. .. pr. box	1 13 0 „	1 14 0	3
Coke, I.C. ..... „	1 6 0 „	1 8 0	„
LEAD, Pig, English ..... pr. ton	23 0 0 „	23 10 0	2½
„ Spanish ..... „	22 10 0 „	22 15 0	„
Sheet ..... „	23 10 0 „	23 15 0	„
SPELTER, on the spot ..... pr. ton	22 5 0 „	22 7 6	nett
for arrival..... „	22 5 0		„
ZINC, English, Sheet ..... „	30 0 0		1½
QUICKSILVER ..... per lb.	0 2 0		1½

REMARKS.—We are not yet able to report any decided improvement in the demand for Metals, the prices of which are almost without alteration since last week.

LAWRIE AND HAGGER, Metal Brokers.

33 Lombard-street, E.C.

METAL AND COAL TRADES, &c.

[FROM OUR OWN CORRESPONDENT.]

Board of Trade Returns for January—South Staffordshire Iron Trade—A Bankrupt Ironmaster—South Wales Trade—Glasgow Pig Iron Trade—Metal and Coal Trades in Derbyshire, Yorkshire, and Lancashire—Birmingham and Wolverhampton Trades—Prices of Metals in Liverpool—Steam Shipping Trade—Trade at Huddersfield and Leeds—Coal Trade, and the Colliers' Petition for a Nine Hours' Bill.

THE number of Trade Returns for January show that in certain descriptions of iron exports, this year hitherto contrasts unfavourably with that of 1857. The opposite, however, obtains in regard to wrought iron, and copper, and brass. We extract the following figures :—

Month of January.

	1857.	1858.	1859.
Pig iron	£57,924	£42,353	£34,820
Bar, bolt, and rod iron, (exclusive of railway iron)	178,807	96,528	173,321
Railway iron	227,189	205,302	189,168
Wire	17,132	17,082	16,789
Cast-iron	65,596	58,894	46,715
Wrought-iron	185,730	147,759	187,339
Steel, unwrought	59,247	22,892	56,183
Copper, unwrought.....	38,543	19,067	94,078
„ sheets and nails, including yellow metal	146,463	106,281	129,810
„ wrought of other sorts	21,112	32,083	19,500
Brass.....	7,698	11,105	17,004
Tin, unwrought.....	32,551	23,559	22,093
„ plates.....	100,202	46,220	90,627
Coals and Culm	177,957	153,722	156,426
Machinery (steam-engines)	76,938	82,070	45,334
„ other sorts	116,649	157,752	140,119

Of this, France, who took steam-engines to the value of £12,146 in 1857, took only £649 worth in 1859. Spain nearly doubled its exports in January this year, and of "other lots" took upwards of five-fold more than in 1857. The augmentation of wrought-iron took place chiefly in the exports to India, which were more than doubled this year.

The South Staffordshire Iron Trade has not improved in the past week. On Change at Wolverhampton, yesterday, the uncertainty upon the vital question of peace or war, was acknowledged on all hands to be the secret of the prevailing quietude. This keeps back the specifications of many orders given out at the commencement of the quarter. Manufactured iron is going to Liverpool and Manchester from houses where there is but little floating capital, at prices very much below those of the first-class house, and considerably under the general rates of the district. Pigs are offering at the prices current before the rise just preceding last quarter day. The fall will continue if war should look imminent, but stop if a rupture should cease to be apprehended. Russia is in the market for rails and plates. Native iron stone realizes from 15s. to 17s. per ton.

Mr. W. T. Riley, ironmaster, of Wolverhampton, has obtained a third-class certificate in the Birmingham Bankruptcy Court, suspended for three months with protection. Mr. Commissioner Sanders strongly censured the neglect of the bankrupt to keep proper books.

In the South Wales district, it is stated that most of the large works are pretty well supplied with orders, and that a steady inquiry exists for iron of all descriptions. Railway iron is being sent away in large quantities to the Continent, the demand both from France and Russia being good.

In the Glasgow pig iron market on Tuesday, the following were the quotations :—No. 1, 50s. 3d. to 50s. 6d. ; Mixed Nos., warrants, 51s. to 51s. 3d. ; Mixed Nos., maker's iron, 50s. 3d. to 50s. 6d. ; No. 3, 50s. 3d. to 50s. 6d. Market quiet and steady. Shipped this week, 8,000 tons ; corresponding week last year, 11,060 tons. Under date Feb. 25, Messrs. Shaw and Thomson write :—"The course of the Scotch pig iron market during the past month has been an almost uninterrupted decline. The price on the 1st instant was 53s. per ton, and to-day there are sellers of mixed numbers, warrants, at 51s. 3d. per ton, and buyers offer 51s. per ton. The fall is chiefly attributable to uncertainty of the result of the present continental difficulties ; but the continued accumulation of stock and small shipments also tends to make holders realise. The shipments last month were 30,931 tons against 37,075 tons same month last year."

In the district embracing Derbyshire, Yorkshire, and Lancashire, the reports of the position and prospects of the iron trade are highly satisfactory, and present indications of a good trade for a considerable time, unless disturbed by the political aspect of affairs on the Continent. The orders from America are now increasing, and occasioning a better state of things in the steel trade at Sheffield, which is rapidly improving in consequence. The inquiry for all descriptions of merchant iron is steady, and gradually improving, and most of the works are in full operation.

The general hardware trades of Birmingham, Wolverhampton, and their districts, are steady. Expectations entertained at the end of the Christmas quarter have not been realised. Consequently, some little disappointment is being expressed ; but there is not much unemployed labour.

In Liverpool, on Saturday, tin-plates were in moderate demand, and purchases could be made at £1 11s. 6d. to £1 14s. per box for charcoal I. C., and £1 5s. to £1 7s. 6d. for coke I. C. Copper : £112 10s. per ton for British cake and tile, and 12½d. per lb. for copper sheathing. Lead : a good business was doing in pig, which is worth £22 5s. to £22 10s. ; sheet unaltered at £22 15s. to £23 per ton.

Respecting the steam shipping trade, Messrs. Alfred Brett and Co. say :—"We cannot report of much activity in steam shipping affairs. A fair extent of inquiry certainly exists for steamers of various sizes ; but an impetus is required that can only be imparted by a more favourable political aspect. For steamers of the largest class there is a remarkable want of remunerative employment, which naturally affects the value of this description of property—a considerable amount of which at present remains idle in port. Screw steamers of a handy size continue in moderate request, and several could just now be advantageously placed on charter. The building establishments remain still short of orders, as very few ships have been arranged for ; in February several important contracts are, however, understood to be in prospect. Sales of several paddle-wheel and screw steamers have taken place during the past month, and we still experience inquiry for useful vessels of these descriptions. As the season advances, and the hoped-for assurance of peace becomes more certain, we may reasonably anticipate increased and general improvement.

Tuesdays reports from Huddersfield and Leeds are dissimilar. In the former town matters are decidedly improving, whilst in Leeds the uncertainty in the immediate course of home and foreign politics has exercised a marked depressing influence upon both the foreign and home divisions of the trade.

The coal trade of the country generally is in a state of quiet prosperity. The miners, however, are not settled ; and owing to their want of information upon the exact condition of trade, are some of them both in the north of England and in South Staffordshire making faint efforts to procure an increase of wages. The movement, however, is premature, and has been successful only in exceptional local instances. The men have, however, a much more important matter under hand. They are about to make a vigorous effort to get from Parliament a Nine Hours' Miners' Bill.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

WIDENING AND IMPROVING TURNPIKE ROADS, *at Penn and Sharcshill.*—Plans, &c., of Mr. Henry Beckett, surveyor, Wolverhampton, after 28th inst. Tenders on March 10th to Surveyor's office, Church-street, Wolverhampton.

INDEPENDENT CHAPEL, *Bridport.*—Plans, &c., at Mr. R. Swayne's, East-street, Bridport. Information of Messrs. Poulton and Woodman, architects, Reading. Tenders to March 11.

TOWN HALL, *Dudley.*—Extension of County Police Station, erection of residence for superintendent, and sixteen dwellings for police constables. Drawings of the Superintendent. Further particulars of Mr. Henry Lowe, jun., County Surveyor, 17 Foregate-st., Worcester. Tenders to March 19.

TWELVE ALMSHOUSES AND OFFICES, *Cambridge.*—For Royal Albert Benevolent Society. Drawings, &c., of the Secretary, Mr. T. P. Clayton, 23 Trumpington-street, Cambridge. Lithographed quantities, &c., of the architect, Mr. F. Peck, Maidstone. Tenders to the Secretary, on March 8.

FREE NEW GRAMMAR SCHOOL, *Stourbridge.*—Plans, &c., of Messrs. Freer and Perry, Solicitors, Stourbridge. Tenders by 19th March.

ALTERATIONS TO SHOREDITCH WORKHOUSE.—Particulars from Mr. J. H. Jones, architect, the Tower, Dalston. Tenders at the Workhouse at noon, March 12.

NATIONAL SCHOOL AND MASTER'S RESIDENCE, *Brewood.*—Plans at office of Edw. Banks, Esq., Clarence-street, Wolverhampton. Tenders 15th March, to Rev. H. E. Gedge, Brewood, Stafford.

RESIDENCE, *Leamington*, with out-office, coach-office, stabling, entrance gate and lodge, at Eathorpe. Specification, &c., R. Clarke, architect, Shakspere-Street, Nottingham ; to whom tenders on 12th March.

DESIGNS FOR A JEWS' HOSPITAL, *Mile End, London.*—For proposed new buildings. First premium £100 second £50 ; third £30. Instructions of Rev. O. P. Mendis, Jews' Hospital, Mile End, for 5s. deposit. Designs to April 11.

RAILWAY WORKS, *London, Brighton, and South Coast.*—For 1st section of Shoreham, Henfield, and Mid-Sussex Branch, 10 miles. Specifications, Engineers' office, London-bridge Terminus. Printed copies of quantities, &c., £3. Tenders, 11 o'clock, March 10.

RAILWAY STATION, *East Lancashire.*—At New Cocker Bar and Rytford. Plans, Engineers' office, Bury Station. Tenders, Mr. Myles Fenton, secretary, March 9.

SWITCHES AND CROSSINGS, *Fort Patrick.*—Seventy sets. Drawings, &c., of Messrs. B. and E. Blyth, engineers, Edinburgh, with whom tenders, March 15.

IRON GIRDERS, *Lymington, Biggar, and Broughton Railway.*—Wrought and cast. Drawings, &c., of Messrs. Bruce and Cunningham, engineers, 21 Castle-street, Edinburgh. Tenders with Mr. D. Thomson, secretary, Biggar, March 15.

GAS HOLDER TANK AND GAS HOLDER, *Burton.*—With columns, girders, &c. ; also 300 yards of 9-in. main pipes. Plans at office of Buxton Gas Company. Tenders to chairman, 12th March.

EIGHTY HYDRANTS, *Barnstaple.*—For Water Supply Company. Tenders, with specimens or drawings, to chairman, March 8.

PORTABLE RACE STAND, *Oldham.*—Plans, &c., Mr. G. B. Mussillwhite, New St. Basingstoke, Hants. Tenders to Mr. J. Trodd, clerk to course, Oldham, March 14. Copies of quantities of Mr. Mussillwhite, for 5s.

BRIDGE, *County Wicklow.*—Plans, &c., Grand Jury Office, Wicklow. No date.

BRIDGE, *Birmingham.*—Over river Rea. Plans, &c., at office of borough surveyor, Moon-street. Tenders, 2 o'clock, 12th March.

WORKHOUSE, *Shoreditch.*—Alterations. Plans, Mr. T. H. Jones, the Tower, Dalston, March 12.

LUNATIC ASYLUM, *Chester.*—Additions, with chaplain's house, heating apparatus for drying, stoves, &c. Plans of Mr. T. M. Pearson, architect, the Bars, Chester, March 14.

ORPHAN ASYLUM, *Sunderland.*—Plans, &c., Mr. T. Mooro, architect, Sunderland, March 9.

BATHS AND WASH-HOUSES, *St. Martin's-in-the-Fields.*—Alterations and additions. Particulars of Messrs. Balam and Lee, 10 Buckingham-street, Adelphi. March 15.

BARRACKS WORK.—Bricklayers', masons', carpenters', plumbers', painters', slaters', glaziers', and paper hangers', smiths', and paviors' works of Dorchester and Weymouth Barracks, Portland Castle, Verne Barracks, Portland, from April 1, 1859, to March 31, 1862. Information till March 9, at Royal Engineer office, Hope-street, Weymouth. Tenders, March 14.

INDEPENDENT CHAPEL AND SCHOOLS, *Bridport.*—Plans, Mr. R. Swayne, East-street, Bridport. Information and bills, Messrs. Poulton and Woodman, Reading. March 10.

FREE GRAMMAR SCHOOL, *Stourbridge.*—Plans of Messrs. Freer and Perry, Solicitors, Stourbridge ; to whom tenders, addressed to "Mr. Edward Hickman Freer, Sec." March 19.

POLICE STATION, *Moseley, near Birmingham.*—Plans at Police Station, Moseley. Tenders to Clerk of Peace's Office, Shire Hall, Worcester, till 18th of March.

POLICE STATIONS, *Thrapstone, Northamptonshire.*—Residence for two officers, three cells, &c. Plans, Mr. James Milne, County Surveyor. March 18.

VILLA RESIDENCE, *Folkestone.*—Plans, &c., Mr. J. Messenger, Architect, Folkestone, or 9 Spring-gardens, London. Tenders, March 9.

RESIDENCE, *Leamington.*—At Eathorpe. Plans, &c., Mr. R. Clarke, Architect, Shakspeare-street, Nottingham ; where tenders, March 12.

HOUSES, *Wandsworth.*—Five fourth-rate, York-road, near Railway-station. Drawings, 1 Carlton-cottages, Biggs's-row, Putney ; where tenders to J. Niblett, Jun., March 10.

SEWERAGE, *Gateshead.*—Laying a sewer and building a wall. Specifications, Surveyor to the Local Board, March 10.

SEWERS, *Harrow.*—1,200 feet of Doulton's stoneware 9 in. pipe sewer. Specifications, Mr. W. Smith, surveyor to the Local Board, March 8.

FOOTPATHS, *Birmingham.*—For a year. Specifications, Borough Surveyor's, Moor-st. Tenders, March 12.

CLOSING THE VAULTS OF ST. PANCRAS.—Specification, Mr. John Dent, 34 Great James-st., Bedford-row, and Mr. W. B. Scott, 10 Edward-street, Hampstead-road. Tenders March 7, Messrs. Scadding and Son, 1 Gordon-street, Gordon-square.

TOOLED YORK-STREET FLAGGING.—800 yards of 2½ inch in stones of not less than 4 feet sup., to be delivered at Milverton station, London and North Western Railway, Leamington Messrs. G. Clark and Son, Warwick, March 10.

DESIGNS FOR NEW ROMAN CATHOLIC CHURCH, *Castle Connell.*—Premium £20. Plans to Rev. P. Hennessy, P. P., to March 20.

DESIGNS FOR POLICE STATION, *Birmingham.*—Particulars at office of the Town Clerk, Temple-st., 14th March.

DESIGN FOR CLOCK TOWER.—For Burnley Improvement Commissioners. First premium 10 and second 15 guineas. Further information of Mr. W. H. Colbran, surveyor to the Commissioners, March 28.

DESIGNS FOR OBELISK.—As the Barnston Memorial, near village of Farndon. First premium 10 and the second 5 guineas. Height 60 feet, cost £100. Designs to John Churton, Hon. Sec., Auction Mart, Chester.

AS FOREMAN OVER MOULDERS.—A. 57, *Manchester Guardian.*

AS SURVEYOR and INSPECTOR OF NUISANCES, *Bideford.*—Salary £80. Applications to Town Clerk, March 12.

The same for *Dukinfield.*—Salary £70, with house, coal, and gas. Application March 7, to Mr. John Brooks, Law Clerk to the Board.

AS FOREMAN PATTERN MAKER.—Good knowledge of marine and stationary engines and general machinery. A. 69, *Manchester Guardian.*

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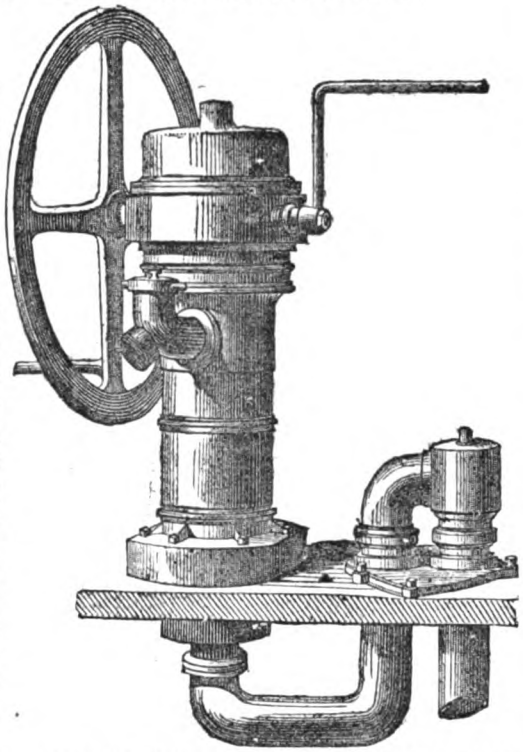
Under the Patronage of the Board of Admiralty.

SHIPS' PUMPS OF HER MAJESTY'S NAVY.

JOSIAH STONE,

Sole Manufacturer of DOWNTON'S well-known and much approved SHIPS' PUMPS, which have been used in preference to all others on board the vessels of Her Majesty's Navy, for upwards of thirty years, and have given the greatest satisfaction, effectually answering all the purposes required of any Ships' Pumps, and capable of throwing most powerful jets of water in case of fire.



These Pumps have also been most extensively used on board merchant vessels, both at home and abroad, and have been supplied to the Royal Navies of France, Prussia, Holland, Russia, Spain, and Turkey. The Pumps are portable, as they may be easily removed from the ship and put to work in a boat alongside in a few minutes. Each pump is fitted with a large foot valve plate (which may be placed in any part of the vessel most convenient), and from which communication is made to any number of distinct compartments in the vessel. In case of any of these pipes fouling, the water, by an almost momentary attachment, may be forced from the Pump downwards, so as to clear all obstructions, preventing any possibility of stoppage. The valves are of the simplest description, and being faced with ordinary leather discs, the latter may be renewed in a few minutes by the most inexperienced hands. By the peculiar construction of these Pumps, a most perfect and uninterrupted flow of water may be maintained; so uniform as to be undistinguishable from that proceeding from a cistern. The Pumps are made of several sizes, those of 7, 9, and 12 inches bore being most generally used. They may, however, be ordered of any dimensions required, and may be fitted either with one or two fly wheels. A standard, &c., is also supplied with these Pumps, to enable them, when necessary, to be used as ordinary hand-lever pumps.

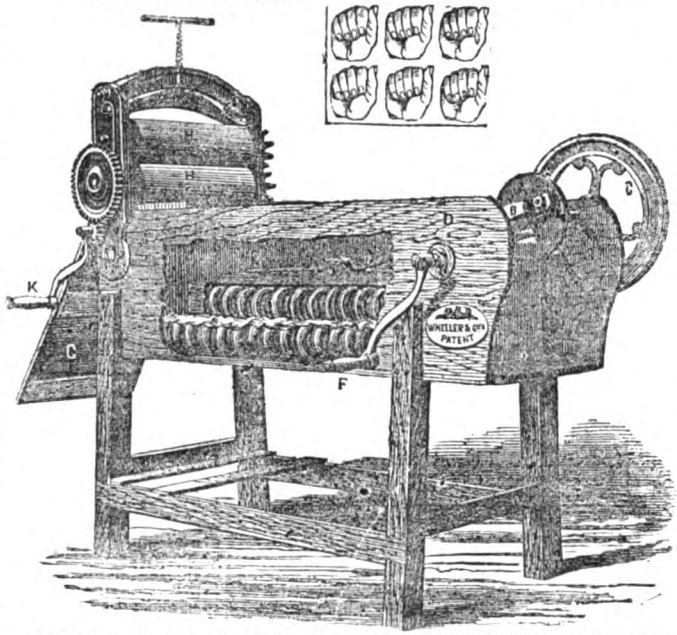
JOSIAH STONE, Engineer, Manufacturer of all descriptions of PUMPS and FIRE ENGINES for Land and Ships' Use; Brass and Iron Founder and Finisher, Nail and Rivet Maker, &c.

CONTRACTORS FOR FIRE-ENGINES, ETC., TO THE WAR DEPARTMENT,

RAILWAY STATION, DEPTFORD, AND 12 GARLICK HILL, CITY, E.C. (97)

T. WHEELER AND CO.'S

"OXONIAN KNUCKLE WASHING MACHINE."



The Improvements in these New Inventions are the non-exposure of the user's hands to the dangerous parts of the Machine, and the rapidity with which the work is done. These Machines have neither bands or wheels passing on the outside, wherein lies the liability to accident. The rubbers are the truest representation of the knuckles or hand washing yet brought out; the compensating floating rubbers work at right angles, backward and forward, in the same manner as does the hands. These Machines can be supplied with rubbers that represent a person's hand in the action of rubbing; the knuckles, finger nails, and palm of the hand being truly modelled. They are capable of Washing Clothes of every description whatsoever, the largest bedding to the most delicate piece of muslin can be washed without breaking a single thread; in fact, such is the delicacy of the action of these Machines, that the paper you are now reading can be passed between the rubbers without sustaining any injury, at the same time being thoroughly effective in cleansing. The Patentees confidently recommend these Machines to the notice of Laundresses, Heads of Families, Hotels, Emigrants, &c. So simple is the action of this Machine, that a boy or girl of 10 or 12 years of age can work it; the only skill required is to soak the clothes one hour before placing them in the Machine, placing a portion of the clothes at the handle end of the Machine; laying on the rubbers a part of them; turn the handle, and the clothes will pass through between the rubbers to the opposite end, effecting a saving of at least 50 per cent.

Prices: Washing Machines, £1 6s., £2 6s., £3 6s., £4 10s., £5 15s.; Washing, Wringing, and Mangling, £8 £10 15s., £14 14s.—Full Instructions sent with every Machine. Testimonials or References sent on application.

MANUFACTORY, ALBION WORKS, PARK END STREET, OXFORD (114)

VOKINS & HURD,

SEYMOUR HOUSE, JUBILEE PLACE, CHELSEA.

HOT-HOUSE BUILDERS

AND

Hot-Water Apparatus Manufacturers.

Plans and Estimates forwarded on Application. (149)

THE

SILVERTOWN INDIA-RUBBER WORKS,

OPPOSITE

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INDIA-RUBBER MANUFACTURES

WITH ALL

RECENT IMPROVEMENTS.

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THE GENERAL IMPLEMENT CO.,

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GLASGOW.

Agricultural Implements of all kinds.

MOWING & REAPING MACHINES.

Price Lists free on application.

AGENTS WANTED. (32)

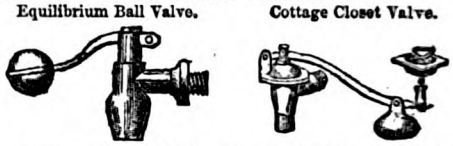
TO BRASS-FOUNDERS, ENGINEERS, &c.

THE PATENT PLUMBAGO CRUCIBLE COMPANY having completed the enlargement of their premises, beg to call the attention of all users and shippers of Melting Pots to the great superiority of the PATENT CRUCIBLES, which have been used during the last three years by some of the largest melters in England and abroad. In addition to their capabilities of melting an average of from thirty-five to forty pourings; they are unaffected by change of temperature, never crack, but can be used till worn out, requiring only one annealing for several days' work, and become heated much more rapidly than ordinary pots, effecting thereby a saving of more than fifty ber cent. in time, labour, fuel, and waste. The Patent Plumbago Crucible Company also manufacture and import clay crucibles, muffles, portable furnaces, sublimate pans and covers, glass-pots, all descriptions of fire- standing goods, and every requisite for the assayer and dentists. For Lists, Testimonials, &c., apply to Battersea Works, London, &c. (43)

HIGH-PRESSURE VALVE-COCKS,

LAMBERT'S PATENT.

Equilibrium Ball Valve. Cottage Closet Valve.



The Equilibrium Ball-Valve is simple and certain in its action, and is cheaper than the common cocks now in use.

The Cottage Valves are suitable for application to any kind of basin; and, as they shut against the pressure, no concussion in the pipes can possibly occur.

These cocks have been extensively and most successfully used in many towns, under continuous high pressure, varying from 100 to 350 feet; their efficiency and durability is, by experience, established.

THOMAS LAMBERT and SON,

Brass Founders, Short-street, New-cut, Lambeth. (80)

PUMPING MACHINERY.

GWYNNE AND Co., Engineers, London, manufacture and supply the following Machinery, of the most approved construction and with all the latest improvements:—Portable and Fixed Steam-Engines and Boilers of every description; Waterwheels, Windmills, Horse and Hand-power Machines; Pumping Machinery for the Supply of Towns, Cities, and Districts, and for the Irrigation of Coffee, Cotton, Indigo, Sugar-cane, and Rice Estates, for pumping out Coffer-dams, Canals, Dry Docks, Reservoirs, &c. They also manufacture and supply the Pumping and other Machinery for Paper, Pulp, and Fulling Mills, Breweries, Distilleries, Tanneries, Starch Works, Bleaching, Dyeing, and Calico Printing Works, Chemical Works, Silk, Cotton, and Flax Mills, and Manufactories in general. All Letters not paid will be refused. Illustrated Price Lists forwarded on receipt of Six Postage Stamps.—GWYNNE AND Co., Hydraulic and Mechanical Engineers, Essex-wharf, Strand, London.

For Exportation.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (24)

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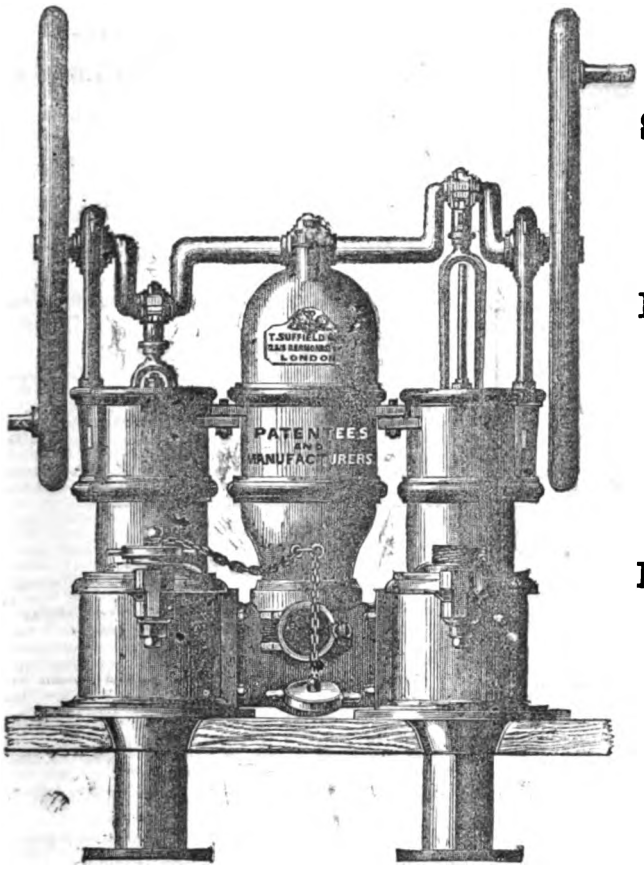
T. SUFFIELD AND CO.

Call the particular attention of

SHIP-OWNERS, SHIP-BUILDERS, AND COMMANDERS OF STEAM AND SAILING VESSELS,

to the Simple and Efficient Arrangements of their

PATENT PUMPS.



Ships' Pumps

AND

Fire Engines,

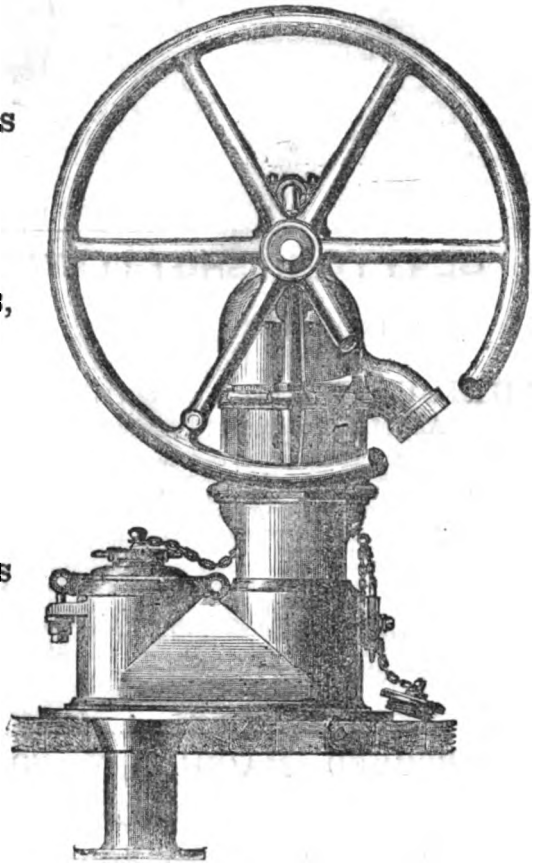
Fixed and Portable.

WITH

Patent Valves

AND OTHER

Improvements.



These Pumps are free from that liability to choke which is common to other Pumps, and their Working Parts are not susceptible of derangement either from wear or from being long out of use. They pass entirely through them, with ease, any substance that may enter the Suction Pipes. The Novelties in these Pumps are their adaptation to the varied duties of Ships' Pumps; the facilities they afford for Cleansing the Suction Pipes, and for Sounding or Examining the Valves; the readiness with which they may be used for Ventilating the Bilge, or for acting as a Syphon either for Watering the Ship, or for extinguishing Accidental Fires on board; the rapidity with which they can be converted into Fire Pumps, or be applied to the Washing of Decks; and their capability of Pumping from Several Compartments.

T. SUFFIELD AND CO.

Also respectfully solicit the attention of STEAM SHIP BUILDERS and OWNERS to their Large and Varied STOCK of

ASSORTED STORES FOR MARINE PURPOSES.

They keep a Large Stock of Goods, of their own Manufacture and from the Best Makers, constantly on view; so that by a visit to their Works or Depôt, much valuable time may be saved by Managers, Engineers, and other Gentlemen who may require such Stores, together with a further saving in the cost of such Articles.

DEPOT, 116, FENCHURCH STREET, E.C.,

(OPPOSITE MARK LANE.)

MANUFACTORY, 12 & 13 BERMONDSEY WALL, S.E.

LONDON.

(15)

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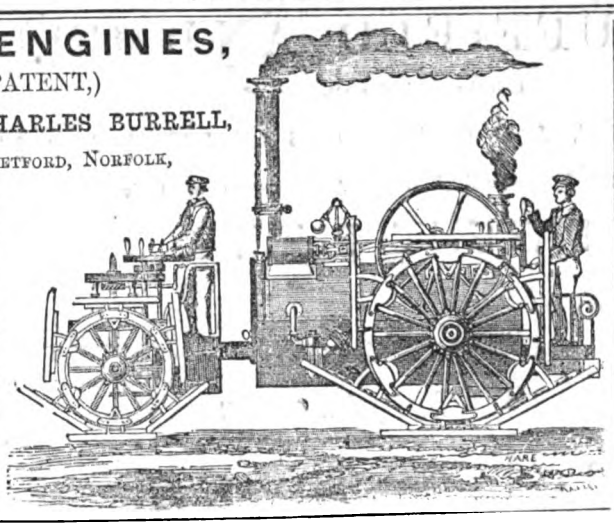
TRACTION ENGINES,

(BOYDELL'S PATENT,)

MANUFACTURED BY CHARLES BURRELL,

ST. NICHOLAS WORKS, THETFORD, NORFOLK,



And ordered for India, Australia, and South America, may now be seen, complete and in course of construction at the above works. BOYDELL'S TRACTION ENGINES AND ENDLESS RAILWAY will draw heavier loads over good roads than any other traction engine, and on soft and bad roads will draw heavy loads where no other traction engine can move itself. All objection to the wear and tear of these Engines is entirely removed by the use of Charles Burrell's improved patent Wrought Iron Wheels, fitted with Rails and Tyre, as well as all the wearing parts, of Steel.

Apply also to Mr. Hemming, 47 Mark Lane, E.C.

(40.)

CLAYTON, SHUTTLEWORTH, AND CO.,

OF LINCOLN,

78 LOMBARD STREET, LONDON, E.C.,

AND 36 DALE STREET, LIVERPOOL,

AGRICULTURAL AND GENERAL ENGINEERS,

And Manufacturers of Portable and Fixed Steam Engines.

Combined Threshing Machines, which dress the corn ready for market at one operation. Grinding Mills, Saw Benches, Pumps for Irrigation and Mining purposes, with all necessary gearing for being driven by steam power. Full particulars and estimates given on application to the above address.

C. S. and Co.'s PORTABLE STEAM ENGINES are adapted for every purpose to which steam-power can be applied. When intended for winding, they are fitted with reversible link motion and winding gear. They are easy of removal, as may be seen by the engraving, and can be set to work immediately on arrival.

C. S. and Co. are now doing an extensive foreign and colonial business, and are prepared to send off engines and machinery of the before-mentioned kinds in a few days from the date of order. They would also call attention to the important *reduction in prices* made for the new year.

For Exportation.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (23)

IMPROVED MACHINERY FOR AGRICULTURISTS.

RICHARD GARRETT & SONS,

LEISTON WORKS, SAXMUNDHAM, SUFFOLK,

(ESTABLISHED A.D. 1778),

EARNESTLY solicit the continued support of their numerous Friends, Agriculturists, Shippers, and others; the additions made to their Works during the present year, in the erection of new sets of Workshops, fitted with the best mechanical appliances for producing Machinery of the most improved construction, expeditiously and economically, justifies their soliciting increased support, while their leading reputation as Inventors and Manufacturers of FIRST CLASS Agricultural Machinery, is a sufficient guarantee that every Machine supplied from Leiston Works will prove to the entire satisfaction of the purchaser.

R. G. & S. are now manufacturing the following Machines and Implements, which they guarantee to be thoroughly efficient in every respect:—

PORTABLE AND FIXED STEAM ENGINES. } From 4 to 40 Horse Power, suited for every kind of work
SELF-PROPELLING AND TRACTION ENGINES. } to which Steam Power is applied.

STONE GRINDING MILLS.
MORTAR AND PUG MILLS.
MILLWRIGHTS' WORK of all kinds.
SAWING MACHINERY, from 4 to 20 Horse Power.
BRICK AND TILE MACHINES.

IMPROVED SETS OF FARM MACHINERY, for Large Occupations.
PORTABLE AND FIXED MACHINERY, for Thrashing and Dressing Corn.
THE PRIZE BOLTING AND OPEN-DRUM HORSE-POWER THRASHING MACHINES.
CORN DRESSING MACHINES, for Hand, Horse, Water, and Steam Power.
BARLEY AVELLING MACHINES.
CHAFF CUTTERS, for Hand, Horse, Water, and Steam Power.
PATENT TURNIP CUTTING AND PULPING MACHINES.

THE PRIZE CORN AND SEED DRILLS.
PRIZE CORN AND SEED DRILLS WITH MANURE APPARATUS.
PRIZE SEED AND MANURE DRILLS.
LIQUID, SEED, AND MANURE DROP DRILLS.
CHAMBER'S PATENT BROADCAST MANURE DISTRIBUTOR.
GARRETT'S PATENT HORSE HOE for all Crops.
PATENT REVOLVING HOES for Root Crops.
IMPROVED PLOUGHS AND REAPING MACHINES.
&c. &c. &c.

Of which full detailed particulars will be found in R. G. & SONS' ILLUSTRATED CATALOGUE, sent postage free to any address, in English, French, or German; and any of the above Machines will be shown in operation at R. G. & Sons' Farm, near the Works, on their receiving a few days' notice.

A Copy of R. G. & SONS' new COLONIAL LIST will be forwarded free to any of the Colonies, and Shippers will be supplied with these lists, with their names and addresses printed on, free of charge, by making application for the same.

ADDRESS—R. GARRETT & SONS, LEISTON WORKS, SAXMUNDHAM, SUFFOLK. (161)

WATER POISONED BY LEADEN PIPES.

"The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight. The water has cut these deep pits almost through the pipe, and not only upon the portion which we have illustrated, but has formed similar chasms throughout the entire length."—*Expositor.*

Poisoned Water Preventable.

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

From Dr. MURRAY, Hull.

"It is impossible to conceive of anything more injurious, or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha. Nothing can be better. I have also recommended it to others, who have adopted the expedient.

Resistance for Frost.

The Gutta Percha Company have been favoured with the following Letters in reference to the non-conducting properties of Gutta Percha Tubing, in the resistance of Frost.

From J. ARMSTRONG, Esq., M.D., Gravesend.

"My private house, which was supplied with your Gutta Percha Tubing some five or six years ago, has never required the slightest attention; and previously, there was no winter passed that we were not deluged in consequence of the bursting of the leaden pipes."

From HENRY BROWN and SONS, Western Works, 108 Rockingham-street, Sheffield.

"We have now a positive proof of the frost-resisting properties of the Gutta Percha Piping. On our premises we have a leaden Pipe and a Gutta Percha one lying side by side. The leaden one has been completely frozen up at least ten days, and the Gutta Percha one is still unaffected.

Every Variety for Gutta Percha Articles

SUCH AS

Mill-bands,
Tubing for Watering Gardens, &c., &c.,
Soles,
Sheet,
Pump-buckets,
Fire-buckets,
Bottles,
Bosses,
Union-joints,
Flasks,
Bowls,
Chamber-vessels,
Galvanic Batteries,
Toilet-trays,
Sponge-bags,
Curtain-rings,
Talbotype-trays,
Photographic Baths, &c., &c.

MANUFACTURED BY THE

GUTTA PERCHA COMPANY,

And Sold by their

WHOLESALE DEALERS IN TOWN AND COUNTRY,

Submarine and Subterranean Telegraph Wires Insulated with Gutta Percha.

The Gutta Percha Company, Patentees,

18, WHARF-ROAD, CITY-ROAD, LONDON. (54)

Published by RICHARD ARCHIBALD BROOMAN, at the MECHANICS' MAGAZINE Office, 166 Fleet-street, in the Parish of St. Dunstan's-in-the-West, in the County of Middlesex, and printed by JAMES JUDD and HENRY ALEXANDER GLASS, of 14 Holford-square, Pentonville, in the County of Middlesex, at their Office, 38A New Bridge-street, in the Parish of St. Anne's Blackfriars, in the City of London.—Friday, March 4, 1859.

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.) [EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. I.—No. 11. [NEW SERIES.] LONDON: FRIDAY EVENING, MARCH 11, 1859. PRICE, FOURPENCE. BY POST 5d.

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SOCIETY OF ARTS.—The Eleventh Annual Exhibition of Inventions will open on the 25th day of April, 1859. The days fixed for receiving articles intended for exhibition are Thursday the 7th, Friday the 8th, and Saturday the 9th April. No charge is made for space, and the Exhibition is Free.

Intending exhibitors should communicate at once with the Secretary. By order,

P. LE NEVE FOSTER,
Society House, John-street, Secretary.
Adelphi, 1st March, 1859. (171)

BRICKS.

TO BE LET, with immediate possession, in consequence of the death of the proprietor, J. M. Paine, the DIPPENHALL SILICA FACTORY, erected for the purpose of making improved Fire Bricks, Building Bricks, Paving Tiles, &c., &c., from the Soluble Silica Rock.

Apply to view the Buildings and Bricks to G. H. Ogston, Esq., Resident Manager, Dippenhall, Farnham, Surrey; and for terms, to Messrs. Nicholls and Potter, Solicitors, Farnham. (125)

GLADSTONE & Co., CONTRACTORS and ENGINEERS.
2 John-Street, Minories, London, E.C.,
Are prepared to ESTIMATE FOR and CONSTRUCT BRIDGES, PIERS, JETTIES, &c., in Iron, Wood, or Stone. Also to supply Cranes, Girders, Turntables, and Railway Work and Plant generally. (56)

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N.B.—The public are cautioned against being imposed upon by worthless imitations. (132)

HART & SON, MALLEABLE IRON-FOUNDERS, 4 Vine-street, York-road, Lambeth. Orders for Malleable Iron Castings executed within a week. (77)

TO BRASS FOUNDERS.

TO BE SOLD, the Patent-right of a New and Highly-approved EQUILIBRIUM WATER COCK or VALVE, suitable for Steam Boiler Feed Pipes, or any cases where the valve is required to be opened against pressure,

Address H., MECHANICS' MAGAZINE Office, 166 Fleet-st., where a Drawing may be seen. (151)

STEAM ENGINES.

FOR SALE, a superior HIGH PRESSURE HORIZONTAL STEAM ENGINE of 6-horse power, 8-inch cylinder, and 1-foot 6-inch stroke. One of 8-horse power, 10-inch cylinder, and 1-foot 6-inch stroke. One of 10-horse power, 12-inch cylinder, and 2-feet stroke. Two of 14-horse power, 14-inch cylinders, and 2-feet stroke; and one of 30-horse power, 20-inch cylinder, and 3-feet stroke.

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ENGINEERING AND MECHANICAL DRAWING CLASSES.—Instruction given in Engineering and Mechanical Drawing, comprising the preparation of plans, elevations, and sections of marine and locomotive engines, with the detail and working drawings; also the method of delineating screws, bevel wheels, &c.; orthographical projection, and tinting, shading, and colouring taught.—For prospectuses of the Day and Evening Classes apply to Mr. T. J. HILL, at the offices, 15, Old-street, City-road. (73)

TO MARINE ENGINEERS, OR SHIP-BUILDERS.

THE PROPRIETOR of a VALUABLE PATENT for Double-expansive Marine Engines (by which great economy of space and fuel is obtained) is desirous of entering into arrangements with a respectable firm for the construction of the same. An adequate portion of the patent-right would be assigned by the advertiser to any firm taking the matter up; and he would render all assistance in his power, either in London or elsewhere, amongst ship-owners (to many of whom he is well known), in obtaining contracts, &c. Unexceptionable references given. Address C. E., MECHANICS' MAGAZINE Office, 166, Fleet-street. (75)

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WANTED, a Gentleman well-acquainted with Ironmongers, Upholsterers, Coopers, &c., to Travel on Commission.

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AN ENGAGEMENT IS OPEN for a Mechanical Draughtsman and General Assistant. One who speaks and writes French is indispensable, and of active business habits, with practical knowledge of Engineering and Machinery preferred.

Apply by letter *only*, stating Age, Salary, and References, to H. CLAYTON, Atlas Works, Upper Park-place, Dorset-square, London. (176)

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A PRACTICAL ENGINEER of long standing prepares Original Drawings, Copies, and Tracings. Advice and Assistance given to Inventors in working out their Plans. Pupils taught privately. Terms moderate.

Apply to J. J., 171 Strand. (138)

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A VALUABLE PATENT to be DISPOSED OF.—The Patentee will either dispose of the Patent or grant Licences to any party wishing to manufacture, or would join a person with capital to carry out the Patent.

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ENORMOUS REDUCTION IN THE COST OF STEAM POWER.

TO RAILWAY COMPANIES, STEAM SHIP PROPRIETORS, AND MANUFACTURERS.—A saving of Fuel equal to one-third of the entire consumption is effected by the introduction of "DUNCAN'S PATENT SPIRAL HEAT DIFFUSERS," which arrest the heat in its passage through the flues or tubes, and convert into impelling power the large measure that without these appliances would (even in the very best boilers) escape along with the smoke. They can be fitted in an hour or two at a small cost, and without any alteration in the existing arrangements of boilers now in use. These results are prepared to be guaranteed, and a part of the value of fuel saved by the use of the Apparatus will be accepted for royalty.

Hitherto, steam navigation to distant parts of the world has proved a commercial failure. The remedy is provided, and the vast numbers of large and splendid vessels can soon be made valuable paying property.

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PORTABLE STEAM ENGINES, from 6 to 12 horse power,
STATIONARY STEAM ENGINES, from 4 to 50 horse power,
TUBULAR BOILERS, from 4 to 50 horse power,
CORNISH BOILERS, from 4 to 50 horse power,

Are in hand, and can be despatched on eight days' notice. Prices moderate. Workmanship and Material of the best description.

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VENTILATION WITHOUT FLUES.

KUKLA'S PATENT STOVES,

At 18s., 25s., and 50s.

KUKLA'S newly-invented Deflagrator—the first and only perfect GAS STOVE. Guaranteed to burn without flue—without dust, smell, or smoke, producing a great and pure heat with the least expenditure of Gas.—*Vide Society of Arts' Journal.*

Patronised by the English and French Government.

Scientific in Principle,
Simple in Construction,
Healthy and efficient in use.

The Deflagrator Stove is cheap, portable, and suited for every situation; and from the principle on which it is constructed (viz., expanding to a sixfold volume the gas used) is capable of warming any given space more quickly and more thoroughly than any other means: while its addition forms a sure remedy for any ill-warmed or ill-ventilated apartments.

The 25s. Deflagrator warms a room of 2,000 cubic feet at a cost of 3d. per day.

The 50s. Deflagrator warms 5 to 6,000 cubic feet at a cost of 6d. per day (twelve hours). Also, the Greenhouse Stove at 18s.

Patentee and sole Manufacturer, F. X. KUKLA, 194 Pentonville-road, London.

Country orders promptly attended to. Carriage free to any Railway in London.

Post-office Orders should be made payable to FRANCIS XAVIER KUKLA, General Office.

N.B.—Every Stove separately tested before sent out.

The New Gas Cooking Stove for 10 persons, price £3. (103)

PIERCE'S

UNRIVALLED

PYRO-PNEUMATIC FIRE-LUMP WARMING AND VENTILATING STOVE GRATES,

WITH the cheerful, open fire, producing healthful warmth, with continuous Self-acting Ventilation, for Churches, Schools, Public Buildings, Banking Houses, &c. These Grates are manufactured solely by PIERCE, the Inventor, for which he received the Prize Medals of London in 1851, and of Paris in 1855.

PRICE, from £7 10s.

ILLUSTRATED CATALOGUE, with Prices and Estimates for Work, furnished on application to the Inventor and Sole Manufacturer.

Also his

IMPROVED COTTAGER'S GRATE,

For Warming Two Rooms with only One Fire. Prices, 30s. and 35s.

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TO STEAM SHIP OWNERS, ENGINEERS, AND OTHERS.

How's Patent Steam Engine Counters, can be read at sight.

These Counters register the number of revolutions made by an engine or other mechanism. They may be used for ascertaining the duty of Pumping Engines and Water-wheels; the revolutions on board a steam-vessel; to calculate the slip of the propeller; and in a locomotive to test the slip of the wheels.

How's Patent Salinometer, for Steam Boilers using Salt Water.

By these, the density of the water in the Boiler is at all times accurately shown, and a saving of boiler and fuel is effected. They are adopted by the Admiralty, the Honorable Trinity Corporation, and others. Copies of Testimonials from Messrs. Penn, Messrs. Maudslay, and others, will be forwarded on application.

How's Engine-Room Telegraph, for communicating between Captain and Engineer. Society of Arts Prize Medal, 1855.

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How's Patent Fresh Water Apparatus for Ships' Use.

This apparatus is designed for the distillation of Fresh from Salt Water; and on long voyages, and where the supply of water is scanty, it will be found invaluable. Testimonials may be seen.

Patent Steam Pump and Fire-Engine for Ships' Use.

This Steam-pump occupies but a small space; works perfectly noiselessly, and throws an immense volume of water. An Illustrated Circular of Fresh Water Apparatus and Steam-pump combined, free on application.

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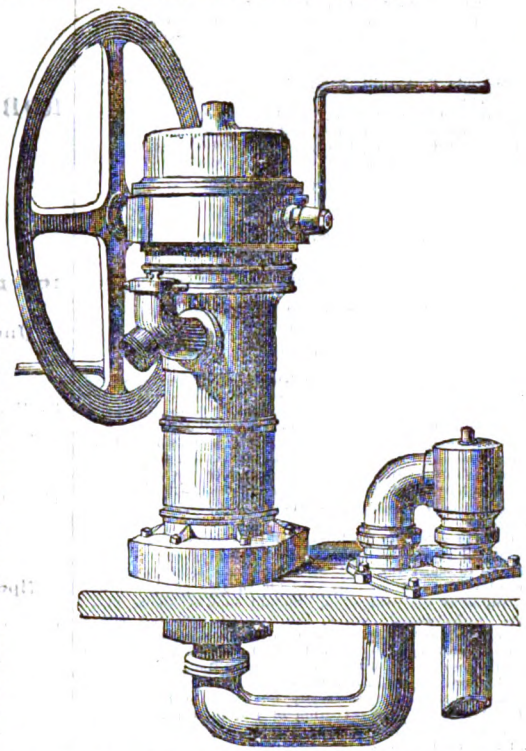

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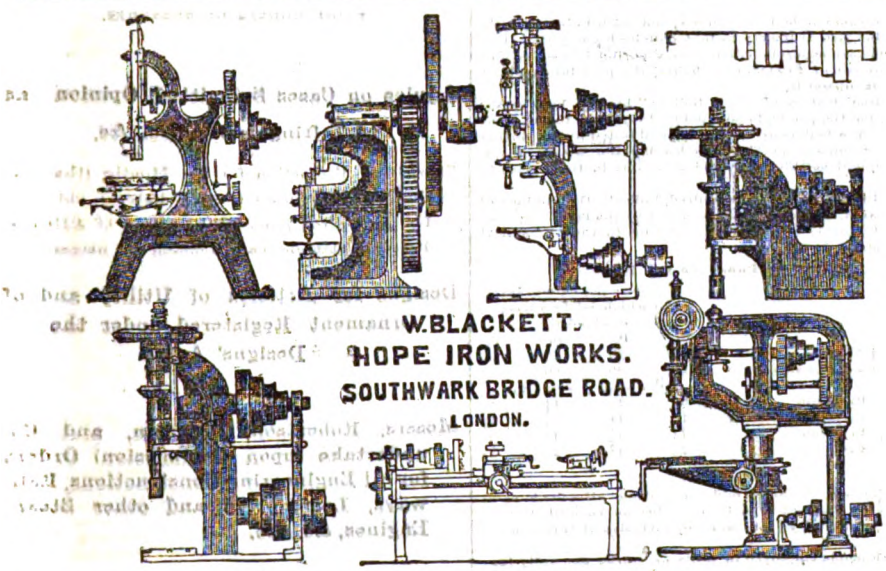

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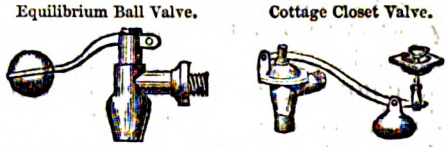

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		lb.	lb.	lb.	lb.
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	and not exceeding	20	40	60	—
		Per cent. per annum.			
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WEBSTER'S METHOD OF RIGGING SHIPS.

A correspondent sends us the following:—

Belfast, 11th Feb., 1859.

GENTLEMEN,—If some knowledge of mechanics without any of seamanship may entitle me to form an opinion, I regard Mr. Webster's proposed method of rigging ships, described in your number of 7th Jan., 1859, as a valuable improvement. Its most important feature, if I understand the description, is making the masts in one piece for the entire height, so that the yard may be lowered to the level of the deck when required. This arrangment must be especially advantageous in such vessels as our new "screw ships of the line," which are intended by their builders to be at once full-rigged sailing ships and full-powered steamers; for it is well known that when a vessel is steaming in a calm or against the wind, the resistance of the air against the rigging is a serious drawback to her speed; and Mr. Webster's plan of lowering the yards will reduce this to a minimum. His "retractile" bowsprit, to borrow a term from zoology, will be advantageous for the same purpose; for a bowsprit is, of course, useful to a sailing vessel by enabling her to spread more canvass, but is an encumbrance to a steamer in a head wind. The difficulty you point out, of obtaining sound sticks of timber of the requisite length, may be easily obviated by substituting iron for wood, as iron masts may be made of any length in one piece. Indeed, the introduction of iron masts must inevitably lead to the disuse of round-tops and all such "top hamper." The union of sail-power and steam-power in the same vessel, without placing the other under any disadvantage, is a most important object, both for ships of war and for the Australian trade, and I am inclined to think has not yet been attained. The *Royal Charter*, which is a screw clipper, appears in no way inferior to the best clippers without screws. Mr. Webster's invention will also be useful in enabling the rigging to be worked from the deck; a most desirable object, not only for the purpose of saving labour, but also of diminishing danger to life. It is intended to work the rigging of the *Great Eastern* from the deck, and by steam-power. I have met with no detailed account of the way in which this is to be done; but I think that very probably there is nothing in Mr. Webster's invention, except the "retractile" bowsprit, but what has been anticipated by the designers of the *Great Eastern*.—Respectfully yours, J. J. M.

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London, 10th March, 1859.

		£ s. d.	£ s. d.	Pts. p. ct.
IRON, Rails in Wales and N. of England	pr. ton	6 5 0 to	6 10 0	nett
Welsh Bars, in Wales	"	6 0 0 "	6 5 0	3
Staf. Bars at the Works,	"	7 0 0 "	7 10 0	2½
" Hoops	"	8 0 0 "	8 10 0	"
" Sheets, Singles	"	8 15 0 "	9 0 0	"
" Nail Rods	"	7 0 0 "	7 10 0	"
" Boiler Plates	"	8 10 0 "	9 0 0	"
Scotch Pig, M.-Nos, Warrants, at Glasgow	"	2 11 9	2 12 0	nett
Do. No. 1, Good Brands	"	2 12 0 "	2 13 6	"
Scotch Bars	"	7 5 0 "	8 0 0	3
Swedish Bars, in London	"	13 10 0 "	16 0 0	2½
COPPER, Sheet and Sheathing per lb.		0 1 0½		3
Tough Cake and Tile	" ton	112 10 0		"
Best Selected	"	115 10 0		"
Australian	"	114 10 0 "	115 0 0	"
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Yellow Metal Sheathing	per lb.	0 0 10½		"
STEEL, Swedish Keg	pr. ton	20 0 0		2½
" Faggot	"			"
TIN, English, Block	pr. cwt.	6 6 0		2½
" Bar	"	6 7 0		
Foreign, Banca	"	6 11 0 "	6 12 0	nett
" Straits	"	6 10 0	6 11 0	"
TINPLATES, Charcoal, I.C.	pr. box	1 12 0 "	1 13 0	3
Coke, I.C.	"	1 0 0 "	1 1 0	"
LEAD, Pig, English	pr. ton	22 15 0 "	23 5 0	2½
" Spanish	"	22 5 0 "	22 10 0	"
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SPELTER, on the spot	pr. ton	21 5 0 "	21 10 0	nett
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METAL AND COAL TRADES, &c.

[FROM OUR OWN CORRESPONDENT.]

Iron and Coal Trades of the Country generally—Those of South Staffordshire—Combined opposition of Traders to the Great Western Bill—Iron and Coal in Derby, Lancashire, and Yorkshire—Glasgow Iron Trade: Great Decrease of Exports—The Hardware Trades of Birmingham and Wolverhampton—The Labour Market; The Glass Makers; The Halifax Stone-Masons—Sheffield, Rotherham, and Hackenthorpe Trades—Northumberland and Durham Districts—Ravensworth and West Hartley Coals for Steam Purposes—Coal Trade of the Tyne—South Yorkshire Coal Trade—Coal Trade and Colliers of South Staffordshire.

THE iron and coal trades of the country generally may be reported this week as having prospects of a more cheering character than those which were before them at the time of our last. It cannot be stated that any large accession of orders has taken place in the week, yet, as the probabilities of a prolongation of peace are more than at the time of our last reports, there is more cheerfulness on every hand, with a consequent firmness or slight upward tendency of rates for both pig and manufactured iron.

From South Staffordshire we learn that the orders from the United States continue steady, and that there is a good demand for railway iron. The bulk of the latter description of orders, however, it is said go to South Wales, on account of the greater facilities there for the production of that class of merchant iron. Good hot-blast mine pigs of native make are not so easy this week, and the slackness of poor descriptions is not so conspicuous.

The iron and coal masters and the traders generally of South Staffordshire and Birmingham are uniting with other districts in a vigorous opposition against a bill which the Great Western Railway Company are bringing into Parliament to increase their carrying rates, and to obtain other powers as carriers which in several instances will more than double the present cost of conveying merchandise upon the greater portion of that line. The matter is regarded as of serious import in Birmingham and its surrounding district.

Of the wide district embracing Derby, Lancashire, and York, the demand for railway iron work during the week has been good, and there have been frequent inquiries for bars and plates. The rates are well maintained. The demand for Derbyshire pig iron is on the increase amongst local ironmasters, and a much larger quantity of the Northamptonshire ores now continues to be received. The coal trade is not so brisk as during the corresponding month of last year, but the remarkable mildness of the weather has materially diminished the consumption for household purposes.

In the Glasgow market on Tuesday last, the shipments of the week were reported at only 1,283 tons, whilst those of the corresponding week last year amounted to 10,034 tons, leaving a falling off of 8,751 tons. The rates realised on Tuesday were, for No. 1, 51s. to 51s. 3d; Mixed Nos., warrants, 51s. 5d. to 51s. 7d.; Mixed Nos., maker's iron, 51s. to 51s. 3d; Nos. 3, 51s. to 51s. 3d. Market drooping.

The Birmingham and Wolverhampton trades continue as a whole quiet, without (except in rare instances) either great activity on the one hand or marked depression on the other. The orders are pretty evenly divided between the home and foreign markets—India and the United States towering high above any other foreign customer, and the northern counties being the leading representatives of the British requirements.

The labour market does not seem to be overstocked either in this particular district or in any other part of the kingdom.

Having received overtures from some of the men, the master glass-makers have offered to re-open their works upon the men complying with certain conditions in respect of the objectionable rules.

The dispute between the stone-masons of Halifax and their masters has been settled, and the men have resumed work.

In Sheffield, the pacific tone which has pervaded the continental imports during the week, has produced a decidedly favourable effect; nevertheless, whilst some houses are tolerably well to do, many others could do more than they have now the profitable opportunity of doing. American advices are most encouraging, without, however, many orders yet, either for rolled steel or cutlery. The employment on continental account is partial; and there is only little doing in the home trade. That stocks are low in the country is shown by the urgency of the orders when they are received, as well for plated as for steel wares.

At Rotherham, trade is by no means active.

At Hackenthorpe and its neighbourhood, the sickle-makers are upon strike.

In the Northumberland and Durham district pig-iron continues to rule low, and the coal trade is quiet. The coking trade, too, is getting quiet. How far this last-named feature of the trade has been brought about by the diminished use of coke upon the railways consequent upon the adoption of coal-burning principle to locomotives, remains to be proved.

Ravensworth West Hartley coals have been tested by the French Government at Cherbourg, for their steam generating qualities; and the experiments have been so far successful, that the Comte de Maricourt, the French Consul at Newcastle-upon-Tyne, has notified to the parties interested, that his Government has included the West Hartley amongst the steam coals to be supplied to the French navies.

The most important recent event in the history of the coal trade of the Tyne, is the opening of the Tyne Docks by the North Eastern Railway Company. These docks are capable of shipping 1,600,000 tons of coal in the year, and may be made, by the extension of jetties, to ship 4,000,000 tons. To enable the Tyne colliers to compete effectively with the Yorkshire and Midland men great dispatch is being used. On the day of the opening of the Tyne Docks, a screw steamer was put under one of the spouts, received 400 tons, was trimmed, and ready for sea, in fifty-five minutes. Under proper arrangements, two such steamers can be loaded at one spout in the same tide.

Dulness pervades the South Yorkshire coal trade.

The colliers of South Staffordshire have commenced to subscribe a shilling each towards the expenses which will be entailed by their application to Parliament, with their Yorkshire brethren, for a short-hours' bill. The coal trade in that district cannot be considered buoyant. The supply continues more than equal to the demand.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

PIER AND OTHER WORKS, *Elie Harbour, Fifeshire.*—Plans, &c., Mr. C Elie. Tenders with Mr. Jamieson, at Elie-house; or, Mr. Andrew Wilkie, banker, Leven, March 19.

DRAINAGE WORKS and IRON PIPES.—The Commissioners of Police of Burgh of Portobello ask tenders for sewerage works, also for 243 yards of cast iron pipes. Plans, &c., Commissioners' offices, Council Chambers, Portobello. Schedules of Measurement, &c., Mr. Paterson, C. E., Surveyor, 20 St. Andrew-square, Edinburgh. Tenders, noon, March 14.

WHARF OR QUAY, *Middlesbro.*—For Stockton and Darlington Railway Company. Plans, &c., Northgate, Darlington. Tenders, March 24, Mr. Mac Nay, Sec., Darlington.

LIMEWORKS, *Direct Portsmouth Railway.*—Tenders from limeburners and others, on the Portsmouth Direct Railway, at Buriton. John Mariner, or Luke Gumbrill, at Buriton, will show the ground. Tenders, March 31, to Messrs. Dunn, Hopkins, Blakemore and Co., Alresford; and Mr. W. Adams.

SEWERS, *Dundee.*—Plans, &c., Mr. John Fulton, to surveyor, Police-buildings. Tenders to Commissioners of Police, March 28.

LOWERING HILL, &c.—London and Hugbridge Turnpike Road, Chiddleton Heath, near Leek. Plans, &c., Mr. Leach, surveyor, Wall-hill, Leek. Tenders, March 17, to Messrs. Challinor and Co., Leek.

ROADS, *Tynemouth.*—Repair and maintenance of public highways. Specifications, &c., Boro' Surveyor's Offices, 40 Norfolk-street, North Shields. Tenders, March 16, Town Clerk, Tynemouth.

STREETS, *Luton.*—Paving, Channelling, &c. Plans, &c., Surveyor's Offices, 15 Stuart-street, Luton. Tenders, March 15.

ROADS AND REMOVAL OF SCRAPINGS, *St. Mary, Islington*—Forms, &c., of Mr. Layton, Vestry Clerk, 21 Milner square. Tenders, March 16.

CONVERSION, *Hanley.*—Pheonix Foundry into an Earthenware Manufactory, &c. Plans, &c., Messrs. Ward and Son, Architects, or Messrs. Meakin, Hanley. Tenders to Messrs. Meakin. No date.

CHURCH, *Bolton-on-Swale.*—Restoration, &c. Drawings to the 14th, at Rev. A. Cumby's, Scorton, near Catterick. Quantities of the architect, Mr. G. Fowler Jones, 4 Newstreet, York. March 16.

BANK, *Worcester.*—New premises for City and County Banking Company. Plans at Rectory House, St. Nicholas, Worcester. Particulars, Mr. E. W. Emslie, architect, March 28.

VILLAS, *Picklebridge, near Halifax.*—Masons', carpenters', joiners', plumbers' and glaziers', plasterers', slaters', and painters' works of two villas. Plans, Messrs. Dobson and Charley, architects, Park-row, Leeds. March 18.

HOUSES, *Worcester.*—Conversion of a building in the Moors into three dwelling-houses. Plans, &c., Mr. E. L. Pugh, solicitor, 81 High-street, Worcester. No date given.

SCHOOLS, *Spilsby and Hundleby, Lincolnshire.*—Schoolmaster's house and school-rooms. Plans, &c., Rev. Mr. Turner, incumbent, Spilsby. March 16.

SCHOOLS, *Tinterden.*—Infant school and class room to boys' school. Plans, &c., Mr. Scratton, solicitor, Tinterden; particulars, Mr. Pope, architect, 21 Bedford-row, London. March 15.

RECTORY HOUSE, *Shrewsbury.*—At Yockleton, parish of Westbury. Plans and tenders to Mr. Cranston, architect, 2 Bennett's-hill, Birmingham, to March 26.

ADDITIONS, *Buxton.*—Hall and Shakspere Hotels. Plans, &c., Buxton Estate office. Tenders, E. W. Wilmot, Esq. Buxton, March 16.

NEWSROOM, SHOPS, &c., *Rochdale.*—Plans, &c., Messrs. Starkey and Cuffey, 40 Princess-street, Manchester. Tenders, Rochdale Market Trustees, April 2.

RE-BUILDING PREMISES, *London.*—No. 28 Addle-street, City. Drawings, &c., to March 15; particulars, Mr. R. Parris, architect, 5 Walsingham-place, Lambeth.

PIG-IRON, *Navy.*—Soft-melting. Distribution of iron and forms of tender, at Storekeeper General's office, Somerset-place. Tenders to two, March 22.

HAND STONES, *Navy.*—Portland stones for scrubbing ships' decks. Samples and tenders as next above.

TAR, PITCH, AND TALLOW, *Navy.*—Descriptions and tenders as above.

OIL, *Dublin.*—125 tuns of best rapeseed, for lighthouses. Proposals to March 23, to Mr. Wm. Lees, secretary, Ballast office, Dublin.

DESIGNS FOR A WORKHOUSE, *Sheffield.*—Near Penistone. Cost not under £2,500, of local stone. Particulars, Clerk of the Guardians, Penistone. Plans, March 16.

DESIGNS FOR NEW SCHOOL OF ART, *Coventry.*—The second prize, £10 10s. Particulars, R. Caldicott, jun., Hon. Sec. April 9.

PLANS FOR POLICE STATION, *Birmingham.*—Lady Woodroad. Time extended to March 28; plans to Town Clerk.

MANAGER OF GAS WORKS, *Scotland.*—Salary to commence at £350 per annum. Printed applications and testimonials to Mr. F. Lyon, Edinburgh, and Leith Gas-Light Company, April 9.

AS SURVEYOR FOR HANLEY.—Whole time. £170 per annum. March 21. Mr. E. Challinor, Town Clerk, Hanley.

AS FLOUR-MILL ENGINEER.—Taking the entire charge of an engine, and knowing the general work of a flour-mill. —A 151, *Manchester Guardian.*

MECHANICAL DRAUGHTSMAN.—For Italy. Acquainted with steam engines, mill-machinery, &c. Age 25 to 30. Salary, £2 to £2 10s. "W.," Mr. Lidstone, George-street, Plymouth.

BRICKMAKING.—A contractor to make and burn bricks. Address, No. 118, *North British Advertiser* office, Glasgow.

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ARTIFICERS' WORK, *War Department.*—From May 1, 1859, to March 31, 1862, at various barracks, &c. Applications for forms of tenders to be accompanied with guarantee of fitness. Information of the Royal Engineer, up to March 24, for 5s. Tenders to Director of Contracts, War Department, Pall Mall, March 31.

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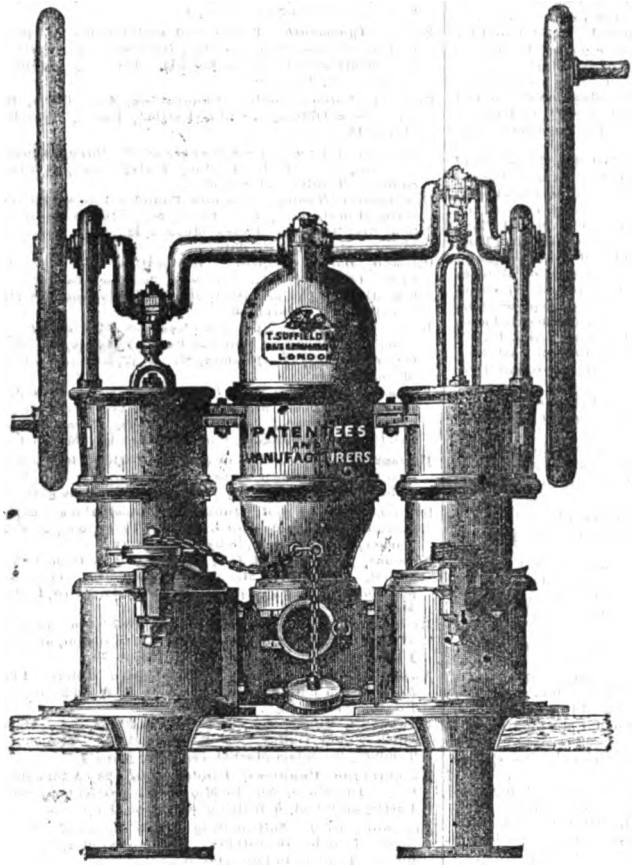

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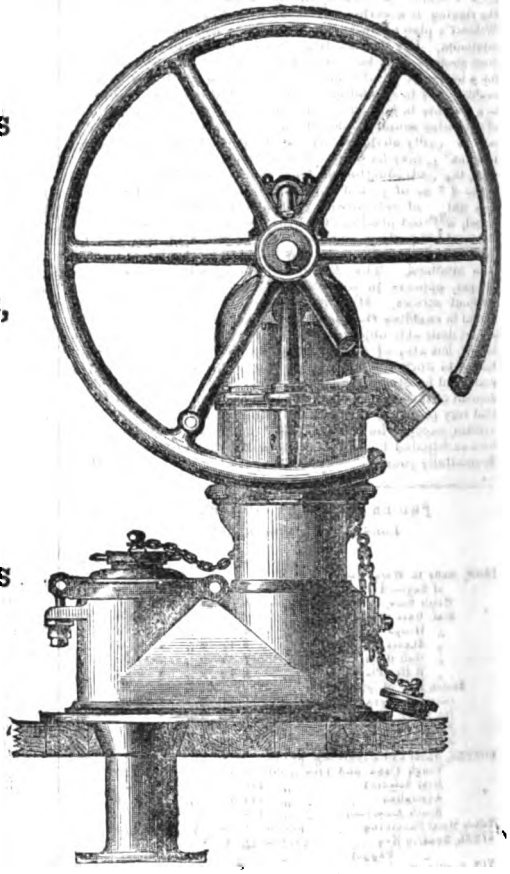

These Pumps are free from that liability to choke which is common to other Pumps, and their Working Parts are not susceptible of derangemen either from wear or from being long out of use. They pass entirely through them, with ease, any substance that may enter the Suction Pipes. The Novelties in these Pumps are their adaptation to the varied duties of Ships' Pumps; the facilities they afford for Cleansing the Suction Pipes, and for Sounding or Examining the Valves; the readiness with which they may be used for Ventilating the Bilge, or for acting as a Syphon either for Watering the Ship, or for extinguishing Accidental Fires on board; the rapidity with which they can be converted into Fire Pumps, or be applied to th Washing of Decks; and their capability of Pumping from Several Compartments.

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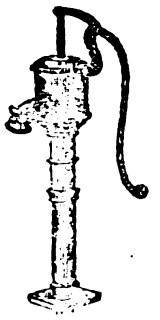

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3½ „	6 „ 6
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Pipe attached, ready for fixi
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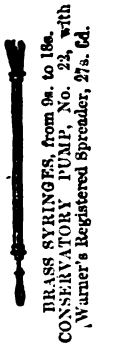

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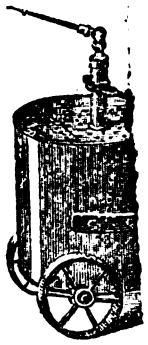

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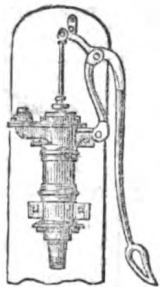

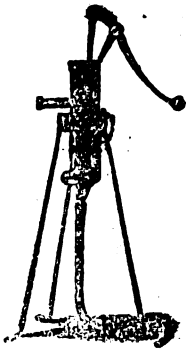

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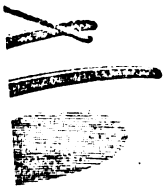

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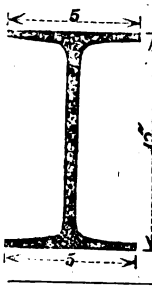

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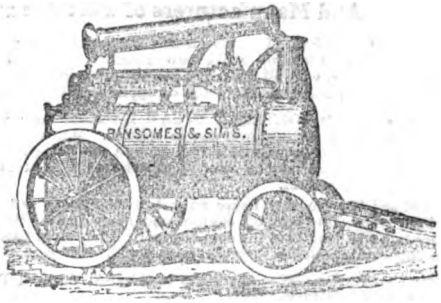

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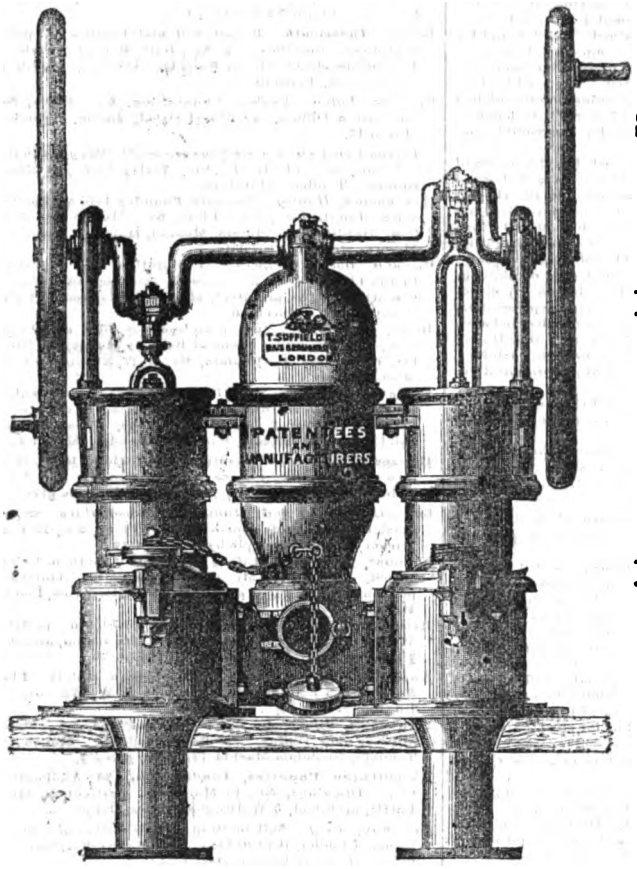

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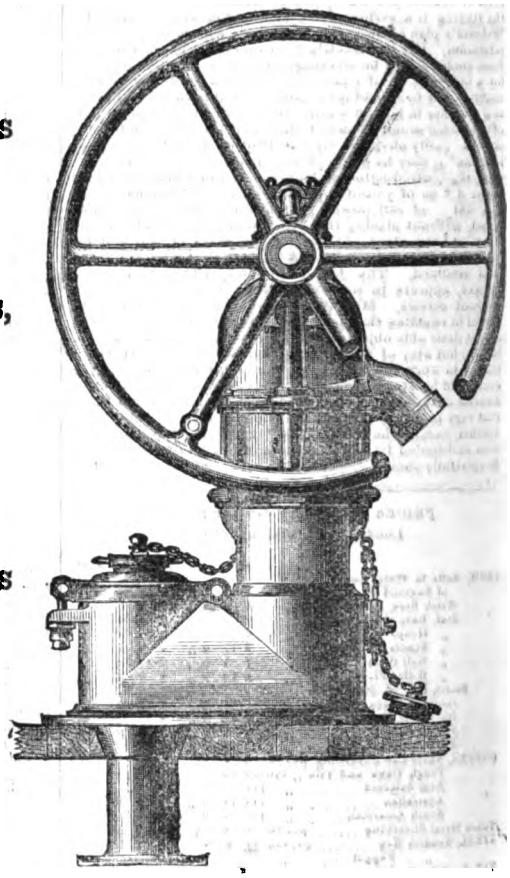

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They keep a Large Stock of Goods, of their own Manufacture and from the Best Makers, constantly on view; so that by a visit to their Works or Depôt, much valuable time may be saved by Managers, Engineers, and other Gentlemen who may require such Stores, together with a further saving in the cost of such Articles.

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(OPPOSITE MARK LANE.)

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LONDON.

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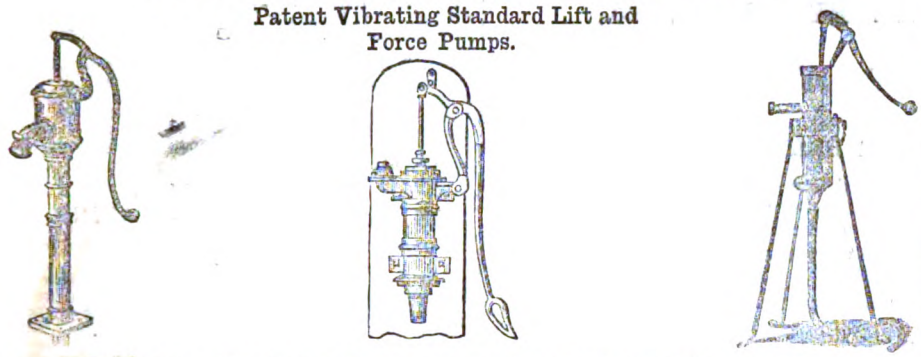
JOHN WARNER AND SONS,

8 CRESCENT, JEWIN STREET, LONDON.

HYDRAULIC ENGINEERS, BRASS AND BELL FOUNDERS,

PATENTEES OF IMPROVEMENTS IN PUMPS.

Patent Vibrating Standard Lift and Force Pumps.



PATENT CAST-IRON PUMP fitted with J. Warner and Sons' Patent Bucket and Sucker, which cannot clog in action, for Farms, Cottages, and Wells, not exceeding 28 feet.

Dia.	Height.	£	s.
2½ in. short	1 ft. 7 in.	1	10
2½ in. long	3 ,, 3 ,,	1	14
3 ,,	6 ,, 6 ,,	2	8
3½ ,,	3 ,, 6 ,,	3	3
4 ,,	3 ,, 6 ,,	3	3
2½ ,,	3 ,, 6 ,,	3	3
2½ in. short, with 15 feet of Lead Pipe attached, ready for fixing		2	14
2½ in. long. do. do.		2	18

PATENT BRASS LIFT AND FORCE PUMP, on Plank, for House purposes, supply of Cisterns, &c.

	£	s.
2½ inch	6	0
3 ,,	7	5
3½ ,,	8	0

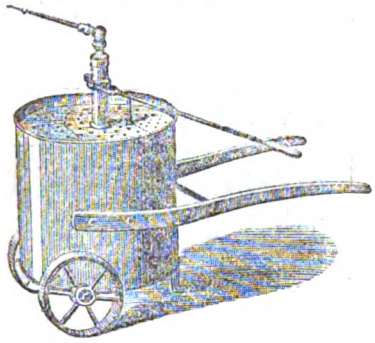
A lighter Pump of 3 inches diameter, can be supplied if required 5 15

IMPROVED LIQUID MANURE, OR GENERAL PORTABLE PUMP.

These Pumps are fitted with J. Warner and Son's Patent Bucket and Sucker, and cannot clog in action. The Barrel is of Galvanized Iron, not likely to corrode, and can be raised or lowered at pleasure. The legs will fold together, and the whole may be carried on shoulder to any pond or tank required.

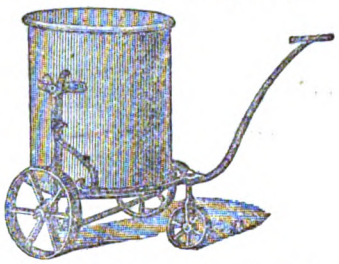
4½ in. Liquid Manure Pumps, with legs, £3 3s.; 1¾ in. Gutta Percha Suction Pipe, 1s. 11d. per foot; 2 in. Flexible Rubber and Canvass Suction Pipe, on Wires, 3s. 3d. per foot. The Barrel is 27½ inches long, and the legs are 5 feet high. Larger sizes of the above if required.

BRASS SYRINGES, from 9s. to 18s.
CONSERVATORY PUMP, No. 22½, with Warner's Registered Spreader, 27s. 6d.



Galvanized Iron Tub GARDEN ENGINE, with Warner's Registered Spreader, is strongly recommended for durability and low price, viz., £2 19s., to hold Ten Gallons. Larger sizes, in either wood or iron.

WARNER'S SWING WATER-BARROW.
(To hold Thirty Gallons), £3 3s.,



is intended for all large Establishments where much watering is done by the watering-pot. By its use much time and labour of the Gardener are saved, particularly where the Tank, Pond, or Pump is at a distance from the garden.

MUSICAL SHEEP BELLS, with Straps, in sets of 6, 19s.; ditto, in sets of 8, 25s.; ditto, in sets of 12, 38s.

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Bells for Churches, Chapels, Colleges, Schools, Turret Clocks, &c., cast for any size, note, or weight, singly or in peals. Tuned by machinery. Stocked and wheeled ready for fixing. Old Bells re-cast or taken in exchange.

The great 16-ton Bell, for the Houses of Parliament, was made by JOHN WARNER and SONS, 1856, under their Patent.

May be obtained of any Ironmonger or Plumber, in town and Country; or of the Patentees and Manufacturers, as above. (30)

TO ENGINEERS, MILLOWNERS, AND MANUFACTURERS.

AMERICAN INDIA-RUBBER Machine Belting, Valves and Washers, Brewers' Hose, Fire Engine Hose, Improved Suction Hose—at Wholesale Prices.

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38 Upper Thames-street, London, E.C. (152)

FOG WHISTLES, for Seagoing Steamers.

WATER GAUGE MOUNTINGS, for Marine and Land Boilers.

GAUGE COCKS, GLAND COCKS, GREASE COCKS, CUPS and SYPHONS.

STEAM TAPS, RANGE COCKS, &c.

IMPROVED BRASS VALVES, for Steam, Water, and Gas.

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USE THE TUBES AND FITTINGS MADE BY JOHN RUSSELL and Co. (Established at the commencement of gas-lighting), whose goods are all well tested, and warranted.

J. R. and Co. supplied Thomas Cubitt, Esq., for all his houses in Belgravia, the Queen's Palace, &c., which locality is proverbially free from gas.

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J. R. and Co. are the holders of the First Prize Medals for Gas-Tubes and Fittings and Boiler Tubes.

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WROUGHT IRON BEAMS AND GIRDERS

Of various sizes up to 12 in. deep, with Top and Bottom Flanges, 5 in. wide, rolled up to 28 ft. long.

Smaller dimensions can be produced much longer.

For Sections, Prices, and other Particulars, apply to

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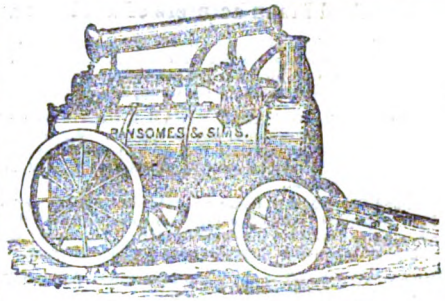
LIVERPOOL. (166)



RANSOMES AND SIMS,
IPSWICH,
AGRICULTURAL & GENERAL ENGINEERS AND IRONFOUNDERS.
LONDON OFFICE: 31 ESSEX STREET, STRAND, W.C. (165)

PATENT WEDGE and GROOVED SURFACE FRICTIONAL GEARING.—The PATENT FRICTIONAL GEARING COMPANY, Proprietors of ROBERTSON'S WEDGE SURFACE FRICTIONAL GEARING PATENTS, grant Licences to Users of Machinery, for the unlimited use of the System in their Works, on very moderate terms, enabling them to make or order from any Mechanician the Machinery they require.

The Company possess Five Patents relating to this Frictional System, including (in addition to their Bevel and Mitre Wheels) a System of Disc Clutches and Clutch Movements, Wheel Clutching, Reversing, Differential, Speed Ring, Varying Speed, and Break Movements, and of Shafting, Pillow Blocks, Shafting Hangers, &c.

Frictional Wheels thus formed are applicable to the heaviest as well as the lightest kind of work, and, in addition to their being extensively in use for ordinary gearing purposes, have been in use for a considerable time applied to Mills for Rolling Iron, the Screw-Propeller, Incline-Winding Engines, Saw Mills, Pumping Engines, Flax Scutchers, Fan Blowers, Calico-Printing Machinery, Steam Winches, Cranes, Hoists, &c.

This system gives great facilities for simplifying Machines, and for mechanical combination, and has the advantage of being noiseless and cleanly, there being no oil or grease used on the wheels. Wheel Catalogues and Circulars, giving particulars, sent free by Post; also a list of manufacturing Agents, and information regarding those who, from locality or experience, are best able to execute orders for the description of work required.

Office, 20 Buchanan Street, Glasgow. (146)

FIRE BRICKS.—THE FARNHAM INDESTRUCTIBLE SILICIOUS FIRE BRICKS have been greatly REDUCED in PRICE, and will be delivered at the Nine Elms Station, London, at 90s. per 1,000.—Address, G. H. OGSTON, J. M., Paine's Silica Works, Farnham, Surrey. (35)

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SCOTT'S
PATENT GRASS SEED SEPARATOR,

which entirely extracts the Seeds of "COUCH," "TWITCH," "SPEAR," or "HAIR" GRASS and other impurities from

PERENNIAL AND ITALIAN RYE-GRASS, &c.,

AND

SCOTT'S PATENT CARROT SEED BEARDING

AND

CLOVER AND TREFOIL MILLING OR DRAWING MACHINE,

which effectually removes the beard from Carrot Seed, rendering it fit for sowing with facility by drill or otherwise, and by the separation of abortive or diseased grains vastly increases its vegetative per centage. By a slight modification it is applicable to the other purposes before mentioned.

These Machines were admittedly the most novel, and, at the same time, the most useful and important to the Farmer of any exhibited at the late SMITHFIELD CLUB SHOW.

They may be seen at work at the Establishment of the Manufacturer,

Mr. T. MIDDLETON, Engineer, Southwark.

Communications to be sent to the Patentee, J. SCOTT, 111 Drummond Street, Euston Square, London, N.W. (48.)

CLAYTON, SHUTTLEWORTH, AND CO.,

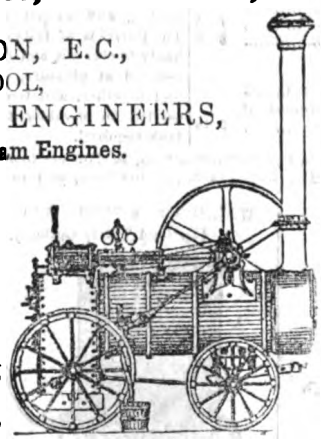
OF LINCOLN,

78 LOMBARD STREET, LONDON, E.C.,

AND 36 DALE STREET, LIVERPOOL,

AGRICULTURAL AND GENERAL ENGINEERS,

And Manufacturers of Portable and Fixed Steam Engines.



Combined Threshing Machines, which dress the corn ready for market at one operation. Grinding Mills, Saw Benches, Pumps for Irrigation and Mining purposes, with all necessary gearing for being driven by steam power. Full particulars and estimates given on application to the above address.

C. S. and Co.'s PORTABLE STEAM ENGINES are adapted for every purpose to which steam-power can be applied. When intended for winding, they are fitted with reversible link motion and winding gear. They are easy of removal, as may be seen by the engraving, and can be set to work immediately on arrival.

C. S. and Co. are now doing an extensive foreign and colonial business, and are prepared to send off engines and machinery of the before-mentioned kinds in a few days from the date of order. They would also call attention to the important *reduction in prices* made for the new year.

For Exportation.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (23)

FOWLER'S PATENT STEAM PLOUGH.

This Implement obtained

THE FIVE HUNDRED POUNDS PRIZE

AT THE ROYAL AGRICULTURAL SOCIETY'S SHOW, JULY, 1858, AT CHESTER,

(AFTER THREE YEARS' COMPETITION,)

And has also obtained

THREE HUNDRED AND SEVENTY FIVE POUNDS AT VARIOUS OTHER AGRICULTURAL SHOWS IN THE UNITED KINGDOM.

THE WINDLASS CAN BE FITTED TO ANY AGRICULTURAL ENGINE.

FOR FURTHER PARTICULARS, PRICES, AND CATALOGUES, APPLY TO

JOHN FOWLER, Jun., 28 Cornhill, London, E.C.

(156)

TO ENGINEERS, MILLWRIGHTS, MACHINISTS, &c.

VULCANIZED INDIA-RUBBER

In any of the following forms, of any size, or to Working Drawings for all MECHANICAL *purposes:—*

WASHERS for Steam and Gas Joints.	GAS-TUBING.	MACHINE AND MILL-BANDS fo Driving all kinds of Machinery.
VALVES for Marine and other Steam Engines.	SUCTION HOSE.	RAILWAY BUFFER SPRINGS.
ENGINE-PACKING (Elastic).	FIRE ENGINE AND FACTORY HOSE.	BALL VALVES.
PUMP-BUCKETS ,,	WATERPROOF CART, VAN, AND WAGGON COVERS.	PUMP-PACKING (Rings or Rope).
HOSE-PIPES.		WHEEL-TIRES (Noiseless).

N.B.—A Large Stock of the above always on hand, and any modification made to order.

Please address all communications to the Manufactory,

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GUTTA PERCHA MILL BANDS.

THE GUTTA PERCHA COMPANY beg to state that the increasing demand for the Gutta Percha Strapping for Driving-bands, Lathe-straps, &c., fully justifies the strong recommendations they have everywhere received.

Their durability and strength—permanent contractability and uniformity of substance—their non-susceptibility of injury from contact with oils, grease, acids, alkalies, or water—and the facility with which the only joint required can be made in bands of from 200 to 300 feet long—render them superior to leather for almost all working purposes, and decidedly more economical.

TESTIMONIALS.

IMPORTANT ANNUAL SAVING.

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"In reply to your inquiry, we have much pleasure in bearing our testimony to the advantages, both as regards economy and saving of time, effected by the use of your Patent Gutta Percha Bands in lieu of Leather Straps. The stoppage of one portion of our works through the failing of the leather strap used to be of daily occurrence—but with this annoyance we are now never troubled. We have had these straps in operation for nearly three years, and are assured by our Engineer that *they effect a saving to us of at least* THIRTY POUNDS *a year.*"

From JAMES ABERNETHY & Co., Fury Hill Foundry Aberdeen.

"We have now had Gutta Percha Bands working here *for three years.* One of them has been driving the fan blast for our smith's shop for all that time, and for anything we see, may drive it as long again. The speed of the fan is but 1,200 per minute. We have used them with complete satisfaction, driving circular saws, and in some cases where leather bands would have been quite inapplicable from damp. We have uniformly endeavoured to have the drums and pulleys so proportioned to the strain, as that there is no chance of the band slipping; and with this precaution, and taking care in using *cross bands that they do not rub,* we are quite satisfied that they are superior in every respect to leather—stronger at the same weight, and keeping quite straight in working—requiring no lacings, and very seldom any repairs."

WATER POISONED BY LEADEN PIPES.

The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight.

POISONED WATER PREVENTABLE

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

From Dr. MURRAY, Hull.

"It is impossible to conceive of anything more injurious or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha Tubing. Nothing can be better. I have also recommended it to others, who have adopted the expedient."

A variety of Gutta Percha Articles, such as Mill Bands, Tubing, Sheet, Bosses, Pump Buckets, Union Joints, Bottles, Bowls, Flasks, Curtain and Cornice Rings, Solid Frames, Galvanic Batteries, &c., &c.

MANUFACTURED BY THE

Gutta Percha Company, Patentees,

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AND SOLD BY THEIR

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(29.)

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.) [EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 12. [NEW SERIES.] LONDON: FRIDAY EVENING, MARCH 18, 1859. PRICE, FOURPENCE. BY POST 5d.

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SOCIETY OF ARTS.—The Eleventh Annual Exhibition of Inventions will open on the 25th day of April, 1859. The days fixed for receiving articles intended for exhibition are Thursday the 7th, Friday the 8th, and Saturday the 9th April. No charge is made for space, and the Exhibition is Free.

Intending exhibitors should communicate at once with the Secretary. By order,

P. LE NEVE FOSTER,
Secretary.

Society House, John-street, Adelphi, 1st March, 1859. (171)

ENORMOUS REDUCTION IN THE COST OF STEAM POWER.

TO RAILWAY COMPANIES, STEAM SHIP PROPRIETORS, AND MANUFACTURERS.—A saving of Fuel equal to one-third of the entire consumption is effected by the introduction of "DUNCAN'S PATENT SPIRAL HEAT DIFFUSERS," which arrest the heat in its passage through the flues or tubes, and convert into impelling power the large measure that without these appliances would (even in the very best boilers) escape along with the smoke. They can be fitted in an hour or two at a small cost, and without any alteration in the existing arrangements of boilers now in use. These results are prepared to be guaranteed, and a part of the value of fuel saved by the use of the Apparatus will be accepted for royalty.

Hitherto, steam navigation to distant parts of the world has proved a commercial failure. The remedy is provided, and the vast numbers of large and splendid vessels can soon be made valuable paying property.

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PORTABLE STEAM ENGINES, from 6 to 12 horse power,
STATIONARY STEAM ENGINES, from 4 to 50 horse power,
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Are in hand, and can be despatched on eight days' notice. Prices moderate. Workmanship and Material of the best description.

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TO BE SOLD, the Patent-right of a New and Highly-approved EQUILIBRIUM WATER COCK or VALVE, suitable for Steam Boiler Feed Pipes, or any cases where the valve is required to be opened against pressure.

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FOR SALE, a superior HIGH PRESSURE HORIZONTAL STEAM ENGINE of 6-horse power, 8-inch cylinder, and 1-foot 6-inch stroke. One of 8-horse power, 10-inch cylinder, and 1-foot 6-inch stroke. One of 10-horse power, 12-inch cylinder, and 2-feet stroke. Two of 14-horse power, 14-inch cylinders, and 2-feet stroke; and one of 30-horse power, 20-inch cylinder, and 3-feet stroke.

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ENGINEERING AND MECHANICAL DRAWING CLASSES.—Instruction given in Engineering and Mechanical Drawing, comprising the preparation of plans, elevations, and sections of marine and locomotive engines, with the detail and working drawings; also the method of delineating screws, bevel wheels, &c.; orthographical projection, and tinting, shading, and colouring taught.—For prospectuses of the Day and Evening Classes apply to Mr. T. J. HILL, at the offices, 15, Old-street, City-road. (73)

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CHARLES MACINTOSH & Co., Patentees,
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MANUFACTORY and DEPÔT, Cambridge-st., Manchester.
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WANTED, a Gentleman well-acquainted with Ironmongers, Upholsterers, Coopers, &c., to Travel on Commission.

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AN ENGAGEMENT IS OPEN for a Mechanical Draughtsman and General Assistant. One who speaks and writes French is indispensable, and of active business habits, with practical knowledge of Engineering and Machinery preferred.

Apply by letter *only*, stating Age, Salary, and References, to H. CLAYTON, Atlas Works, Upper Park-place, Dorset-square, London. (176)

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A PRACTICAL ENGINEER of long standing prepares Original Drawings, Copies, and Tracings. Advice and Assistance given to Inventors in working out their Plans. Pupils taught privately. Terms moderate.

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A STRONG & POWERFUL PLANING MACHINE, to plane 6 feet × 30 ins. × 30 ins., self-acting in all its cuts.

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A SINGLE-POWER DRILLING MANCHINE, complete.

A DOUBLE-GEARED SELF-ACTING BORING AND DRILLING MACHINE, complete.

A SELF-ACTING NUT SHAPING MACHINE.

A BOLT AND NUT SCREWING MACHINE.

A STRONG & POWERFUL STEAM-ARM SHAPING MACHINE, complete.

A NUMBER OF PLATE-IRON PUNCHING AND SHEARING MACHINES, to punch and cut iron from ¼ in. to 1 in. thick; portable to work by hand, and stationary to work by steam power.

A SET OF PLATE-IRON BENDING ROLLERS, to work by hand or steam-power.

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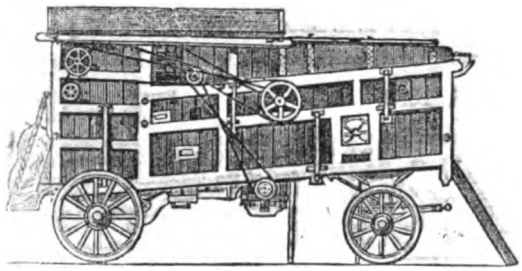

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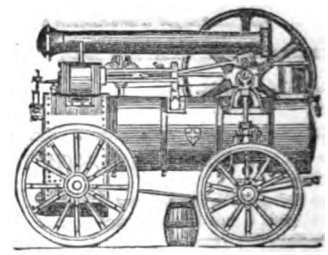

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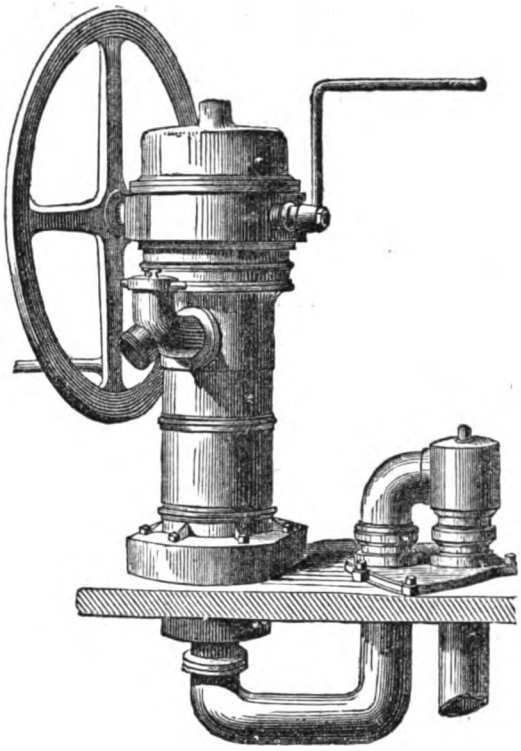

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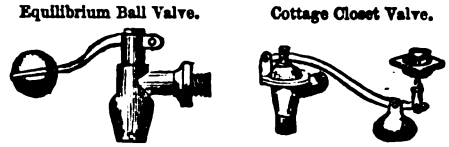

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TIN, English, Block	pr. cwt.	6 6 0			2½
„ Bar.....	„	6 7 0			„
Foreign, Banca	„	6 11 0	„	6 12 0	nett
Straits.....	„	6 9 0	„	6 10 0	„
TINPLATES, Charcoal, I.C. ..	pr. box	1 11 0	„	1 12 0	3
Coke, I.C.	„	1 5 6	„	1 6 0	„
LEAD, Pig, English	pr. ton	22 15 0	„	23 5 0	2½
„ Spanish	„	22 5 0	„	22 10 0	„
Sheet	„	23 0 0	„	23 10 0	„
SPELTER, on the spot	pr. ton	21 12 6	„	21 15 0	nett
for arrival.....	„	21 12 6			„
ZINC, English, Sheet	„	28 0 0	„	30 0 0	1½
QUICKSILVER	per btl.	7 0 0			1½

Remarks.—For Rails the demand is good and the price firm. Other kinds of manufactured are in moderate request. In Scotch Pigs a considerable business has been done at 51s. to 51s. 6d. per ton cash for Warrants. The shipments are fair, and would warrant an advance in price but for the unsettled state of continental politics. Other Metals present almost no fluctuation in price, and the business done in all has been very small.

LAWRIE AND HAGGER, Metal Brokers.
33 Lombard-street, E.C.

METAL AND COAL TRADES, &c.

[FROM OUR OWN CORRESPONDENT.]

The Iron Trade generally—Glasgow Pig Iron—Rails in the North—South Wales Iron Trade—South Staffordshire Trade; United States Demand; Preliminary Meetings; Prospects—Birmingham and Wolverhampton Trades—Sheffield Trade—Metals: Tin, Tin Plates, Spelter.

The Iron Trade has undergone no change for the better since our last. American houses continue to receive orders by each packet. It may be noticed some of the London shipping firms have evinced more disposition of late to do business, but up to the present time their operations have not been on a very extensive scale.

The Glasgow Pig Iron market was very dull on Tuesday, and a large business was done at 51s. 3d. one month, and 51s. cash; closing, buyers at 51s. cash, and 52s. three months, sellers 3d. higher. Nos. 1 and 3, G.M.B., 51s. 6d.

A contract for 15,000 tons, required for the East Indies, has been taken in the North, where there is a greater abundance of ore and coal, the raising of which is less expensive than in this district.

In South Wales the ironworks are generally well engaged, and fresh orders are daily coming in. The Continental demand continues good, and for home consumption large quantities of both pigs and rails have been disposed of. It is stated that rails are now selling, in South Wales, at £6 0s. 6d. to £6 2s. 6d.,

Respecting the South Staffordshire trade, we may remark that at Wolverhampton, on Wednesday, there was not that feeling which is always desired a fortnight before the preliminary meeting. Business was decidedly sluggish. The disappointment of last week was still more perceptible. The spring has not found us in the midst of great activity. United States advices received since last week, without being very valuable, speak of considerable under-selling through Liverpool shippers. Home and foreign trade dull. Buyers for home still hold back specifications. If peace should not appear more probable before the end of the ensuing fortnight there will be a dull preliminary meeting. Agents are quoting last quarter's prices for pigs, but the transactions in which they are obtained are inconsiderable. Pigs in large transactions rule from 2s 6d. to 5s. below last quarter-day rates.

The trade of Birmingham has become much quieter during the last few days. The partial re-action which has taken place has, however, been almost confined to the outworkers and to some of the small manufacturers, who, having few orders on their books, have been executing them almost as rapidly as they were given out. The large manufacturers have scarce experienced any change. The factors' travellers who deferred the commencement of their journeys for a week or two later than usual, are giving tolerably good accounts of the prospects of the home trade. In the North of England and in Scotland the aspect of business concerns is slightly improving. In the agricultural districts business is slightly restricted by the low prices obtained for produce. In connection with the export trade there is nothing new to report.

In reference to the hardware and cutlery trades of Sheffield we have the following:—There is no perceptible change in the state of trade during the last week, and any improvement which may have taken place is only partial. Though several firms are moderately busy, they are by no means fully engaged, and the business of the town generally is known to be much below the average.

The metal market is reported slacker, except as regards the East Indies; for that quarter operations have been on a more extensive scale. During the last fortnight there has not been much doing in foreign tin, the large consumers having been apparently content to use up stocks previously purchased; prices are, however, pretty well maintained. In Holland the stock in warrants and the tin arrived towards the next sale, shows a decrease in the deficiency there appeared last month, when compared with last year's figures; but against this the quantity reported to be afloat from Java to Holland is considerably less, being 35,000 slabs against 50,000 slabs of last year.

Tin plates are scarcely in so active demand as a week ago, and the manufacturers not so well off for orders.

There is a good stock of spelter in the country, and prices continue to rule down.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

Railway Offices, *London, Brighton, and South Coast.*—In one or three contracts, booking offices, clerks' houses, warehouses, engine sheds, &c. Specifications, &c., Engineer's Office, London Bridge Terminus, March 24.

Gas Tank, *Boston.*—Brick tank, 86 ft. diameter, by 24 ft. deep, and single-lift gasholder, with columns and girders. Plans at Gas Works, Boston.

Cathedral Tower, *Durham.*—Restoration of central tower. Plans, Messrs. Walton and Ribson, architects, Durham.

Hotel, *Norwood.*—Alterations to Beulah Spa Hotel. Drawings, &c., of the Architect, 38 Bloomsbury-square. No date.

Manse, *Monymusk, Aberdeenshire.*—Masons' and carpenters' work. Plans, Mr. Ramage, architect, 115 Union-street, Aberdeen. March 29.

Rectory, *Yockleton, Shrewsbury.*—House and offices. Plans, &c., Mr. J. Cranston, architect, 2 Bennett's-hill, Birmingham. March 26.

Rectory, *Abbess Roding.*—Plans, Beadel & Co., architects, Chelmsford. March 28.

Houses.—Master's house, for F. Wright, Esq., Butterley Iron Works, Codnor, Derbyshire. Plans with architect, C. H. Edwards, Esq., 4 St. James's-terrace, Camden Town. March 22.

Royston, Hertfordshire.—House and two farmsteads. Plans, Mr. E. Browning, architect, Stamford. March 26.

Designs for Hospital, *Chesterfield.*—Estimated cost, £1,200. Further information, H. Waller, Hon. Sec., Chesterfield. Designs to April 3.

Designs for Mixed School and Teacher's Residence, *Caistor, Lincolnshire.*—Maximum cost, £900. £10 for second best. Further information, the Vicar of Caistor, March 25.

For Central Police Station, &c., *Lincoln.*—Plans of ground, Office of County Constabulary, Lincoln. April 2.

Refuse Wood for Sale, *Royal Arsenal, Woolwich.*—5 stacks oak, 3 of ash, 6 of elm, 1 beech, 1 fir, 3 refuse. Printed forms at War Office, Pall-mall, or Principal Military Storekeeper, Woolwich. Tenders, March 24.

Church, *County of Leicester.*—Enlarging parish church of Sheepy Magna, Leicester. Plans, &c., Black Horse, Sheepy; Tenders, March 24, Mr. R. Jennings, architect, Atherstone.

Oak Roof.—For nave of Gosberton Church, Lincolnshire, &c. Plans, &c., Mr. E. Browning, architect, Stamford. Tenders to Churchwardens, noon, March 28.

Independent Chapel, *Manchester.*—At Droylsden. Plans, &c., Mr. R. M. Smith, architect, 42 Lloyd-street, Cooper-street, Manchester. Tenders, Rev. Charles Bingley, Milton-terrace, Droylsden. March 30.

National Schools, *Heywood.*—Drawings, &c., Mr. Crowther, architect, 22 Princes-street, Manchester. Tenders, Rev. Julius Shadwell, St. Luke's Parsonage, Heywood, April 6.

School and Teacher's House, *Derwen.*—Drawings, &c., R. L. Williams, architect, Hwllan-place, Denbigh, from 25th to 30th March; from 31st March to 4th April, at Rectory-house, Derwen; at which time tenders to architect.

Parsonage, *North Wales.*—At Bettws Abergele. Plans, &c., with Mr. Williams, as above, from March 28 to April 4; when contracts.

Villas, *Nottingham.*—Four detached villa residences, south side Nottingham park. Particulars, at office of Messrs. Hine and Evans, architects, Nottingham, by March 24.

Shop and Dwelling House, *Swindon.*—Plans, &c., Mr. E. W. Mantell, Bath-terrace, Swindon, to March 24 inclusive; when tenders.

Labourers' Cottages, *Hammersmith.*—Plans, &c., Mr. G. Saunders, architect, &c., King-street, Hammersmith. Tenders, 5 P.M., March 21.

Gas Holder, *Northampton.*—Plans at offices of Gas Light Company, Northampton; or at office of Mr. J. Ennson, gas engineer, Wolverhampton. Tenders to chairman of company, by noon, April 6.

Well, *Kent.*—To sink bore well, now 160 ft. deep. Information, Mr. Oldreive, clerk of works, Kenward, Pembury, near Tonbridge, Kent.

Railway Sleepers.—30,000 railway sleeper blocks, of metal or Dantzic red wood. Tenders, March 24, to secretary of North Eastern Railway.

Hemp, *Navy.*—Riga and Petersburg. Form of tender, Storekeeper General, Somerset-place. Tender, by 2 o'clock, April 5.

Creosoting Plant Wanted.—The machinery necessary for creosote works. "A. B.," 103 Cheapside, London.

Railway Stores.—For the South Eastern Railway. Specifications, &c., of Storekeeper, London-bridge Terminus. Tenders, March 28.

Removal of Mud.—From Basin of Woolwich Dockyard. Specifications at office of Commodore Superintendent. Tenders, noon, March 31.

As Surveyor, &c.—Surveyor, inspector of nuisances, and superintendent of highways for Ely. Salary, £120 per annum. Applications, March 29, to Mr. Wm. Marshall, clerk to the Local Board, Ely.

As Draughtsman.—Accustomed to make drawings of railway carriages, &c. Messrs. J. Wright and Sons, Saltley Works, Birmingham.

Secretary and General Manager of Ironworks, *Midland Counties.*—Salary, from £400 to £500, principals, and to possess from £600 to £1,000. P. P., Hoghen and Godson, New-street, Blackfriars.

TO ENGINEERS, MILLOWNERS, AND MANUFACTURERS.

AMERICAN INDIA-RUBBER Machine Belting, Valves and Washers, Brewers' Hose, Fire Engine Hose, Improved Suction Hose—at Wholesale Prices.

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WATER GAUGE MOUNTINGS, for Marine and Land Boilers.

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STEAM TAPS, RANGE COCKS, &c.

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TO WIRE ROPE MAKERS.—ARCHIBALD SMITH is now prepared to GRANT LICENCES for the use of his PATENT ROPE MACHINERY, guaranteed to work at six times the speed of any other, and to save upwards of fifty per cent. in the cost of making. It is used by the most eminent makers, and was also in the manufacture of the Atlantic Cable.—Apply to 69 Princes-street, Leicester-square, W. (8)

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TO ARCHITECTS AND BUILDERS.—In consequence of numerous complaints, the Patentee begs to inform the above, that all genuine

SMITH'S PATENT DOOR SPRINGS,

For Swing Doors, are stamped with Name and Address, thus—

SMITH, PATENTEE, 69 PRINCES STREET,
LEICESTER SQUARE, LONDON,

and that Springs thus marked are warranted.

SMITH'S PATENT WEATHER-TIGHT CASEMENT FASTENING AND SILL-BARS

are admitted by all to be the most perfect invention for the purpose. Diagrams and List of Prices on application. (143)

WATER GAUGES—WATER GAUGES.—Sir,—We find your German Gauge Tube superior to any other, and strongly recommend it. We were compelled to abandon the use of our water gauge until applying your glass tube.

Wilcox and Co., Millwall Pottery Company.

These Tubes are superior to all others; being a clear white, no mistake can arise in working. Guaranteed to stand a pressure of 500 lb.

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*** Price List of Gauge Fittings, &c., on application. (98)

PATENT WEDGE and GROOVED SURFACE FRICTIONAL GEARING.—The PATENT FRICTIONAL GEARING COMPANY, Proprietors of ROBINSON'S WEDGE SURFACE FRICTIONAL GEARING PATENTS, grant Licences to Users of Machinery, for the unlimited use of the System in their Works, on very moderate terms, enabling them to make or order from any Mechanician the Machinery they require.

The Company possess Five Patents relating to this Frictional System, including (in addition to their Bevel and Mitre Wheels) a System of Disc Clutches and Clutch Movements, Wheel Clutching, Reversing, Differential, Speed Ring, Varying Speed, and Break Movements, and of Shafting, Pillow Blocks, Shafting Hangers, &c.

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This system gives great facilities for simplifying Machines, and for mechanical combination, and has the advantage of being noiseless and cleanly, there being no oil or grease used on the wheels. Wheel Catalogues and Circulars, giving particulars, sent free by Post; also a list of manufacturing Agents, and information regarding those who, from locality or experience, are best able to execute orders for the description of work required.

Office, 20 Buchanan Street, Glasgow. (146)

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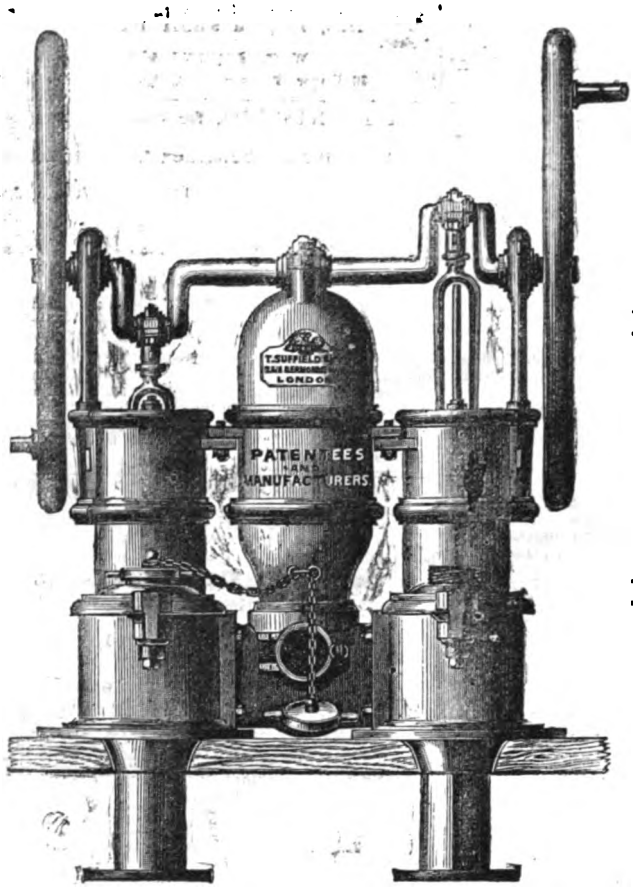
Call the particular attention of

SHIP-OWNERS, SHIP-BUILDERS, AND COMMANDERS OF STEAM AND SAILING VESSELS,

to the Simple and Efficient Arrangements of their

PATENT PUMPS.



Ships' Pumps

AND

Fire Engines,

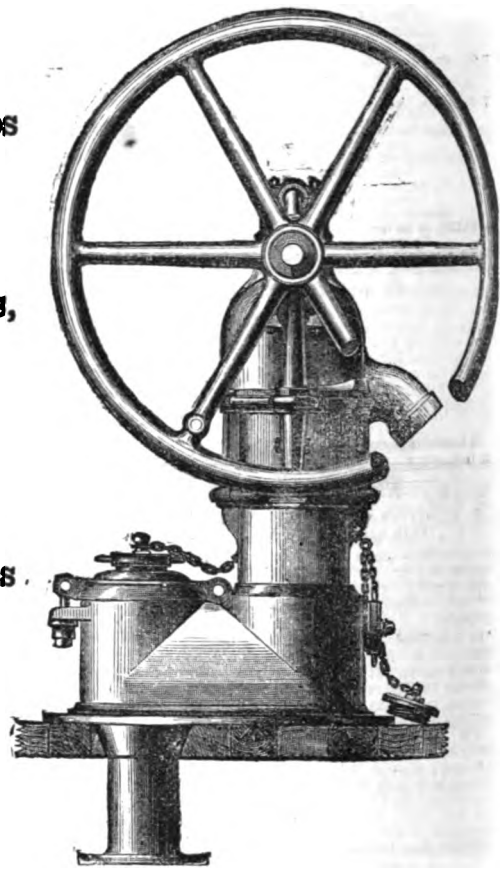
Fixed and Portable.

WITH

Patent Valves

AND OTHER

Improvements.



These Pumps are free from that liability to choke which is common to other Pumps, and their Working Parts are not susceptible of derangement either from wear or from being long out of use. They pass entirely through them, with ease, any substance that may enter the Suction Pipes. The Novelties in these Pumps are their adaptation to the varied duties of Ships' Pumps; the facilities they afford for Cleansing the Suction Pipes, and for Sounding or Examining the Valves; the readiness with which they may be used for Ventilating the Bilge, or for acting as a Syphon either for Watering the Ship, or for extinguishing Accidental Fires on board; the rapidity with which they can be converted into Fire Pumps, or be applied to th Washing of Decks; and their capability of Pumping from Several Compartments.

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which entirely extracts the Seeds of "COUCH," "TWITCH," "SPEAR," or "HAIR" GRASS and other impurities from

PERENNIAL AND ITALIAN RYE-GRASS, &c.,

AND

SCOTT'S PATENT CARROT SEED BEARDING

AND

CLOVER AND TREFOIL MILLING OR DRAWING MACHINE,

which effectually removes the beard from Carrot Seed, rendering it fit for sowing with facility by drill or otherwise, and by the separation of abortive or diseased grains vastly increases its vegetative per centage. By a slight modification it is applicable to the other purposes before mentioned.

These Machines were admittedly the most novel, and, at the same time, the most useful and important to the Farmer of any exhibited at the late SMITHFIELD CLUB SHOW.

They may be seen at work at the Establishment of the Manufacturer,

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Communications to be sent to the Patentee, J. SCOTT, 111 Drummond Street, Euston Square, London, N.W. (48.)

CLAYTON, SHUTTLEWORTH, AND CO.,

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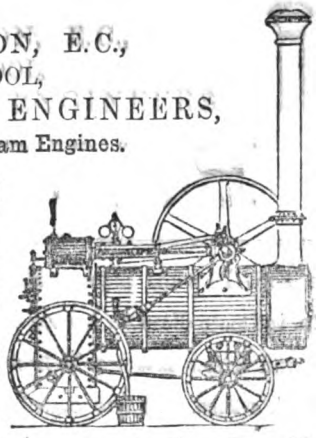
AGRICULTURAL AND GENERAL ENGINEERS,

And Manufacturers of Portable and Fixed Steam Engines.



Combined Threshing Machines, which dress the corn ready for market at one operation. Grinding Mills, Saw Benches, Pumps for Irrigation and Mining purposes, with all necessary gearing for being driven by steam power. Full particulars and estimates given on application to the above address.

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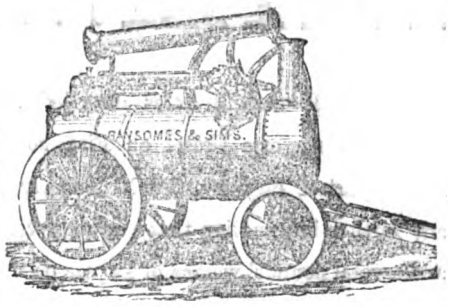

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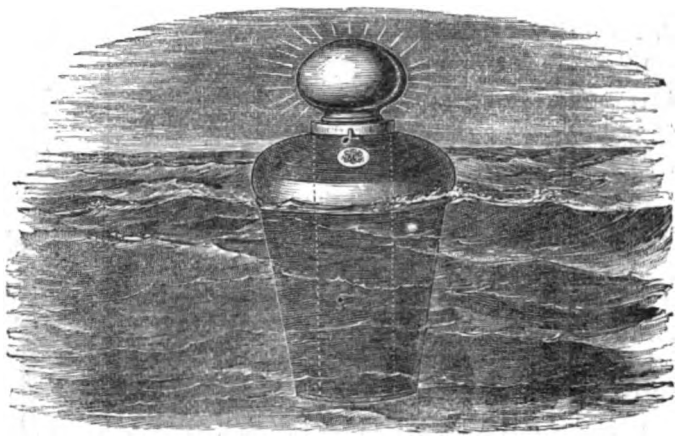

PATENT RECORD BUOY.

The RECORD BUOY is intended to be kept in some place available for instant use, and to be thrown overboard from a sinking Ship, or a Vessel on Fire, so as to intimate disaster, having a paper inserted therein, already filled up with the Ship's Name, Port of Registry, Official Number, &c., and a few last words hastily written, intimating the nature of the calamity, with any further information that can be given at such a time. It has capacity and buoyancy to contain besides these, the Log Book, and several pounds' weight of Papers or Valuables. It is lined with Cork between the Cylinder and outside case, so that, although waterlogged, it will not sink, but keep afloat for a long time, probably for years.

In order to DISTINGUISH IT FROM ANY OTHER FLOATING SUBSTANCE, so that the Captain of a passing Ship may recognize it as an intimation of disaster, and consider it a sacred and imperative duty to pick it up and convey the information it contains according to the directions found within, it HAS RAISED CONSPICUOUSLY UPON ITS SURFACE A SILVERED GLOBE, which, owing to the reflection of the light, will make it visible at a great distance, and when dancing on the wave it shines, in fact, like a star in the firmament, and being distinguishable from anything else its character cannot be mistaken.

It is furnished with ample directions to the finder how to act, and has Envelopes already directed to the proper authorities, who, on receipt thereof (and they should be transmitted by the first available means), will, after verifying them to prevent imposition, immediately convey the information to the owners of the lost Ship, to Lloyds, and all parties concerned; and if a foreign ship, to the Consul of the nation to which she belongs.

In order to establish uniformity, and to prevent the uncertainty and confusion which a multiplicity of Buoys of various forms might occasion, when their utility becomes apparent, and to make ESPECIAL RECOGNITION OF THESE UNDOUBTED, MR. JOHN GRESHAM, J.P. and Alderman of Hull, has Patented his Invention, and has arranged with the old established Firm of

GEORGE & JOSEPH OLIVER,

286 WAPPING, LONDON, E.,

TO MANUFACTURE AND SUPPLY THEM, AND TO WHOM ALL COMMUNICATIONS SHOULD BE ADDRESSED

(183)

Published by RICHARD ARCHIBALD BROOMAN, at the MECHANICS' MAGAZINE Office, 166 Fleet-street, in the Parish of St. Dunstan's-in-the-West, in the County of Middlesex; and printed by JAMES JUDD and HENRY ALEXANDER GLASS, of 14 Holford-square, Pentonville, in the County of Middlesex, at their Office, 88a New Bridge-street, in the Parish of St. Anne's, Blackfriars, in the City of London.—Friday, March 18, 1859.

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 13. [NEW SERIES.]

LONDON: FRIDAY EVENING, MARCH 25, 1859.

PRICE, FOURPENCE. BY POST 5d.

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SOCIETY OF ARTS.—The Eleventh Annual Exhibition of Inventions will open on the 25th day of April, 1859. The days fixed for receiving articles intended for exhibition are Thursday the 7th, Friday the 8th, and Saturday the 9th April. No charge is made for space, and the Exhibition is Free.

Intending exhibitors should communicate at once with the Secretary. By order,

P. LE NEVE FOSTER, Secretary.

Society House, John-street, Adelphi, 1st March, 1859. (171)

LECTURES TO WORKING MEN.—GOVERNMENT SCHOOL OF MINES, JERMYN-STREET.—The Fourth Course of Six Lectures, on "Applied Mechanics," by Professor WILLIS, M.A., F.R.S., will be commenced on Monday, April 4th, at Eight o'clock.

Tickets may be obtained by Working Men only, on Monday, 28th March, from Ten to Five o'clock, upon payment of a Registration Fee of 6d. Each Applicant is requested to bring his Name, Address, and Occupation, written on a piece of paper, for which the Ticket will be exchanged.

TRENHAM REEKS, Registrar. (186)

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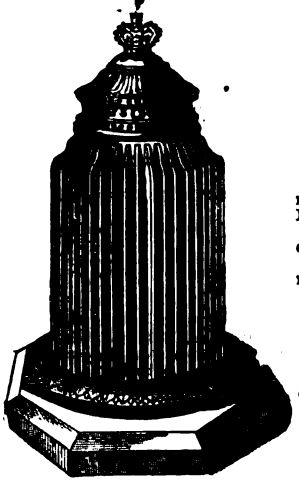

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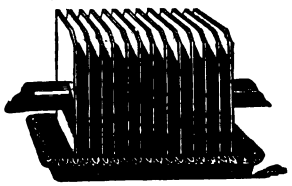

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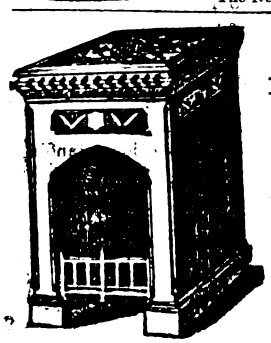

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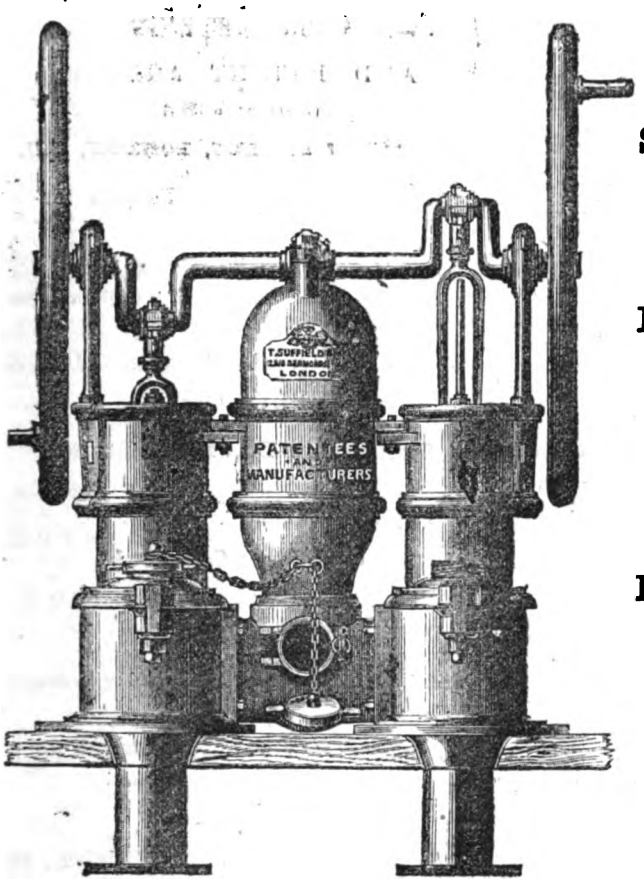

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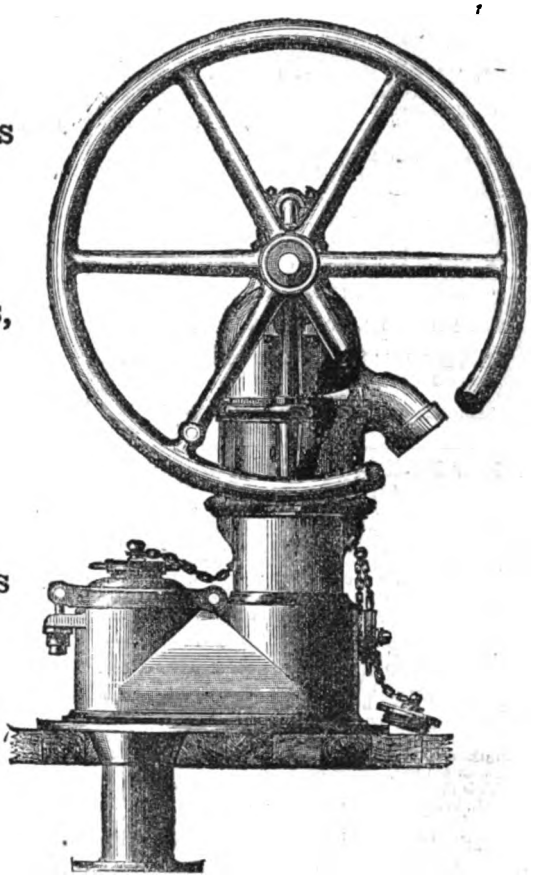

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RANSOME'S PATENTED PROCESS FOR PRESERVING STONE, CEMENT, STUCCO, &c.—By this process the softest and most friable Stone, Cement, or Stucco, can be rendered Impervious and Imperishable, DECAY AT ONCE ARRESTED AND PREVENTED.

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GENERAL WAREHOUSE, 3 Cannon-street West, London, E.C.—C. M. and Co.'s only Establishments. (139)

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Apply to view the Buildings and Bricks to G. H. Ogston Esq., Resident Manager, Dippenhall, Farnham, Surrey, and for terms, to Messrs. Nicholls and Potter, Solicitors, Farnham. (125)

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OWING to the continued ill health of the Proprietor, the first-class business of an Engineer and Crane and Block Maker is offered for sale. It has been established in the Metropolis for nearly 30 years, and has enjoyed extensive patronage amongst Brewers, Manufacturers, Warehousemen, and others, in and about London; the business done amounting to nearly £8,000 per annum. About £3,200 would be required, (part of which, however, may remain for any reasonable time on good security,) which is the bare value of the tools, patterns, and stock in trade. The premises, including good dwelling-house, very conveniently situated, and capable of accommodating from 60 to 70 hands, are held upon a long lease, at an extraordinary low rental, not exceeding £100 per annum, taxes included. Many of the tools are nearly new, and of the best construction. The present proprietor, who relinquishes the business solely on account of ill health, would give every assistance in his power to those succeeding him; and as his foreman, who has been with him for nearly ten years, is thoroughly acquainted with the practical parts of the business, any gentleman desirous of commencing as a manufacturing engineer would find the present a very favourable opportunity. As all accounts have been, for many years past, collected quarterly, a very small amount, say £800, would suffice as working capital. Full particulars may be obtained by application to E. E. ALLEN, Esq., MECHANICS' MAGAZINE Office, 166 Fleet Street, E.C. (130)

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MESSRS.

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Civil Engineers

AND PATENT AGENTS,

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PRICES CURRENT OF METALS.

London, 25th March, 1859.

		£ s. d.		£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N. of England	pr. ton	6 5 0	to	6 10 0	nett
Welsh Bars, in Wales	„	6 0 0	„	6 5 0	3
Staf. Bars at the Works	„	7 0 0	„	7 10 0	2½
„ Hoops	„	8 0 0	„	8 10 0	„
„ Sheets, Singles	„	8 15 0	„	9 0 0	„
„ Nail Rods	„	7 0 0	„	7 10 0	„
„ Boiler Plates	„	8 10 0	„	9 0 0	„
Scotch Pig, M.-Nos. Warrants, at Glasgow	„	2 12 6		2 13 0	nett
Do. No. 1, Good Brands	„	2 11 6	„	2 12 6	„
Scotch Bars	„	7 5 0	„	8 0 0	3
Swedish Bars, in London	„	13 10 0	„	16 0 0	2½
COPPER, Sheet and Sheathing per lb.		0 1 0½			3
Tough Cake and Tile	„ ton	112 10 0			„
Best Selected	„	115 10 0			„
Australian	„	113 10 0	„	114 10 0	„
South American	„	104 0 0	„	105 0 0	„
Yellow Metal Sheathing	per lb.	0 0 10½			„
STEEL, Swedish Keg	pr. ton	20 0 0			2½
„ Faggot	„				„
TIN, English, Block	pr. cwt.	6 6 0			2½
„ Bar	„	6 7 0			
Foreign, Banca	„	6 11 0	„	6 12 0	nett
„ Straits	„	6 9 0	„	6 10 0	„
TINPLATES, Charcoal, I.C.	per box	1 11 0	„	1 12 0	3
Coke, I.C.	„	1 5 6	„	1 6 0	„
LEAD, Pig, English	pr. ton	22 15 0	„	23 5 0	2½
„ Spanish	„	22 5 0	„	22 10 0	„
Sheet	„	23 0 0	„	23 10 0	„
SPELTER, on the spot	pr. ton	21 15 0	„	21 17 0	nett
for arrival	„	21 15 0			„
ZINC, English, Sheet	„	28 0 0	„	30 0 0	1½
QUICKSILVER	per btl.	7 0 0			1½

REMARKS.—Since the receipt of the favourable news as to continental politics a much better feeling prevails, and a moderate amount of business has been done without any alteration of a material character in price.

LAWRIE AND HAGGER, Metal Brokers.
33 Lombard-street, E.C.

IRON AND OTHER METALS.

[FROM OUR OWN CORRESPONDENT.]

State of the Iron Trade Generally.—Glasgow Pig Iron Market: Increased Shipments.—Yorkshire, Derbyshire, and Lancashire District.—Monmouthshire and South Wales: Brightening Prospects.—Hardware and General Trades of Birmingham and Wolverhampton.—Cutlery and Hardware Trades of Sheffield.—The Metal Market: Prices Steady.

THE disturbed state of the Continent has continued to produce unfavourable impression on the iron trade. The news, however, received on Monday last, as to the probability of an European Congress on the Italian question, cannot fail to inspire strong hopes in the minds of all that peace will be preserved, and thus produce a beneficial effect not only upon the iron trade, but on the commercial transactions generally. Although orders from the United States and the Continent are not so large as were at one time expected, the demand for home requirements is good; a fair proportion of the works in most of the districts are in pretty full employment.

At Glasgow, on Tuesday, No. 1 realized from 52s. 9d. to 53s. 6d.; Mixed Nos., warrants, 51s. 3d. to 51s. 6d.; Mixed Nos., maker's iron, 52s. 9d. to 53s. 0d.; No. 3, 52s. 9d. to 53s. 0d. Market steady. Shipped this week, 14,891; corresponding week last year, 6,578.

In Yorkshire, Derbyshire, and Lancashire, orders are on the increase, especially from India and our other chief colonies, for which markets some large orders are now under execution. The orders for railway iron are in the ascendant. Pig iron is tightening. The total shipments are in favour of this year as compared with last.

In Monmouthshire and South Wales the general state of the iron trade in both its malleable and also its pig branches is satisfactory, considering the time of the quarter and the general state of home and foreign politics. Future prospects are regarded as brightening.

In South Staffordshire the houses continue to be well supplied with orders, and it is said to be the intention of the leading members of the trade at the ensuing preliminary meeting, not to advocate any alteration in existing rates.

The inquiry for railway iron is on the increase; but few of the orders find their way into South Staffordshire or East Worcestershire.

The pig trade is rather brisk, and for first-rate qualities the price remains firm, but for inferior makes there has been a slight giving way. At Wolverhampton on Wednesday prices of all descriptions were decidedly firmer than was the case last week.

In the hardware trades of Birmingham and Wolverhampton there is a pretty good demand, so far as the home market is concerned. The accounts from Scotland are decidedly more favourable, although the demand for that market is still small. The foreign trade is generally dull, and most of the orders for the United States and Canada for what is known as the fall trade, have been received, and a large portion executed.

The factors' reports as to the condition of the country trade are upon the whole of a satisfactory character. There is evidence of a disposition to withhold orders from the manufacturers as the end of the quarter draws near, which may be regarded as an indication that the factors' themselves are not much pressed by their customers; but the season trade has been upon the whole beyond the average. At the present moment there are few instances in which anything approaching to slackness prevails, and through the whole of the quarter there has been little if any working for stocks. In some of the fancy trades they are looking up orders rather anxiously; but in the great bulk of the trades the workmen are making as much time as they choose to do, and there are few of any class out of employment.

Respecting the hardware and cutlery trades of Sheffield we learn that a few manufacturers are busy, but that others are with reason complaining of having but little to do. The expectations of those who are fully engaged are a little more hopeful with regard to the future than they were last week.

The metal market continues quiet but firm, a contemplated further rise in copper being on consideration deemed expedient.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

DREDGING, *Great Yarmouth.*—Dredging and deepening of the channel of the Breydon (700 yards) and parts of the haven. Forms of tender from Isaac Preston, clerk to the commissioners. Further information from the Pier Master, April 11.

RAILWAY STATION, *Bacup, East Lancashire.*—Plans at the engineer's office, Bury Station. Tenders to Mr. Miles Fenton, Secretary, 5th April.

ENGINE STABLE, *North Eastern Railway, Gateshead.*—Iron roof. Plans, &c., Mr. Thos. Prosser, architect, Central Station, Newcastle-on-Tyne. Tenders to Mr. J. Cleghorn, Secretary, 13th April.

PERMANENT WAY STORES, *London and North Western Railway.*—No 1. sleepers. 2. Keys and treenails. 3. Fish-plates. 4. Chairs. 5. Spikes, bolts, and nuts. Specifications and forms of tender, Euston Station, London.

ST. PATRICK'S BRIDGE, *Cork.*—For rebuilding, according to plans, &c., at the office of city engineer, 20 South Mall. Tenders April 7.

SEWERAGE WORKS, *Brighton.*—For construction of tubular iron outfall, &c. Drawings, &c., borough surveyor, town hall, March 31.

CEMETERY, *Walcote, Bath.*—Designs for two mortuary chapels, entrance lodge, gateways, boundary walls, &c., in the parish of Wesson. Particulars, Mr. Williams, 1, Fountain Buildings, Bath. No date.

INFIRMARY, *Ashton-under-Lyne.* Detailed plans, elevations, and general description; to be erected at Chamber Hill. £100 for the best, and £50 for the second best plans. Plan of site, &c., Mr. H. T. Darnton, Hon. Sec. to the Committee, 88 Old-street, Ashton-under-Lyne. Plans to April 30.

CORFE CASTLE CHURCH, *Dorsetshire.*—Restoration, &c. Plans, &c., town-hall, Corfe Castle, on application to R. Taylor, Esq., churchwarden, to whom tenders, April 5.

MAINDEE CHURCH, *near Newport, Monmouthshire.*—Plant, &c., of Pritchard and Liddon, Llandaff; and 6 Whitehall, London. Tenders, 11 o'clock, April 6, T. M. Llewellin, Esq., Hon. Sec., Newport; of whom quantities, for a guinea.

CHAPEL, *Wednesfield Heath, near Wolverhampton.*—Plans at the office of Mr. George Bidlake, architect. Tenders to Mr. H. Summerhill, Heath Street, Wednesfield Heath, to 20th April.

CHAPEL, *Middleton, near Manchester.*—Plans in the schoolroom, near the Congregational Chapel. Tenders to the Honorary Secretary, Mr. Clement Kemp, Parkfield Mill, Middleton, April 11.

SCHOOLS AND MASTER'S RESIDENCE, *Wombourne, Staffordshire.*—Plans, &c., Mr. Bidlake, architect, Whampton, to whom tenders, April 11.

THE SAME, *Rawington.*—Plans, &c., Mr. G. T. Robinson, 8, Priory Row, Coventry. Tenders April 17, Rev. P. B. Brodie, Rawington, Warwick.

NEW NATIONAL SCHOOLS AND TEACHERS' HOUSES, *Bloxwich, Staffordshire.*—Tenders to C. Somerville, M.D., Hon. Sec., of whom further particulars. No date given.

VICARAGE, *Beeston.*—Plans, &c., Mr. F. Bakewell, architect, Thurland-street, Nottingham.

RECTORY HOUSE, *Abbess Roding, Essex.*—Time extended to April 4. Plans, Beadel and Co., Chelmsford.

MILITIA STOREHOUSE, *Bodmin.*—Designs of Cap. Alms, Military Orderly Rooms, Castle-street, Bodmin. Tenders April 4.

POLICE STATIONS, *Cornwall.*—At Torpoint, Menhenist, and St. Cleer. Drawings, &c., for that of Torpoint, Serjeant of County Police, Torpoint; and for Menhenist and St. Cleer, of the Inspector of County Police, Dubwalls, near Liskeard, until the 31st ult. Tenders April 2.

BANKING-HOUSE AND RESIDENCE, *Hertford.*—Plans, &c., Mr. Wm. Wilds, architect and surveyor, Hertford, on and after March 28.

HOUSES, *London.*—Taking down and re-building 28 Addle-street, City. Particulars, Mr. R. Parris, architect, 5 Walsingham-place, Lambeth. No date given.

VILLA, *Headingly.*—Extensions, North Hill. Drawings, &c., Mr. G. Smith, surveyor, 117 Park-lane, Leeds. No date.

SHEDS, *Alford.*—Masons', carpenters', and slaters' works, for the Aberdeen Commercial Company and the Aberdeen Lime Company. Plans at W. Henderson and Son's, architects, 66 Lock-street. March 30.

CARRIAGEWAY, *Maida Hill.*—In a street called Hall Place. Particulars, Mr. Tidy, builder, 36 Titchborne-street, Edgeware-road. March 31.

SCAVENGING, *Wigan.*—For three or five years. Specifications and forms of tender of the Surveyor to the Board, 67 Wallgate. Tenders, noon, April 6.

SURVEY, *St. Leonard's.*—For surveying and mapping the parish of St. Leonard's. Particulars, Mr. John Phillips, solicitor, Hastings. March 29.

DESIGNS FOR JEW'S HOSPITAL, *Mile End Road.*—Time extended to May 2.

FOREMAN ENGINEER.—To superintend the designing and construction of marine and land engines and other machinery. Gourlay, Brothers, and Co., engineers and iron shipbuilders, Dundee.

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THE SAME.—Knowledge of perspective essential. Salary £150. "Architect," Deacon's Coffee House, Walbrook, E.C.

METAL ROLLERS.—A Foreman, to take the management of a rolling-mill. Mr. S. Walker, Rolling Wire and Tube Mills, Lower Fazeley-street, Birmingham.

PRACTICAL PUDDLER.—To manage that department. Apply to Bollkaw and Vaughan, Middlesbro'-on-Tees.

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WORKING FOREMAN OF MASONS.—Permanent, if suited. Address, with references and terms, to "A. B.," Post-office, Leicester.

TIMBER MERCHANTS' FOREMEN.—To undertake the management of timber-yard, &c. X. Y. Z., Messrs. Leathwaite and Simmons, 1 Pope's Head-alley, Cornhill, E.C.

GAS-WORKS ENGINEER, *Borough of Salford.*—Make of gas 170,000,000 feet per annum; additional works in course of erection. Clay retorts used. No house. State time when can enter on service, and salary. Tenders, Mr. C. Gibson, town clerk, April 11.

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2 John-Street, Minories, London, E.C.,
Are prepared to ESTIMATE FOR and CONSTRUCT BRIDGES, PIERS, JETTIES, &c., in Iron, Wood, or Stone. Also to supply Cranes, Girders, Turntables, and Railway Work and Plant generally. (56)

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EDWIN JEWITT, ENGRAVER ON WOOD AND DRAFTSMAN, 1 Pickett-place, Strand, near Temple-bar. Engineering, Scientific, and Mechanical Designs accurately engraved. Manufacturers and Tradesmen's Catalogues Illustrated. W.C. (84)

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These Tubes are superior to all others; being a clear white, no mistake can arise in working. Guaranteed to stand a pressure of 500 lb.

Extensively used on all the principal lines.

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*** Price List of Gauge Fittings, &c., on application. (98)

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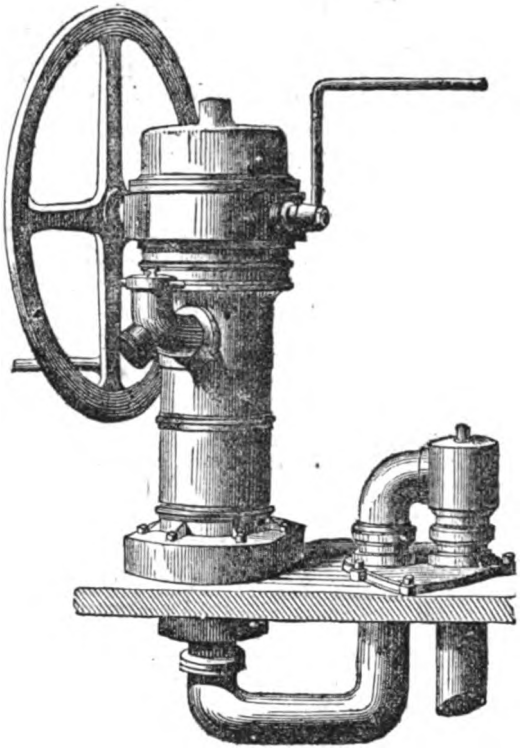
Sole Manufacturer of DOWNTON'S well-known and much approved SHIPS' PUMPS, which have been used in preference to all others on board the vessels of Her Majesty's Navy, for upwards of thirty years, and have given the greatest satisfaction, effectually answering all the purposes required of any Ships' Pumps, and capable of throwing most powerful jets of water in case of fire.



These Pumps have also been most extensively used on board merchant vessels, both at home and abroad, and have been supplied to the Royal Navies of France, Prussia, Holland, Russia, Spain, and Turkey. The Pumps are portable, as they may be easily removed from the ship and put to work in a boat alongside in a few minutes. Each pump is fitted with a large foot valve plate (which may be placed in any part of the vessel most convenient), and from which communication is made to any number of distinct compartments in the vessel. In case of any of these pipes fouling, the water, by an almost momentary attachment, may be forced from the Pump downwards, so as to clear all obstructions, preventing any possibility of stoppage. The valves are of the simplest description, and being faced with ordinary leather discs, the latter may be renewed in a few minutes by the most inexperienced hands. By the peculiar construction of these Pumps, a most perfect and uninterrupted flow of water may be maintained; so uniform as to be undistinguishable from that proceeding from a cistern. The Pumps are made of several sizes, those of 7, 9, and 12 inches bore being most generally used. They may, however, be ordered of any dimensions required, and may be fitted either with one or two fly wheels. A standard, &c., is also supplied with these Pumps, to enable them, when necessary, to be used as ordinary hand-lever pumps.

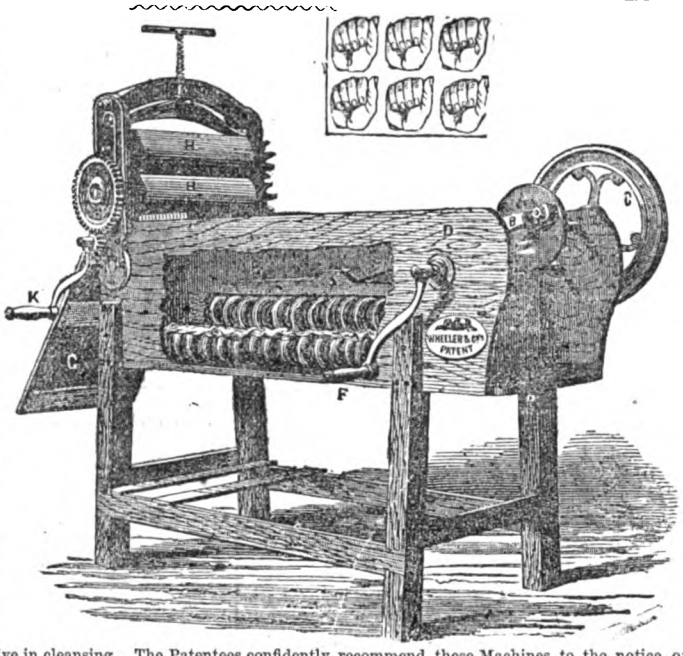
JOSIAH STONE, Engineer, Manufacturer of all descriptions of PUMPS and FIRE ENGINES for Land and Ships' Use; Brass and Iron Founder and Finisher, Nail and Rivet Maker, &c.

CONTRACTORS FOR FIRE-ENGINES, ETC., TO THE WAR DEPARTMENT,

RAILWAY STATION, DEPTFORD, AND 12 GARLICK HILL, CITY, E.C.

(97)

T. WHEELER AND CO.'S
'OXONIAN KNUCKLE WASHING MACHINE."



THE Improvements in these New Inventions are the non-exposure of the user's hands to the dangerous parts of the Machine, and the rapidity with which the work is done. These Machines have neither bands or wheels passing on the outside, wherein lies the liability to accident. The rubbers are the truest representation of the knuckles or hand washing yet brought out; the compensating floating rubbers work at right angles, backward and forward, in the same manner as does the hands. These Machines can be supplied with rubbers that represent a person's hand in the action of rubbing; the knuckles, finger nails, and palm of the hand being truly modelled. They are capable of Washing Clothes of every description whatsoever, the largest bedding to the most delicate piece of muslin can be washed without breaking a single thread; in fact, such is the delicacy of the action of these Machines, that the paper you are now reading can be passed between the rubbers without sustaining any injury, at the same time being thoroughly effective in cleansing. The Patentees confidently recommend these Machines to the notice of Laundresses, Heads of Families, Hotels, Emigrants, &c. So simple is the action of this Machine, that a boy or girl of 10 or 12 years of age can work it; the only skill required is to soak the clothes one hour before placing them in the Machine, placing a portion of the clothes at the handle end of the Machine; laying on the rubbers a part of them; turn the handle, and the clothes will pass through between the rubbers to the opposite end, effecting a saving of at least 50 per cent.

Prices: Washing Machines, £1 6s., £2 6s., £3 6s., £4 10s., £5 15s.; Washing, Wringing, and Mangling, £8 £10 15s., £14 14s.—Full Instructions sent with every Machine. Testimonials or References sent on application.

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RECENT IMPROVEMENTS.

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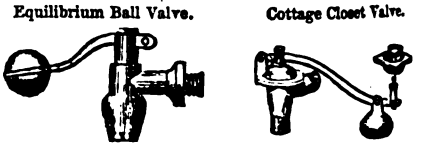
THE PATENT PLUMBAGO CRUCIBLE COMPANY having completed the enlargement of their premises, beg to call the attention of all users and shippers of Melting Pots to the great superiority of the PATENT CRUCIBLES, which have been used during the last three years by some of the largest melters in England and abroad. In addition to their capabilities of melting an average of from thirty-five to forty pourings; they are unaffected by change of temperature, never crack, but can be used till worn out, requiring only one annealing for several days' work, and become heated much more rapidly than ordinary pots, effecting thereby a saving of more than fifty per cent. in time, labour, fuel, and waste. The Patent Plumbago Crucible Company also manufacture and import clay crucibles, muffles, portable furnaces, sublimate pans and covers, glass-pots, all descriptions of fire-standing goods, and every requisite for the assayer and dentists. For Lists, Testimonials, &c., apply to Battersea Works, London, &c. (47)

HIGH-PRESSURE VALVE-COCKS, LAMBERT'S PATENT.

Equilibrium Ball Valve. Cottage Closet Valve.



The Equilibrium Ball-Valve is simple and certain in its action, and is cheaper than the common cocks now in use.

The Cottage Valves are suitable for application to any kind of basin; and, as they shut against the pressure, no concussion in the pipes can possibly occur.

These cocks have been extensively and most successfully used in many towns, under continuous high pressure, varying from 100 to 350 feet; their efficiency and durability is, by experience, established.

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GWYNNE AND Co., Engineers, London, manufacture and supply the following Machinery, of the most approved construction and with all the latest improvements:—Portable and Fixed Steam-Engines and Boilers of every description; Waterwheels, Windmills, Horse and Hand-power Machines; Pumping Machinery for the Supply of Towns, Cities, and Districts, and for the Irrigation of Coffee, Cotton, Indigo, Sugar-cane, and Rice Estates, for pumping out Coffer-dams, Canals, Dry Docks, Reservoirs, &c. They also manufacture and supply the Pumping and other Machinery for Paper, Pulp, and Fulling Mills, Breweries, Distilleries, Tanneries, Starch Works, Bleaching, Dyeing, and Calico Printing Works, Chemical Works, Silk, Cotton, and Flax Mills, and Manufactories in general. All Letters not paid will be refused. Illustrated Price Lists forwarded on receipt of Six Postage Stamps.—GWYNNE AND Co., Hydraulic and Mechanical Engineers, Essex-wharf, Strand, London.

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which entirely extracts the Seeds of "COUCH," "TWITCH," "SPEAR," or "HAIR" GRASS and other impurities from

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AND

SCOTT'S PATENT CARROT SEED BEARDING

AND

CLOVER AND TREFOIL MILLING OR DRAWING MACHINE,

which effectually removes the beard from Carrot Seed, rendering it fit for sowing with facility by drill or otherwise, and by the separation of abortive or diseased grains vastly increases its vegetative per centage. By a slight modification it is applicable to the other purposes before mentioned.

These Machines were admittedly the most novel, and, at the same time, the most useful and important to the Farmer of any exhibited at the late SMITHFIELD CLUB SHOW.

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Mr. T. MIDDLETON, Engineer, Southwark.

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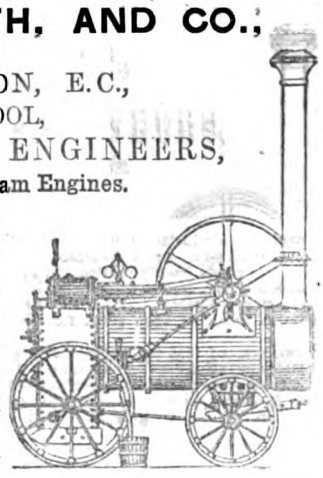
AGRICULTURAL AND GENERAL ENGINEERS,

And Manufacturers of Portable and Fixed Steam Engines.



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HOPKINSON'S PATENT MERCURIAL STEAM PRESSURE GUAGE. Price from 42s. to 84s., according to pressure.

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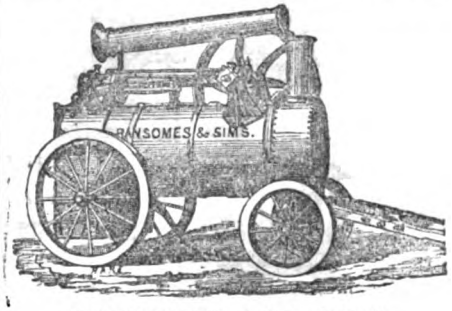

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Manufacturers of Wrought Iron Tubes & Fittings,

FOR GAS, STEAM, AND WATER.

PATENT GLASS ENAMELLED AND GALVANIZED TUBES,

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LAP-WELDED IRON BOILER TUBES.

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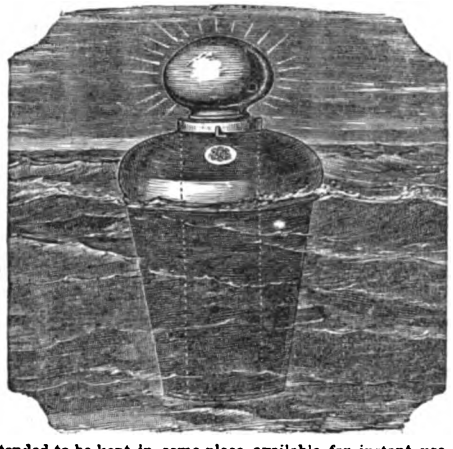
GRESHAM'S RECORD PATENT BUOY.



The RECORD BUOY is intended to be kept in some place available for instant use, and to be thrown overboard from a sinking ship, or a Vessel on Fire, so as to intimate disaster, having a paper inserted therein, already filled up with the Ship's Name, Port of Registry, Official Number, &c., and a few last words hastily written, intimating the nature of the calamity, with any further information that can be given at such a time. It has capacity and buoyancy to contain besides these, the Log-Book, and several pounds' weight of Papers or Valuables. It is lined with Cork between the Cylinder and outside case, so that, although waterlogged, it will not sink, but keep afloat for a long time, probably for years.

In order to DISTINGUISH IT FROM ANY OTHER FLOATING SUBSTANCE, so that the Captain of a passing Ship may recognize it as an intimation of disaster, and consider it a sacred and imperative duty to pick it up and convey the information it contains according to the directions found within, it HAS RAISED CONSPICUOUSLY UPON ITS SURFACE A SILVERED GLOBE, which, owing to the reflection of the light, will make it visible at a great distance, and when dancing on the wave it shines, in fact, like a star in the firmament, and being distinguishable from anything else, its character cannot be mistaken.

It is furnished with ample directions to the finder how to act, and has Envelopes already directed to the proper authorities, who, on receipt thereof (and they should be transmitted by the first available means), will, after verifying them to prevent imposition, immediately convey the information to the owners of the lost Ship, to Lloyd's, and all parties concerned; and if a foreign ship, to the consul of the nation to which she belongs.

In order to establish uniformity, and to prevent the uncertainty and confusion which a multiplicity of Buoys of various forms might occasion, when their utility becomes apparent, and to make ESPECIAL RECOGNITION OF THESE UNDOUBTED, MR. JOHN GRESHAM, J.P. and Alderman of Hull, has Patented his Invention, and has arranged with the old-established Firm of

GEORGE & JOSEPH OLIVER,

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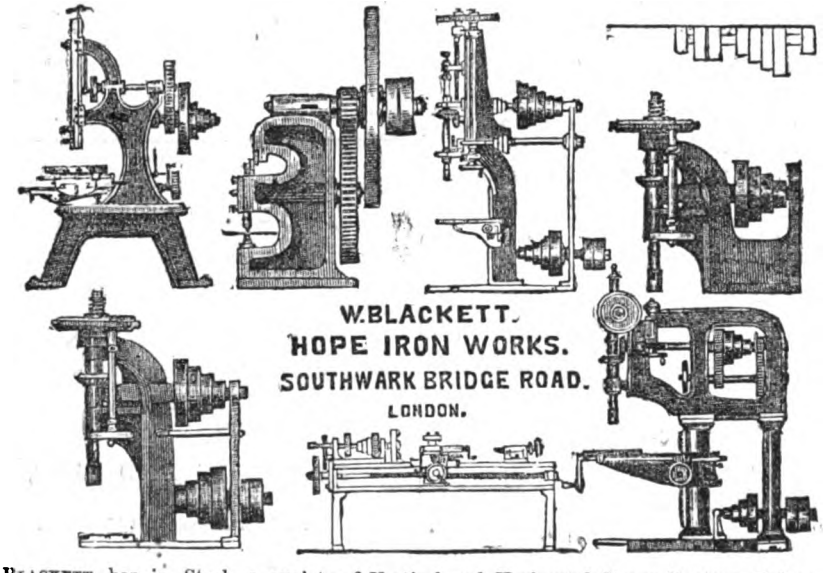
TO MANUFACTURE AND SUPPLY THEM, AND TO WHOM ALL COMMUNICATIONS SHOULD BE ADDRESSED. (194)



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GUTTA PERCHA MILL BANDS.

THE GUTTA PERCHA COMPANY beg to state that the increasing demand for the Gutta Percha Strapping for Driving-bands, Lathe-straps, &c., fully justifies the strong recommendations they have everywhere received.

Their durability and strength—permanent contractability and uniformity of substance—their non-susceptibility of injury from contact with oils, grease, acids, alkalies, or water—and the facility with which the only joint required can be made in bands of from 200 to 300 feet long—render them superior to leather for almost all working purposes, and decidedly more economical.

TESTIMONIALS.

IMPORTANT ANNUAL SAVING.

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"In reply to your inquiry, we have much pleasure in bearing our testimony to the advantages, both as regards economy and saving of time, effected by the use of your Patent Gutta Percha Bands in lieu of Leather Straps. The stoppage of one portion of our works through the failing of the leather strap used to be of daily occurrence—but with this annoyance we are now never troubled. We have had these straps in operation for nearly three years, and are assured by our Engineer that *they effect a saving to us of at least* THIRTY POUNDS *a year.*"

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WATER POISONED BY LEADEN PIPES.

The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight.

POISONED WATER PREVENTABLE

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

From Dr. MURRAY, Hull.

"It is impossible to conceive of anything more injurious or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha Tubing. Nothing can be better. I have also recommended it to others, who have adopted the expedient."

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Gutta Percha Company, Patentees,

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(29.)

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 14. [NEW SERIES.]

LONDON: FRIDAY EVENING, APRIL 1, 1859.

PRICE, FOURPENCE. BY POST 5d.

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SOCIETY OF ARTS.—The Eleventh Annual Exhibition of Inventions will open on the 25th day of April, 1859. The days fixed for receiving articles intended for exhibition are Thursday the 7th, Friday the 8th, and Saturday the 9th April. No charge is made for space, and the Exhibition is Free.

Intending exhibitors should communicate at once with the Secretary. By order,

P. LE NEVE FOSTER, Secretary.

Society House, John-street, Adelphi, 1st March, 1859. (171)

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TO RAILWAY COMPANIES, STEAM SHIP PROPRIETORS, AND MANUFACTURERS.—A saving of Fuel equal to one-third of the entire consumption is effected by the introduction of "DUNCAN'S PATENT SPIRAL HEAT DIFFUSERS," which arrest the heat in its passage through the flues or tubes, and convert into impelling power the large measure that without these appliances would (even in the very best boilers) escape along with the smoke. They can be fitted in an hour or two at a small cost, and without any alteration in the existing arrangements of boilers now in use. These results are prepared to be guaranteed, and a part of the value of fuel saved by the use of the Apparatus will be accepted for royalty.

Hitherto, steam navigation to distant parts of the world has proved a commercial failure. The remedy is provided, and the vast numbers of large and splendid vessels can soon be made valuable paying property.

Further information may be had on application to GWYNNE and CO., Engineers, Essex-street Wharves, Strand, W.C.; London. (167)

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A 12-HORSE HORIZONTAL STEAM ENGINE and a 4-HORSE DIRECT ACTING STEAM ENGINE, with Fly-wheel Governors, &c., complete. Address, W. F. Plummer, 12 Albany-road, Camberwell. (188)

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MESSRS. BOOTH & CO., will Sell by Auction, on Tuesday next, an Excellent Assortment of Building Materials; 30 Marble Chimney-Pieces; 900 Yellow Deals, Battens, and Pine Planks; 3,500 feet of New Scantling and Cut Stuff; 105 Squares of excellent ¾, 1¼ and 1-inch Dry Yellow Flooring; 75 Pair of New Sashes; A few Oak Spokes and Ash Felloes; Second-hand Shop-Fronts, Doors, Sashes, and Frames, glazed with plate and other glass; Carpenter's and Engineer's Patterns and Tools; 90 Oil Stones; New Shovels; Coach-Screws, Bolts, and Blank Nuts; Iron Doors; and Columus' Patent Water-Closets; Various Machines and other effects. On View the Monday prior and morning of Sale.

Catalogues on the Premises, and of the Auctioneer, 13 Eastcheap, London, E.C.; or by Post for one stamp. (203)

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MESSRS. BOOTH & CO., AUCTIONEERS and BUILDERS' SALESMEN, having opened Registers for Public and Private Sales of all kinds of JOB LOTS, Surplus Stock, Stores, Tools, Implements, &c., &c., (either Old or New,) beg to call the attention of all parties to the only medium established of the kind, and to state that they are prepared to receive consignments of any weight, bulk, or value, and of any class of Goods for immediate Sale. Full particulars may be had for two stamps, at the BUILDING TRADES REGISTRY OFFICES, (established 1857,) 13 EASTCHEAP, LONDON, E.C. The Public Sales by Auction are held Weekly, on EVERY TUESDAY, at ONE O'CLOCK, and for the present at the BUILDERS' SALE GROUNDS, (established 1858,) 23 and 24 MARYLEBONE ROAD, REGENT'S PARK, W. Catalogues by Post for One Stamp. Advances on New Goods. All communications are held private and confidential. (204)

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A VALUABLE PATENT to be DISPOSED OF.—The Patentee will either dispose of the Patent or grant Licences to any party wishing to manufacture, or would join a person with capital to carry out the Patent.

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Apply to J. J., 171 Strand. (138)

THE COTTON SUPPLY ASSOCIATION.

COTTON GINS.

IMPROVEMENT UPON THE INDIAN CHURKA.

TO COTTON GIN MAKERS, MACHINISTS, AND INVENTORS.

THE Committee of the Cotton Supply Association have received from the Bombay Chamber of Commerce two Indian Churkas, or Hand-roller Gins of native construction, and such as are now used by the natives of India, with the request that they should be submitted to the Machinists of this country, with a view to obtaining, if possible, a superior machine. Your attention is therefore respectfully requested to the construction of this "Churka," which may be seen at the offices of this Association. The objects to be aimed at in the making of an improved machine, are—

1. That the machine do no injury to the cotton, in the process of separating the seed from the fibre. It is said that "no machine can possibly separate the cotton from the seeds with less injury to the staple than does the Churka."
2. That the machine, as far as possible, do rid the cotton from leaf and impurities.
3. That the machine be of simple construction, and durable.
4. That the machine be easily repaired by the native Indian.
5. That it be portable.
6. That the cost be as low as possible. The "Churka" costs only two rupees, or 4s. It is necessary that the improved machine should be within the ability of the natives to purchase.
7. That the machine be able to do its work faithfully, in spite of carelessness or neglect.
8. That the machine be able to clean a fair quantity of cotton per day, with the labour of one person (male or female).

The Committee submit the above conditions to the consideration of Machine Makers, and Mr. Haywood, the Secretary of this Association, will be prepared to afford any further information that may be required.

It is proposed, in furtherance of the wishes of the Bombay Chamber of Commerce, to hold a trial of the merits of the different Gins that may be constructed to meet the above conditions, in two or three months from this date. Due notice of the day of trial will be given.

Premiums of £20, £10, and £5 will be paid by the Association to the exhibitors of the Gins which rank 1st, 2nd, and 3rd in order of merit.

G. R. HAYWOOD, Secretary of the Cotton Supply Association.

1 Newall's Buildings, Manchester, March 25th, 1859. (196)

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PORTABLE STEAM ENGINES, from 6 to 12 horse power,
STATIONARY STEAM ENGINES, from 4 to 50 horse power,
TUBULAR BOILERS, from 4 to 50 horse power,
CORNISH BOILERS, from 4 to 50 horse power,

Are in hand, and can be despatched on eight days' notice. Prices moderate. Workmanship and Material of the best description.

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Are prepared to ESTIMATE FOR and CONSTRUCT BRIDGES, PIERS, JETTIES, &c., in Iron, Wood, or Stone. Also to supply Cranes, Girders, Turntables, and Railway Work and Plant generally. (199)

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In any of the following forms, of any size, or to Working Drawings for all MECHANICAL *purposes:—*

WASHERS for Steam and Gas Joints.
VALVES for Marine and other Steam Engines.
ENGINE-PACKING (Elastic).
PUMP-BUCKETS ,,
HOSE-PIPES.
GAS-TUBING.
SUCTION HOSE.
FIRE ENGINE AND FACTORY HOSE.
WATERPROOF CART, VAN, AND WAGGON COVERS.
MACHINE AND MILL-BANDS for Driving all kinds of Machinery.
RAILWAY BUFFER SPRINGS.
BALL VALVES.
PUMP-PACKING (Rings or Rope).
WHEEL-TIRES (Noiseless).

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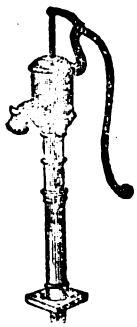
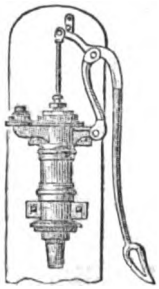
PATENTEES OF IMPROVEMENTS IN PUMPS.

Patent Vibrating Standard Lift and Force Pumps.





PATENT CAST-IRON PUMP fitted with J. Warner and Sons' Patent Bucket and Sucker, which cannot clog in action, for Farms, Cottages, and Wells, not exceeding 28 feet.

Dia.	Height.	£	s.
2½in. short	1 ft. 7 in.	1	10
2½in. long	3 ,, 3 ,,	1	14
,,	6 ,, 6 ,,	2	8
,,	3 ,, 6 ,,	3	3
,,	3 ,, 6 ,,	3	3
2½ ,,	3 ,, 6 ,,	3	3

2½ in. short, with 15 feet of Lead Pipe attached, ready for fixing 2 14
2½ in. long. do. do. 2 18

PATENT BRASS LIFT AND FORCE PUMP, on Plank, for House purposes, supply of Cisterns, &c.

	£	s.
2½ inch	6	0
3 ,,	7	5
3½ ,,	8	0

A lighter Pump of 3 inches diameter, can be supplied if required 5 15

IMPROVED LIQUID MANURE, OR GENERAL PORTABLE PUMP.

These Pumps are fitted with J. Warner and Son's Patent Bucket and Sucker, and cannot clog in action. The Barrel is of Galvanized Iron, not likely to corrode, and can be raised or lowered at pleasure. The legs will fold together, and the whole may be carried on shoulder to any pond or tank required.

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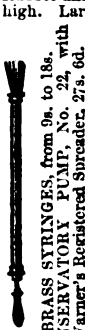

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Patentee and Sole Manufacturer of
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PATENT HOT HOUSES
every way superior to any other Material, at 1s. 3d. per ft. super, with excellent heavy, good quality GLASS.
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A Lever Embossing Press and Die, complete 15s. (51)

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AND PRONOUNCED BY HER MAJESTY'S LAUNDRESS TO BE THE FINEST STARCH SHE EVER USED.
WHEN YOU ASK FOR
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AND EVERY DESCRIPTION OF CASTINGS. (115)

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TO ARCHITECTS AND BUILDERS.—In consequence of numerous complaints, the Patentee begs to inform the above, that all genuine
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For Swing Doors, are stamped with Name and Address, thus—
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and that Springs thus marked are warranted.
SMITH'S PATENT WEATHER-TIGHT CASEMENT FASTENING AND SILL-BARS
are admitted by all to be the most perfect invention for the purpose. Diagrams and List of Prices on application. (143)

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NO FAMILY SHOULD BE WITHOUT HANCOCK'S UNIVERSAL WASHING MACHINE. It effectually cleanses the Crevices of Baby-linen, Collars, Wristbands, &c., without the possibility of injuring the Linen or Collars. Received 500 Testimonials.

PRICES.

No. 2 Washes 9 Shirts in from 3 to 10 minutes; or 4 Sheets in 5 minutes	£5	5	0
No. 3 Washes 12 Shirts in from 3 to 10 minutes; or 6 Sheets in 5 minutes	7	11	0
No. 4 Washes 18 Shirts in from 3 to 10 minutes; or 12 Sheets in 5 minutes	12	12	0

And all other Articles in proportion.
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Complete lists of sizes and prices may be had on application.
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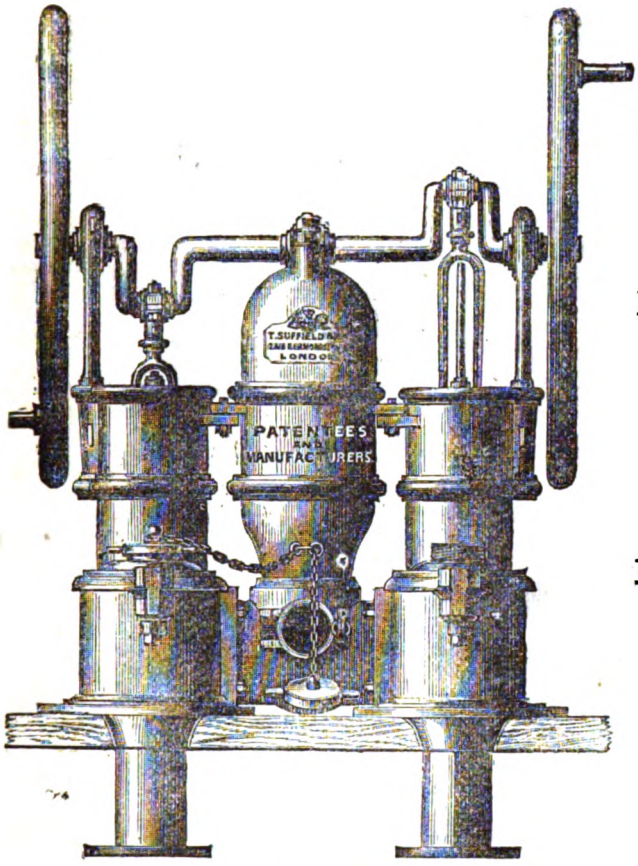
Call the particular attention of

SHIP-OWNERS. SHIP-BUILDERS, AND COMMANDERS OF STEAM AND SAILING VESSELS,

to the Simple and Efficient Arrangements of their

PATENT PUMPS.



Ships' Pumps

AND

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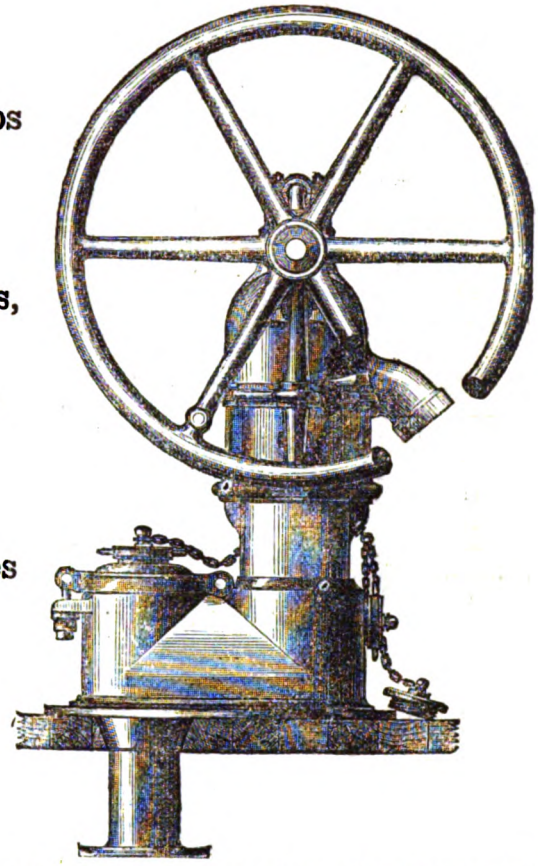
Fixed and Portable.

WITH

Patent Valves

AND OTHER

Improvements.



These Pumps are free from that liability to choke which is common to other Pumps, and their Working Parts are not susceptible of derangemen t either from wear or from being long out of use. They pass entirely through them, with ease, any substance that may enter the Suction Pipes. The Novelties in these Pumps are their adaptation to the varied duties of Ships' Pumps, the facilities they afford for Cleansing the Suction Pipes, and for Sounding or Examining the Valves; the readiness with which they may be used for Ventilating the Bilge, or for acting as a Syphon either for Watering the Ship, or for extinguishing Accidental Fires on board; the rapidity with which they can be converted into Fire Pumps, or be applied to the Washing of Decks; and their capability of Pumping from Several Compartments.

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ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY, in respect to Dimensions, Form, Means of Propulsion, and Powers of Attack and Defence: together with a Letter on the Steam Navy of France. By Mr. E. J. Reed, late of Her Majesty's Dockyard, Portsmouth; one of the Editors of the Mechanics' Magazine. (Republished by permission of the Council of the Society of Arts.)

ROBERTSON, BROOMAN, AND CO., Mechanics' Magazine and Patent Offices, 166 Fleet-st., London. (159)

"The Story of our Lives from Year to Year."
Shakspeare.

On Saturday, the 30th April, 1859, will be published, Price Twopence, the First Number of

ALL THE YEAR ROUND. A Weekly Journal, Designed for the Instruction and Entertainment of all Classes of Readers, and to assist in the Discussion of the Social Questions of the Day. Conducted by CHARLES DICKENS.

Published also in Monthly Parts and in Half-Yearly Volumes, at the Office, 11 Wellington Street North, Strand, W.C.: also by Chapman & Hall, 193 Piccadilly, London, W.

On Saturday, 28th May, 1859, Mr. Charles Dickens will CEASE TO CONDUCT HOUSEHOLD WORDS; that Periodical will be DISCONTINUED by him; and its partnership of Proprietors dissolved. (189)

"The Story of our Lives from Year to Year."
Shakspeare.

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To be continued from week to week until completed. (190)

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ENGINEERING AND MECHANICAL DRAWING CLASSES.—Instruction given in Engineering and Mechanical Drawing, comprising the preparation of plans, elevations, and sections of marine and locomotive engines, with the detail and working drawings; also the method of delineating screws, bevel wheels, &c.; orthographical projection, and tinting, shading, and colouring taught.—For prospectuses of the Day and Evening Classes apply to Mr. T. J. HILL, at the offices, 15, Old-street, City-road. (73)

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A SELF-ACTING TURNING, CROSS-SURFACING, AND SCREW-CUTTING DOUBLE-GEARED GAP LATHE, headstocks, 8 ins. to centres; bed, 10 feet long, with top driving gear.

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PRICES CURRENT OF METALS.

London, 1st April, 1859.

	Unit	£ s. d.	£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N. of England	pr. ton	6 5 0 to	6 10 0	nett
Welsh Bars, in Wales	„	6 2 6 „	6 5 0	3
Staf. Bars at the Works	„	7 0 0 „	7 10 0	2½
„ Hoops	„	8 0 0 „	8 10 0	„
„ Sheets, Singles	„	8 15 0 „	9 0 0	„
„ Nail Rods	„	7 0 0 „	7 10 0	„
„ Boiler Plates	„	8 10 0 „	9 0 0	„
Scotch Pig, M.-Nos. Warrants, at Glasgow	„	2 12 3	2 12 6	nett
Do. No. 1, Good Brands	„	2 12 0 „	2 14 0	„
Scotch Bars	„	7 5 0 „	8 0 0	3
Swedish Bars, in London	„	13 10 0 „	15 0 0	2½
COPPER, Sheet and Sheathing	per lb.	0 1 0½		3
Tough Cake and Tile	„ ton	112 10 0		„
Best Selected	„	115 10 0		„
Australian	„	114 0 0 „	115 0 0	„
South American	„	105 0 0		„
Yellow Metal Sheathing	per lb.	0 0 10½		„
STEEL, Swedish Keg	pr. ton	20 0 0		2½
„ Faggot	„			„
TIN, English, Block	pr. cwt.	6 6 0		2½
„ Bar	„	6 7 0		
Foreign, Banca	„	6 14 0 „	6 15 0	nett
„ Straits	„	6 10 0 „	6 11 0	„
TINPLATES, Charcoal, I.C.	pr. box	1 11 0 „	1 12 0	3
Coke, I.C.	„	1 5 0 „	1 6 0	„
LEAD, Pig, English	pr. ton	22 15 0 „	23 5 0	2½
„ Spanish	„	22 5 0 „	22 10 0	„
Sheet	„	23 0 0 „	23 10 0	„
SPELTER, on the spot	pr. ton	22 10 0 „	22 15 0	nett
for arrival	„	22 10 0		„
ZINC, English, Sheet	„	28 0 0 „	30 0 0	1½
QUICKSILVER	per btl.	7 0 0		1½

REMARKS.—Metals generally quiet, with prices steady. Foreign Tin has improved considerably in price, and sellers are few. Spelter evinces signs of further improvement.

LAWRIE AND HAGGER, Metal Brokers.
33 Lombard-street, E.C.

IRON AND OTHER METALS.

[FROM OUR OWN CORRESPONDENT.]

The Preliminary Meeting of Iron Masters yesterday (Thursday): Prices unaltered: quietude throughout the Trade—Similarity of experience in all the Districts—Pig Iron Trade generally—Glasgow Market: Increased Exports—The General Hardware and other Trades of Birmingham, Wolverhampton, and Sheffield—Felicitations on the Defeat of the Great Western Bill—Board Returns of the Exports of Metals: General Increase of Manufactured Iron, with Copper, Brass, Lead, and Tin—Machinery—Metal Imports.

THE great event of the week in the iron trade was the preliminary meeting of masters, which was held yesterday (Thursday) in Birmingham. It was scarcely so influentially or numerously attended as is the case when a change is likely to be made in prices. For a few weeks past it has been evident that there would be no alteration. The meeting was therefore anticipated with less interest than customary. The period just preceding the preliminary meeting is often characterised by the absence or the conspicuous silencing of the complaints of alarmists. This state of things was very observable last quarter. Now, however, there does not seem to be any visible effort to unduly elevate the present position and future prospects of the trade. To a superficial observer, therefore, the trade held scarcely so prosperous an aspect as at this time last quarter. Still, of the two we have no doubt but there is more iron being made and sold now than then. How long the comparison will be favourable to the current time will depend upon the course of foreign politics.

From the several iron-making districts of the country the week's reports are very similar, and may be thus summarised:—"The iron trade is quieter than could be wished, and the orders do not come in fast as is desirable. The leading makers have, however, enough orders in hand to keep their works in tolerably active operation."

Pig iron is scarcely so buoyant as usual at this period.

At Glasgow, on Tuesday, the week's shipments were entered at 13,171 tons against 12,955 tons in the corresponding period of last year. The prices obtained on Tuesday were for No. 1, 52s. 6d. to 52s. 9d.; mixed No.'s. warrants, 52s. 9d. to 52s. 10d.; ditto, maker's iron, 52s. 6d. to 52s. 9d.; No. 3, 52s. 6d. to 52s. 9d. Market drooping.

In Birmingham and South Staffordshire congratulations have been exchanged by the different leading iron masters and merchants upon the defeat of the attempt by the Great Western Railway Company to legalise a new and increased scale of tariff charges for the conveyance of both merchandise and passengers. The tables of exports for the months of January and February, just issued by the Board of Trade, are especially interesting to us as showing the progress of the iron trade during that period. The following is a summary of the principal items more immediately affecting the interests referred to:—

	January and February. 1858. Tons.		1859. Tons.
Pig Iron	28,457	...	27,496
Castings	10,067	...	8,884
	38,524		38,380
Bar Iron	25,993	...	41,422
Railway Iron	44,013	...	47,189
Wire	1,162	...	1,682
Wrought of all sorts ...	17,065	...	24,837
Steel	1,322	...	2,913
	89,555		118,043

The general hardware, edge tool, and cutlery trades of Birmingham, Wolverhampton, and Sheffield, have very slightly changed in two or three branches; some impetus has been given by orders coming in for goods for season wear or use, but in other respects the orders given out by the factors have been inconsiderable, the shopkeepers continuing to order only the smallest quantity of almost all descriptions of goods.

The falling-off in the export of pig-iron and castings accounts for the temporary depression in the pig-iron trade of the country generally from the commencement of the year to the end of February.

Placing February this year in comparison with that month in 1858 and 1857 respectively, the figures stand as under:—

	Month ending February 28th. 1857.		1858.		1859.
Iron, Pig	£86,309	...	47,337	...	46,244
Iron, Bar and Rod ...	200,217	...	124,372	...	160,495
Iron, Wire	23,589	...	9,693	...	13,638
Iron, Railway	292,352	...	153,696	...	158,402
Iron, Cast	62,438	...	58,773	...	50,438
Iron, Wrought	219,014	...	140,146	...	189,627
Steel...	58,008	...	28,564	...	52,392

On dissecting the returns we find that, whilst the total export of pigs shows a falling-off, a larger quantity than usual went to the United States in February this year. For bar and rod iron the exports increased to all parts of the world, except Holland and Sardinia; and the same of railway iron, the exceptions in the latter case being Hanover, the Hanse Towns, Spain, and Australia. In cast iron, the only improvement was in regard to Australia and Brazil. There was a slight difference in favour of last year in the exports of wrought-iron to the former country and Holland, but to all other markets an increase.

In the metals not classed under the head of iron we find the returns for February in the three past years as follows:—

	Month ending February 28th. 1857:		1858.		1859.
Copper unwrought ...	£58,700	...	62,103	...	68,870
Copper sheets, nails, &c., including yellow metal	133,643	...	122,710	...	98,524
Copper and other wrought	26,735	...	66,459	...	23,769
Brass	11,607	...	7,483	...	11,337
Lead	32,982	...	28,169	...	31,433
Tin	19,305	...	16,926	...	20,096
Tin Plates	135,585	...	80,502	...	107,726

Whilst the exports of yellow metal sheathing increased to Holland, Belgium, the United States and Brazil, the total exports show a considerable falling-off.

In tin plates, whilst there is an improvement upon 1858, the exports are yet far short of 1857. To America twice the quantity of tin plates has gone this year as compared with last.

Machinery stands thus:—Steam-engines, Feb. 1857, £104,068; 1858, £76,798; 1859, £43,335. Other sorts, Feb. 1857, £141,800; 1858, £130,160; 1859, £129,412.

In imports there was a falling-off in bar-iron, steel, and tin; but an increase in copper, with lead and spelter.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

RAILWAY WORKS, *Ireland*.—To make and lay railway from Banbridge Junction to junction with Ulster Railway, with all the excavations, embankments, &c., complete. Plans, &c., Mr. Blakiston, engineer of the company, 33, Anglesey-street, Dublin. Tenders at the office of the company, Belfast, April 20.

EXCAVATING ROCK, *Scotland*.—At entrance to the Edinburgh, Perth, and Dundee Railway Companies' Harbour, at Broughty. Plans, &c., Mr. Barril, engineer, Burntisland. Tenders to the Secretary, 9, Prince's-street, Edinburgh, April 13.

LANDING STAGE, *Scotland*.—At entrance to Victoria Dock, Leith. Specifications at office of Superintendent Leith Harbour and Docks. Tenders, Mr. Phin, clerk to commissioners of said harbours, 13, Heriot Row, Edinburgh, April 9.

SLEEPERS, *Monckland Railway*.—Larch timber. Delivered at any of the company's stations. Tenders, April 6, at Secretary's offices, 64, West Regent-street, Glasgow.

WAGGON WHEELS, *North Eastern Railway*.—For 1,000 wrought iron waggon wheels, with cast iron naves, according to drawing, &c., with Mr. E. Fletcher, Locomotive Works, Gateshead. Tenders to Mr. J. Cleghorn, Secretary, York, April 13.

BRIDGE, *Pennybout*.—For the replanking of Pennybout Bridge, with crossed rod deal. Specifications, Mr. W. Wisleade, county surveyor, Kington. Tenders, April 5.

CHURCH, *Kegworth, Leicestershire*.—For the works required in the restoration, &c. Plans, &c., Mr. Wells, churchwarden, Kegworth, from April 4. Tenders, April 16, Rev. J. Clark, Kegworth Rectory, near Derby.

CHURCH, *Wakefield*.—For building a new church for the West Riding Asylum, Wakefield. Plans until April 16, at the Court House. Tenders April 20.

CHURCH, *Milford*.—For enlarging the district church of St. John, near Godalming. Plans at the school house. Tenders to Rev. W. Watson, Milford, Godalming, April 9

CHAPEL AND SUNDAY SCHOOL, *Bury*.—For the Christian Church. Plans, &c., at the vestry. Tenders to Mr. W. Kay, 22, Union Square, April 16.

CHAPEL, *Warwick*.—For the erection of a Roman Catholic chapel. Plans, Mr. Cordles, West-street, Warwick, to whom tenders. April 7.

CHAPEL, *Collampton, Devonshire*.—Enlarging, &c., Baptist Chapel. Plans, &c., Mr. Bond. Further particulars, Mr. John Back, Willand. April 4.

PARSONAGE, *Ilfracombe*.—For the district of St. Philip and St. James. Drawings and specifications at 102, Guildford-street, Russell-square, to whom tenders to April 9; and at the Portland Rooms, Ilfracombe.

PARSONAGE, *Sleren, Suffolk*.—Plans, &c., at the Inn. Tenders to Mr. Robert Appleton, surveyor, Halesworth, April 11.

PUBLIC HALL, MECHANICS' INSTITUTE, &c., *Maldon*.—Plans, &c., Mr. W. K. Digby, High-street, Maldon; and Mr. J. R. Smith, architect, 8, Adam-street, Adelphi, London. April 11.

HOSPITAL, *Bath*.—Re-erection of Bellott's Hospital. Plans, &c., Messrs. Cotterell and Spackman, 6, Walks, Bath. Tenders to April 4.

WAREHOUSE, *Aldershot*.—For erecting a warehouse, building, and dwelling house over. Plans, &c., Mr. F. Eggar, architect, Farnham, to whom tenders, April 6.

FARM-HOUSE, *Chester-le-street*.—Farm-house, Honaton, Outside Farm, near Fatfield. Plans, &c., Mr. Cawthorn, Lumley. Tenders, April 4.

HOUSE, *Oldham*.—For Wesleyan minister. Plans, &c., Mr. W. T. Thompson, architect, 52 George-street, Oldham. Tenders to Rev. J. Tindall, April 11.

CHIMNEY SHAFT, *Penge*.—At the North Surrey District School, near the Anerley station. Plans with the Superintendent of the school. Tenders, April 14.

PAINTERS' WORK, *Manchester*.—The painting of certain corporation buildings, within and without, in two contracts. Specifications, &c., city surveyor, April 8.

SCAVENGING AND WATERING, *City of London*.—For the six divisions, for one year, from Midsummer next. Specifications, commissioners of sewers offices, Guildhall. Tenders, April 19, accompanied with names of two sureties for £500 each, and £20 in Bank of England notes.

COPPER, *East India Company*.—Tenders are received today (Friday) for 125 tons of copper slips, 2¼ in. wide and 1-10th in. thick; 125 tons of copper slips, 2¼ in. wide and 1-13th in. thick; also, 500 copper sheets of ¼ in. thick.

STONE, *Dover*.—The Dover Local Board of Health want 500 yards of the best 2½ in. tooled Yorkshire paving stone; 1,000 ft. lineal of Guernsey or Aberdeen kirb, 12 in. by 6 in.; 500 tons of blue Guernsey broken granite; and 50 tons of Guernsey or Aberdeen granite pitchers, 9 in. by 4 in. Further particulars of the surveyor. Tenders to office of Local Board, April 6.

PARTNERSHIP WANTED.—By an engineer having a thorough knowledge of the business, and who can bring £2,000 capital. Apply at Mr. C. H. Minchin's, 59 King-street, Manchester.

WANTED, A PARTNER, with a small capital, to commence a new machine for the Manchester trade. Apply to J., 147, *Manchester Guardian* office.

WANTED, A WATER TANK (either cast or wrought iron), 24 ft. long, 19 ft. wide, and 6 ft. deep. To be fixed near Wolverhampton. James Fullwood, Sedgley, near Dudley.

ADDITIONAL INSPECTOR TO STEAM BOILER ASSURANCE COMPANY.—Salary, £120 per annum. Must be a practical mechanic, accustomed to the examination of steam boilers, indicating engines, and mechanical drawing. Address Mr. R. B. Longridge, No. 1 New Brown-street, Manchester.

AN ENGINEER, to take the entire management of two 45-horse power engines, coupled. C. D, 11 Half Moon-street, Manchester.

PLANS FOR COVERED MARKET HOUSE, *Pontefract*.—On the vacant ground in the market place. Further information to Mr. H. J. Coleman, town-clerk, to whom tenders, April 19.

FOR TRAINING SCHOOL, *Winchester*.—The plan should admit of the erection of a chapel, &c., and must meet the requirements of the Committee of Council on Education. Plans to Rev. Canon Jacob, Crawley Rectory, Winchester.

EDWIN JEWITT, ENGRAVER ON WOOD AND DRAFTSMAN, 1 Pickett-place, Strand, near Temple-bar. Engineering, Scientific, and Mechanical Designs accurately engraved. Manufacturers and Tradesmen's Catalogues Illustrated. W.C. (84)

ARTESIAN WELLS, BORING TOOLS, PUMPS, &c. Engineers, Architects, Surveyors, Builders or others requiring a good supply of Water may have any quantity procured by W. SPELLER, 14 York-street, Blackfriars'-road, London, where may be had any quantity of Tools for Sinking or Boring, from 2 to 20 inches diameter, and from 100 to 2,000 feet depth; also Men and Tools to bore for Railroads, Minerals, &c., in any part of the world. Boring Tools and suitable Pipes for exportation, with full instructions for their use.

Builders, Contractors, Brickmakers, Barge and Ship Builders, and others, can be supplied with Wrought or Cast Iron Pumps, Double or Single, for excavation of Deep Wells, from 3 to 14 inches in the bore, and from 6 to 150 feet in length, to work by Hand or Steam Power.

Hot-water Apparatus for Conservatories, &c., on the most economical and improved principles.

Also Manufactory for Captain John Grant's much improved Cooking Apparatus. (44)

INDIA-RUBBER VALVES FOR STEAM ENGINES, PUMP PACKING, &c.—Explanatory Drawings and Information as to the best modes of fitting and arranging the above, and all other Mechanical Applications of VULCANISED INDIA-RUBBER, are furnished post-free by

CHARLES MACINTOSH & Co., Patentees, Cambridge-st., Manchester, and 3 Cannon-st. West, London.

MANUFACTORY and DEPÔT, Cambridge-st., Manchester.

GENERAL WAREHOUSE, 3 Cannon-street West, London, E.C.—C. M. and Co.'s only Establishments. (12[illegible])

EMIGRATION TO NEW YORK, CANADA, AUSTRALIA, NEW ZEALAND, EAST INDIES, CAPE OF GOOD HOPE, &c. All Classes of Passengers booked throughout in the Finest Steam and Sailing Packets. Full Particulars in our circulars for 1859, may be had gratis on application to F. S. GRAY and Co., 51 King William Street, City, and 6 Tower Hill, London; and at [illegible] Street, Liverpool. ([illegible])

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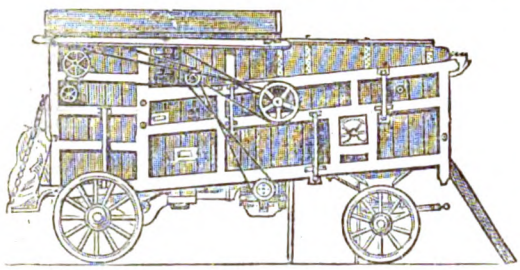
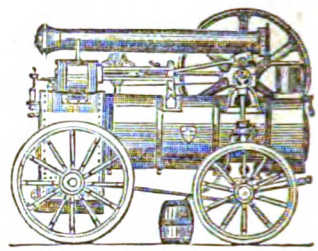
AGRICULTURAL ENGINEERS AND MILLWRIGHTS.



MANUFACTURE

PRIZE PORTABLE and FIXED STEAM ENGINES,
SMITH'S PATENT STEAM PLOUGHS,
PATENT PRIZE COMBINED THRASHING MACHINES, containing R. P. and Co.'s NEW PATENT CORN CLEANER,
SAWING MACHINERY, CIRCULAR and VERTICAL of all Sizes,
MILLS of all Kinds, FIXED and PORTABLE, for Grinding Bones, Flour, Linseed, Mortar, Clay, &c.
PUMPS, CRANES, CRABS, SCREW-JACKS, &c.



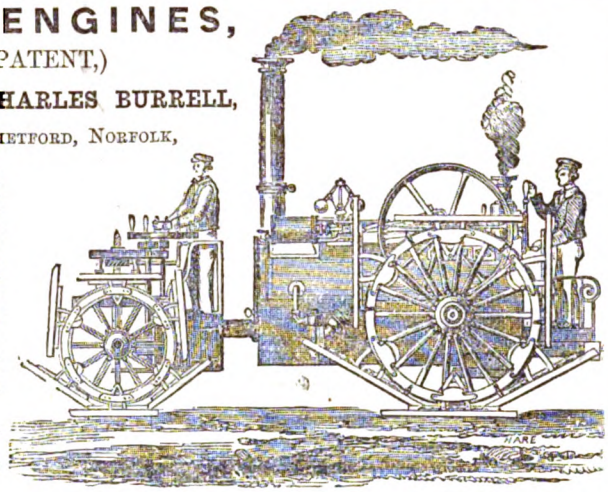
Illustrated Catalogues, with full Particulars and Testimonials, may be had by applying as above. (34)

TRACTION ENGINES,

(BOYDELL'S PATENT,)

MANUFACTURED BY CHARLES BURRELL,

ST. NICHOLAS WORKS, THETFORD, NORFOLK,



And ordered for India, Australia, and South America, may now be seen, complete and in course of construction at the above works. BOYDELL'S TRACTION ENGINES AND ENDLESS RAILWAY will draw heavier loads over good roads than any other traction engine, and on soft and bad roads will draw heavy loads where no other traction engine can move itself. All objection to the wear and tear of these Engines is entirely removed by the use of Charles Burrell's improved patent Wrought Iron Wheels, fitted with Rails and Tyre, as well as all the wearing parts, of Steel.

Apply also to Mr. Hemming, 47 Mark Lane, E.C.

(40.)

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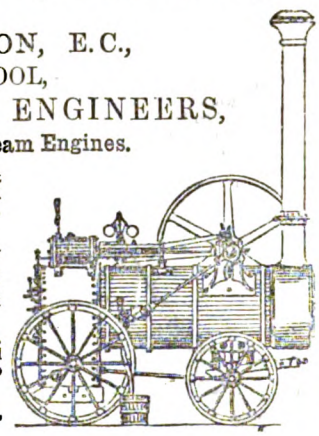
OF LINCOLN,

78 LOMBARD STREET, LONDON, E.C.,

AND 36 DALE STREET, LIVERPOOL,

AGRICULTURAL AND GENERAL ENGINEERS,

And Manufacturers of Portable and Fixed Steam Engines.



Combined Threshing Machines, which dress the corn ready for market at one operation. Grinding Mills, Saw Benches, Pumps for Irrigation and Mining purposes, with all necessary gearing for being driven by steam power. Full particulars and estimates given on application to the above address.

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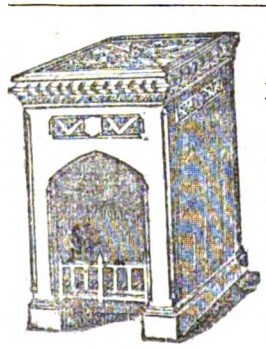
For Exportation.---The above can be obtained through British Merchants, Shippers, and Colonial Agents. (23)



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UNRIVALLED

PYRO-PNEUMATIC FIRE-LUMP WARMING AND VENTILATING STOVE GRATES,

WITH the cheerful, open fire, producing healthful warmth, with continuous Self-acting Ventilation, for Churches, Schools, Public Buildings, Banking Houses, &c. These Grates are manufactured solely by PIERCE, the Inventor, for which he received the Prize Medals of London in 1851, and of Paris in 1855.

PRICE, from £7 10s.

ILLUSTRATED CATALOGUE, with Prices and Estimates for Work, furnished on application to the Inventor and Sole Manufacturer.

Also his

IMPROVED COTTAGER'S GRATE,

For Warming Two Rooms with only One Fire. Prices, 30s. and 35s.

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HOT-HOUSE BUILDERS

AND

Hot-Water Apparatus Manufacturers.

Plans and Estimates forwarded on Application. (149)

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SILVERTOWN INDIA-RUBBER WORKS,

OPPOSITE

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WITH ALL

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Agricultural Implements of all kinds.

MOWING & REAPING MACHINES.

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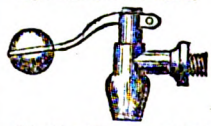
THE PATENT PLUMBAGO CRUCIBLE COMPANY having completed the enlargement of their premises, beg to call the attention of all users and shippers of Melting Pots to the great superiority of the PATENT CRUCIBLES, which have been used during the last three years by some of the largest melters in England and abroad. In addition to their capabilities of melting an average of from thirty-five to forty pourings; they are unaffected by change of temperature, never crack, but can be used till worn out, requiring only one annealing for several days' work, and become heated much more rapidly than ordinary pots, effecting thereby a saving of more than fifty per cent. in time, labour, fuel, and waste. The Patent Plumbago Crucible Company also manufacture and import clay crucibles, muffles, portable furnaces, sublimate pans and covers, glass-pots, all descriptions of fire-standing goods, and every requisite for the assayer and dentists. For Lists, Testimonials, &c., apply to Battersea Works, London, &c. (43)

HIGH-PRESSURE VALVE-COCKS,

LAMBERT'S PATENT.

Equilibrium Ball Valve. Cottage Closet Valve.



The Equilibrium Ball-Valve is simple and certain in its action, and is cheaper than the common cocks now in use.

The Cottage Valves are suitable for application to any kind of basin; and, as they shut against the pressure, no concussion in the pipes can possibly occur.

These cocks have been extensively and most successfully used in many towns, under continuous high pressure, varying from 100 to 350 feet; their efficiency and durability is, by experience, established.

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EARNESTLY solicit the continued support of their numerous Friends, Agriculturists, Shippers, and others; the additions made to their Works during the present year, in the erection of new sets of Workshops, fitted with the best mechanical appliances for producing Machinery of the most improved construction, expeditiously and economically, justifies their soliciting increased support, while their leading reputation as Inventors and Manufacturers of First Class Agricultural Machinery, is a sufficient guarantee that every Machine supplied from Leiston Works will prove to the entire satisfaction of the purchaser.

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PORTABLE AND FIXED STEAM ENGINES. } From 4 to 40 Horse Power, suited for every kind of work
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STONE GRINDING MILLS.
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&c. &c. &c.

Of which full detailed particulars will be found in R. G. & SONS' Illustrated Catalogue, sent postage free to any address, in English, French, or German; and any of the above Machines will be shown in operation at R. G. & Sons' Farm, near the Works, on their receiving a few days' notice.

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GREAT REDUCTION IN THE PRICE OF

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From the great Improvements recently made, JOHN FOWLER is prepared to execute Orders at the following prices:—

Windlass to Eight-horse Engine, with Patent Self-moving Anchor, Headland Ropes, Rope Porters, and all necessary Tools	£160 0 0
Cultivator, fitted with Three, Five, or Seven Tines	25 0 0
Seven Hundred Yards Iron Wire Rope, 1¼ in. circumference, which is a sufficient length, on this plan of working, for a 350 yards furrow	22 10 0
Steel Rope, £7 10s. extra.	£207 10 0

The advantages to be derived in the working of this Tackle over others are, no belt is used, consequently no delay is caused from its slipping in showery weather; it can be efficiently worked by two men and two boys; and it is not confined to scarifying only, but a two-furrow balance plough can be worked by it. From the direct action of the draught, a small engine will effect a larger quantity of work than the same engine on the "round-about system;" only half the rope is required for the same length of furrow, and a whole field can be done without shifting. The windlass can be attached to any agricultural engine, and the weight added would only be 12 cwt. The Tackle can be set at work within an hour of entering the field intended to be cultivated. The Drums on which the Rope is worked are four feet in diameter, and from its being wound in grooves, all crushing is avoided, and by these means a great saving in wire rope is effected.

LARGER POWER ENGINES AT COMPARATIVE PRICES.

Illustrated Catalogues with New Prices will be ready shortly. For further Particulars apply to

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PATENT GRASS SEED SEPARATOR,

which entirely extracts the Seeds of "COUCH," "TWITCH," "SPEAR," or "HAIR" GRASS and other impurities from

PERENNIAL AND ITALIAN RYE-GRASS, &c.,

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AND

CLOVER AND TREFOIL MILLING OR DRAWING MACHINE,

which effectually removes the beard from Carrot Seed, rendering it fit for sowing with facility by drill or otherwise, and by the separation of abortive or diseased grains vastly increases its vegetative per centage. By a slight modification it is applicable to the other purposes before mentioned.

These Machines were admittedly the most novel, and, at the same time, the most useful and important to the Farmer of any exhibited at the late SMITHFIELD CLUB SHOW.

They may be seen at work at the Establishment of the Manufacturer,

Mr. T. MIDDLETON, Engineer, Southwark.

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GAS EXPLOSIONS PREVENTED.

USE THE TUBES AND FITTINGS MADE BY JOHN RUSSELL and Co. (Established at the commencement of gas-lighting), whose goods are all well tested, and warranted.

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FIRE BRICKS.—THE FARNHAM INDESTRUCTIBLE SILICIOUS FIRE BRICKS have been greatly REDUCED in PRICE, and will be delivered at the Nine Elms Station, London, at 90s. per 1,000. —Address, G. H. OGSTON, J. M., Paine's Silica Works, Farnham, Surrey. (35)

WROUGHT IRON BEAMS AND GIRDERS

Of various sizes up to 12 in. deep, with Top and Bottom Flanges, 5 in. wide, rolled up to 28 ft. long.

Smaller dimensions can be produced much longer.

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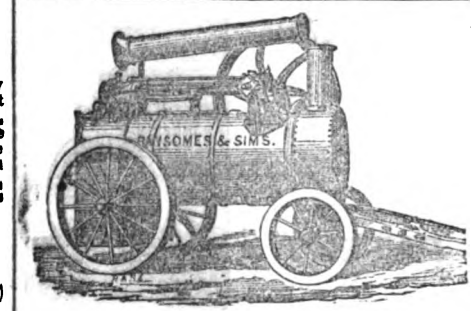

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Price 50s. per Cask, containing 448 Feeds
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A Pamphlet, Testimonials, &c., gratis. (133)

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(SUCCESSORS TO GEORGE B. LLOYD & CO.)

GAS STREET AND BERKLEY STREET,

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Manufacturers of Wrought Iron Tubes & Fittings,

FOR GAS, STEAM, AND WATER.

PATENT GLASS ENAMELLED AND GALVANIZED TUBES,

AND

LAP-WELDED IRON BOILER TUBES.

(193)

TO STEAM SHIP OWNERS, ENGINEERS, AND OTHERS.

How's Patent Steam Engine Counters, can be read at sight.

These Counters register the number of revolutions made by an engine or other mechanism. They may be used for ascertaining the duty of Pumping Engines and Water-wheels; the revolutions on board a steam-vessel; to calculate the slip of the propeller; and in a locomotive to test the slip of the wheels.

How's Patent Salinometer, for Steam Boilers using Salt Water.

By these, the density of the water in the Boiler is at all times accurately shown, and a saving of boiler and fuel is effected. They are adopted by the Admiralty, the Honorable Trinity Corporation, and others. Copies of Testimonials from Messrs. Penn, Messrs. Maudslay, and others, will be forwarded on application.

How's Engine-Room Telegraph, for communicating between Captain and Engineer. Society of Arts Prize Medal, 1855.

is a Mechanical Telegraph, and by its peculiar construction, error or misunderstanding is rendered impossible. It now extensively adopted, and gives great satisfaction.

How's Patent Fresh Water Apparatus for Ships' Use.

This apparatus is designed for the distillation of Fresh from Salt Water; and on long voyages, and where the supply of water is scanty, it will be found invaluable. Testimonials may be seen.

Patent Steam Pump and Fire-Engine for Ships' Use.

This Steam-pump occupies but a small space; works perfectly noiselessly, and throws an immense volume of water. An Illustrated Circular of Fresh Water Apparatus and Steam-pump combined, free on application.

How's Patent Machine for Cutting Bolts, Rods, Spindles, Wire, &c.

Simple in construction, inexpensive, occupies but little space, and will not easily get out of order.

A Pamphlet Illustrative of the above, sent free by post, on application to

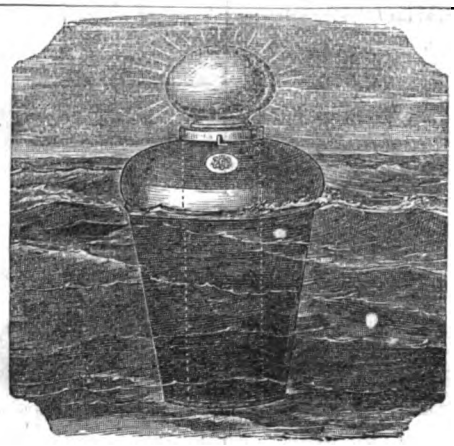
A. P. HOW, ENGINEER,

81 MARK LANE, LONDON.

EVERY DESCRIPTION OF ENGINEERS' TOOLS, ENGINE ROOM STORES, &c., &c., SUPPLIED.

(89)

GRESHAM'S



RECORD

PATENT

BUOY.

The RECORD BUOY is intended to be kept in some place available for instant use, and to be thrown overboard from a sinking ship, or a Vessel on fire, so as to [illegible] disaster, having a paper inserted therein, already filled up with the Ship's Name, Port of Registry, Official Number, &c., and a few last words hastily written, intimating the nature of the calamity, with any further information that can be given at such a time. It has capacity and buoyancy to contain besides these, the Log Book, and several pounds' weight of Papers or Valuables. It is lined with Cork between the Cylinder and outside case, so that, although waterlogged, it will not sink, but keep afloat for a long time, probably for years.

In order to DISTINGUISH IT FROM ANY OTHER FLOATING SUBSTANCE, so that the Captain of a passing Ship may recognize it as an intimation of disaster, and consider it a sacred and imperative duty to pick it up and convey the information it contains according to the directions found within, it HAS RAISED CONSPICUOUSLY UPON ITS SURFACE A SILVERED GLOBE, which, owing to the reflection of the light, will make it visible at a great distance, and when dancing on the wave it shines, in fact, like a star in the firmament, and being distinguishable from anything else, its character cannot be mistaken.

It is furnished with ample directions to the finder how to act, and has Envelopes already directed to the proper authorities, who, on receipt thereof (and they should be transmitted by the first available means), will, after verifying them to prevent imposition, immediately convey the information to the owners of the lost Ship, to Lloyd's, and all parties concerned; and if a foreign ship, to the consul of the nation to which she belongs.

In order to establish uniformity, and to prevent the uncertainty and confusion which a multiplicity of Buoys of various forms might occasion, when their utility becomes apparent, and to make ESPECIAL RECOGNITION OF THESE UNDOUBTED, MR. JOHN GRESHAM, J.P. and Alderman of Hull, has Patented his Invention, and has arranged with the old-established Firm of

GEORGE & JOSEPH OLIVER,

286 WAPPING, LONDON, E.,

TO MANUFACTURE AND SUPPLY THEM, AND TO WHOM ALL COMMUNICATIONS SHOULD BE ADDRESSED.

(194)

WATER POISONED BY LEADEN PIPES.

"The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight. The water has cut these deep pits almost through the pipe, and not only upon the portion which we have illustrated, but has formed similar chasms throughout the entire length."—*Exposition.*

Poisoned Water Preventable.

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

From Dr. MURRAY, Hull.

"It is impossible to conceive of anything more injurious, or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha. Nothing can be better. I have also recommended it to others, who have adopted the expedient.

Resistance for Frost.

The Gutta Percha Company have been favoured with the following Letters in reference to the non-conducting properties of Gutta Percha Tubing, in the resistance of Frost.

From J. ARMSTRONG, Esq., M.D., Gravesend.

"My private house, which was supplied with your Gutta Percha Tubing some five or six years ago, has never required the slightest attention; and previously, there was no winter passed that we were not deluged in consequence of the bursting of the leaden pipes."

From HENRY BROWN and SONS, Western Works, 108 Rockingham-street, Sheffield.

"We have now a positive proof of the frost-resisting properties of the Gutta Percha Piping. On our premises we have a leaden Pipe and a Gutta Percha one lying side by side. The leaden one has been completely frozen up at least ten days, and the Gutta Percha one is still unaffected.

Every Variety for Gutta Percha Articles

SUCH AS

Mill-bands,
Tubing for Watering Gardens, &c., &c.,
Soles,
Sheet,
Pump-buckets,
Fire-buckets,
Bottles,
Bosses,
Union-joints,
Flasks,
Bowls,
Chamber-vessels,
Galvanic Batteries,
Toilet-trays,
Sponge-bags,
Curtain-rings,
Talbotype-trays,
Photographic Baths,
&c., &c.

MANUFACTURED BY THE

GUTTA PERCHA COMPANY,

And Sold by their

WHOLESALE DEALERS IN TOWN AND COUNTRY,

Submarine and Subterranean Telegraph Wires Insulated with Gutta Percha.

The Gutta Percha Company, Patentees,

18 WHARF-ROAD, CITY-ROAD, LONDON.

(34)

Published by RICHARD ARCHIBALD BROOMAN, at the MECHANICS' MAGAZINE Office, 166 Fleet-street, in the Parish of St. Dunstan's-in-the-West, in the County of Middlesex, and printed by JAMES JUDD, of 14 Holford-square, Pentonville, in the County of Middlesex, and HENRY ALEXANDER GLASS, at their Office, 38a New Bridge-street, in the Parish of St. Anne's Blackfriars, in the City of London.—Friday, April 1859.

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 15.
[NEW SERIES.]

LONDON: FRIDAY EVENING, APRIL 8, 1859.

PRICE, FOURPENCE.
BY POST 5d.

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THE COTTON SUPPLY ASSOCIATION.

COTTON GINS.

IMPROVEMENT UPON THE INDIAN CHURKA.

TO COTTON GIN MAKERS, MACHINISTS, AND INVENTORS.

THE Committee of the Cotton Supply Association have received from the Bombay Chamber of Commerce two Indian Churkas, or Hand-roller Gins of native construction, and such as are now used by the natives of India, with the request that they should be submitted to the Machinists of this country, with a view to obtaining, if possible, a superior machine. Your attention is therefore respectfully requested to the construction of this "Churka," which may be seen at the offices of this Association. The objects to be aimed at in the making of an improved machine, are—

1. That the machine do no injury to the cotton, in the process of separating the seed from the fibre. It is said that "no machine can possibly separate the cotton from the seeds with less injury to the staple than does the Churka."
2. That the machine, as far as possible, do rid the cotton from leaf and impurities.
3. That the machine be of simple construction, and durable.
4. That the machine be easily repaired by the native Indian.
5. That it be portable.
6. That the cost be as low as possible. The "Churka" costs only two rupees, or 4s. It is necessary that the improved machine should be within the ability of the natives to purchase.
7. That the machine be able to do its work faithfully, in spite of carelessness or neglect.
8. That the machine be able to clean a fair quantity of cotton per day, with the labour of one person (male or female).

The Committee submit the above conditions to the consideration of Machine Makers, and Mr. Haywood, the Secretary of this Association, will be prepared to afford any further information that may be required.

It is proposed, in furtherance of the wishes of the Bombay Chamber of Commerce, to hold a trial of the merits of the different Gins that may be constructed to meet the above conditions, in two or three months from this date. Due notice of the day of trial will be given.

Premiums of £20, £10, and £5 will be paid by the Association to the exhibitors of the Gins which rank 1st, 2nd, and 3rd in order of merit.

G. R. HAYWOOD,
Secretary of the Cotton Supply Association.

1 Newall's Buildings, Manchester,
March 25th, 1859. (196)

THE NATIONAL FLAX COMPANY, LIMITED.—Incorporated under the "Joint Stock Companies Acts," by which Limited Liability is secured to the Shareholder.

Capital £200,000, in Shares of £1 each.

5s. to be paid on Application; 5s. within Three Months from Allotment; and the remainder, as required, in two Payments of 5s. each.

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THE Imports of Foreign Flax Fibre having declined to a most serious extent, and the Cultivation of the Plant decreased at home, a great necessity has arisen for laying the foundation of a System whereby a sufficient supply of raw material may be secured to meet the requirements of a great staple industry of the country—known as the Flax and Linen Trade.

It has, therefore, been determined to form "THE NATIONAL FLAX COMPANY, LIMITED," whereby such a System may be initiated.

This will be effected by the introduction of mechanical improvements, whereby a continuous and easy, as well as profitable, preparation of the Fibre from the Plant can be effected.

Such preparation will be carried on in establishments to be called "Rettories," and to be erected in suitable localities, where the Flax Crop, in its entirety, or otherwise, will be purchased from the Grower.

By thus creating a Market within easy reach of the Farmer, and proving to him practically that he can easily produce a good-paying Crop, needing no further trouble in its preparation, and for which he may regularly receive *ready money* at harvest time, when the demands on him for *labour-cost* are large, it is considered that a very extensive growth of Flax will be gradually introduced throughout the country generally.

A more perfect cultivation of this Plant will also be induced, whereby many existing prejudices, in respect to the supposed exhaustive properties of Flax, will be removed, and the Grower convinced that it is really one of value in Districts suitable to it, and in fair rotation. It will also be found that land capable of producing any kind of grain is equally available for Flax; and that there is no better *preparation* for a Wheat Crop to follow.

The Company have secured the Patents, Plans, and Services of Mr. G. A. CATOR, who has devoted a large sum of money and many years in bringing the matter to its present effective condition.

By reference to the detailed Prospectus, it will be clearly seen that, with the outlay proposed, a very large Dividend may be calculated on with perfect safety; showing that this Company presents unusual features of promise to parties seeking investment in substantial and well-considered enterprises.

*** Prospectuses, Pamphlets, Forms of Application for Shares, and all other information, may be obtained at the Offices of the Company. (207)

HART & SON, MALLEABLE IRON-FOUNDERS, 4 Vine-street, York-road, Lambeth. Orders for Malleable Iron Castings executed within a week. (77)

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WANTED, a Gentleman well-acquainted with Ironmongers, Upholsterers, Coopers, &c., to Travel on Commission.

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12 Pancras-lane, Cheapside, E.C., London.

The improved system adopted by the last Patent Law Amendment Act having greatly increased the number of Patents taken out by, and removed various obstacles in the way of Inventors, and the Acts of Parliament lately passed limiting the liability of Shareholders in Public Companies, have now rendered the formation of such an Association not only comparatively easy, but have also afforded the means by which it may become remunerative to its Members, without incurring any unnecessary risk.

The Company has been formed for the purpose of assisting Inventors, and its contemplated operations comprise—

The taking out of Patents and Registrations for Inventors, and when required, advancing the money for this purpose.
The advancing sums of Money on approved security to Inventors and Patentees, for the purpose of enabling them to develope and complete their Patents and Inventions.
The devotion of a portion of the Company's Premises for the purpose of receiving Models and Drawings of Inventions and Patents.
The Purchase and Sale of Inventions and Patents.
The Selling of Patents and Inventions on Commission.
The investigation of the value and merits of Inventions, and the granting of Certificates thereof.
The keeping a Registry of all Patents taken out by the Company, and the furnishing a Monthly List thereof to all Subscribers.

The Board of Directors will not require the particulars of an Invention to be communicated to them before the same is registered; but the particulars will only have to be communicated to the Secretary, who will give a written undertaking, not to disclose them to any one without the consent of the Inventor.

No Shareholders holding 10 Shares in the Company, will be required to pay any preliminary fee for the consideration by the Board of any Patent or Invention they may wish to bring before its notice.

All Shareholders in the Company will be considered as Subscribers to the monthly list of Patents, and as such, will have the lists sent to them, without further payment.

The subscription for the list, by parties not holding Shares, will be £1 1s. per annum.

One of the great objects of the Company will be at all times to watch over and preserve the rights of Patentees; and if possible to obtain a repeal of the stamp duties affecting Inventors; or if not able to accomplish this, to obtain a great reduction in the amount of such duties.

As the business of the Company can be carried on by means of a small Capital, it is with the greatest confidence anticipated that a very high return in the shape of a bonus or dividend will be obtained by the Shareholders of the Company.

All information may be obtained at the Office, and the Deposit may be paid to the Bankers or to the Secretary. (200)

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OWING to the continued ill health of the Proprietor, the first-class business of an Engineer and Crane and Block Maker is offered for sale. It has been established in the Metropolis for nearly 30 years, and has enjoyed extensive patronage amongst Brewers, Manufacturers, Warehousemen, and others, in and about London; the business done amounting to nearly £8,000 per annum. About £3,200 would be required, (part of which, however, may remain for any reasonable time on good security,) which is the bare value of the tools, patterns, and stock in trade. The premises, including good dwelling-house, very conveniently situated, and capable of accommodating from 60 to 70 hands, are held upon a long lease, at an extraordinary low rental, not exceeding £100 per annum, taxes included. Many of the tools are nearly new, and of the best construction. The present proprietor, who relinquishes the business solely on account of ill health, would give every assistance in his power to those succeeding him; and as his foreman, who has been with him for nearly ten years, is thoroughly acquainted with the practical parts of the business, any gentleman desirous of commencing as a manufacturing engineer would find the present a very favourable opportunity. As all accounts have been, for many years past, collected quarterly, a very small amount, say £800, would suffice as working capital. Full particulars may be obtained by application to E. E. ALLEN, Esq., MECHANICS' MAGAZINE Office, 166 Fleet Street, E.C. (130)

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GAUGE COCKS, GLAND COCKS, GREASE COCKS, CUPS and SYPHONS.

STEAM TAPS, RANGE COCKS, &c.

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N.B.—The public are cautioned against being imposed upon by worthless imitations. (132)

WATER GAUGES—WATER GAUGES.—Sir,—We find your German Gauge Tube superior to any other, and strongly recommend it. We were compelled to abandon the use of our water gauge until applying your glass tube.

WILCOX and Co., Millwall Pottery Company.

These Tubes are superior to all others; being a clear white, no mistake can arise in working. Guaranteed to stand a pressure of 500 lb.

Extensively used on all the principal lines.

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*** Price List of Gauge Fittings, &c., on application. (94)

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METROPOLITAN BOARD OF WORKS.—MAIN DRAINAGE OF THE METROPOLIS.—SOUTHERN HIGH LEVEL SEWER.—To BUILDERS, CONTRACTORS, and Others.—The Metropolitan Board of Works hereby give notice, that they will MEET at the Council Chamber, Guildhall, in the City of London, on Friday, the 20th day of May next, at Twelve o'clock at noon precisely, and will then be prepared to open TENDERS by parties who may be willing to CONTRACT for the CONSTRUCTION of MAIN BRICK SEWERS, 9 miles 2,940 feet in length, or thereabouts, and for the execution of other works in connection therewith, to extend from Deptford Creek to High-street, Clapham. Also, a branch to extend from the Broadway, Deptford, to the point of junction of the Effra Sewer at Dulwich and Norwood, all in the respective parishes of Saint Nicholas, Deptford, in the county of Kent; Saint Giles, Camberwell; Saint Mary, Lambeth; Clapham, and Streatham, in the county of Surrey; and for the maintenance of such works in complete repair for twelve calendar months.

Parties desiring to submit tenders, may, upon payment of £3, obtain plans, sections, specification, form of tender, and other particulars, on application at the office of the Board, between the hours of Nine a.m. and Four p.m., on and after Thursday, the 14th of April instant.

Tenders addressed to the Metropolitan Board of Works, must be delivered at the office of the Board, No. 1 Greek-street, Soho, before Four o'clock p.m. on Thursday, the 19th day of May next, and no tender will be received after that hour.

The Board do not bind themselves to accept the lowest, or any tender, and the party whose tender shall be accepted, will be required to provide two approved sureties for the due performance of the work.

E. H. WOOLRYCH, Clerk of the Board.
No. 1 Greek-street, Soho, April 7, 1859. (211)

VULCANISED INDIA-RUBBER MACHINE BANDING IS NOT AFFECTED BY WET, HEAT, OR COLD; does not stretch nor slip on the pulleys. HOSES for BREWERIES, &c., will NOT impart TASTE, SMELL, or COLOUR: also for conducting, or steam purposes. Washers, Valves, Sheets, Printing Blankets, &c., in Stock. Other Articles made to order. All Goods warranted to stand 300° Fahrenheit.

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KING'S ROAD, CHELSEA, AND HAMPSTEAD ROAD,
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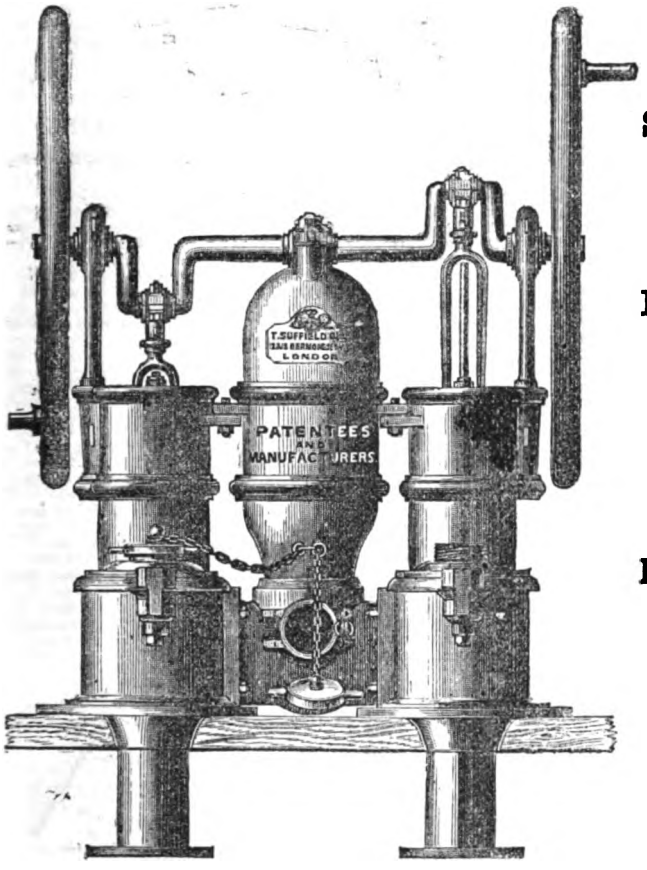

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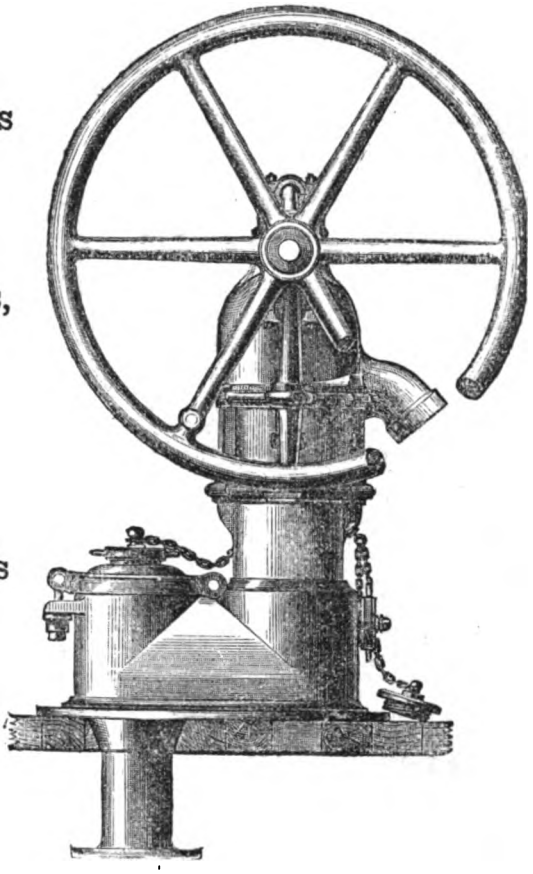

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ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY, in respect to Dimensions, Form, Means of Propulsion, and Powers of Attack and Defence: together with a Letter on the Steam Navy of France. By Mr. E. J. REED, late of Her Majesty's Dockyard, Portsmouth; one of the Editors of the MECHANICS' MAGAZINE. (Republished by permission of the Council of the Society of Arts.)

ROBERTSON, BROOMAN, AND CO., MECHANICS' MAGAZINE and Patent Offices, 166 Fleet-st., London. (159)

"The Story of our Lives from Year to Year."
SHAKSPEARE.

On Saturday, the 30th April, 1859, will be published, Price Twopence, the First Number of

ALL THE YEAR ROUND. A Weekly Journal, Designed for the Instruction and Entertainment of all Classes of Readers, and to assist in the Discussion of the Social Questions of the Day. Conducted by CHARLES DICKENS.

Published also in Monthly Parts and in Half-Yearly Volumes, at the Office, 11 Wellington Street North, Strand, W.C.: also by CHAPMAN & HALL, 193 Piccadilly, London, W.

On Saturday, 28th May, 1859, Mr. CHARLES DICKENS will CEASE TO CONDUCT HOUSEHOLD WORDS; that Periodical will be DISCONTINUED by him; and its partnership of Proprietors dissolved. (189)

"The Story of our Lives from Year to Year."
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The First Number, Price Twopence, of the New Weekly Journal,

ALL THE YEAR ROUND, will contain the First Part of A NEW STORY,
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TESTIMONIALS.

IMPORTANT ANNUAL SAVING.

From TRUMAN, HANBURY, BUXTON, & Co., Brewery, London.

"In reply to your inquiry, we have much pleasure in bearing our testimony to the advantages, both as regards economy and saving of time, effected by the use of your Patent Gutta Percha Bands in lieu of Leather Straps. The stoppage of one portion of our works through the failing of the leather strap used to be of daily occurrence—but with this annoyance we are now never troubled. We have had these straps in operation for nearly three years, and are assured by our Engineer that *they effect a saving to us of at least* THIRTY POUNDS *a year.*"

From JAMES ABERNETHY & Co., Fury Hill Foundry Aberdeen.

"We have now had Gutta Percha Bands working here *for three years.* One of them has been driving the fan blast for our smith's shop for all that time, and for anything we see, may drive it as long again. The speed of the fan is but 1,200 per minute. We have used them with complete satisfaction, driving circular saws, and in some cases where leather bands would have been quite inapplicable from damp. We have uniformly endeavoured to have the drums and pulleys so proportioned to the strain, as that there is no chance of the band slipping; and with this precaution, and taking care in using *cross bands that they do not rub*, we are quite satisfied that they are superior in every respect to leather—stronger at the same weight, and keeping quite straight in working—requiring no lacings, and very seldom any repairs."

WATER POISONED BY LEADEN PIPES.

The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. D——, of Bonchurch, Isle of Wight.

POISONED WATER PREVENTABLE

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

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"It is impossible to conceive of anything more injurious or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha Tubing. Nothing can be better. I have also recommended it to others, who have adopted the expedient."

A variety of Gutta Percha Articles, such as Mill Bands, Tubing, Sheet, Soles, Pump Buckets, Bosses, Union Joints, Bottles, Bowls, Flasks, Curtain and Cornice Rings, Solid Frames, Galvanic Batteries, &c., &c.

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PRICES CURRENT OF METALS.

London, 8th April, 1859.

	£ s. d.	£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N.			
of England ..... pr. ton	6 5 0 to	6 10 0	nett
Welsh Bars, in Wales .. „	6 0 0 „	6 2 6	3
Staf. Bars at the Works „	7 0 0 „	7 10 0	2½
„ Hoops ..... „	8 0 0 „	8 10 0	„
„ Sheets, Singles .. „	8 15 0 „	9 0 0	„
„ Nail Rods ..... „	7 0 0 „	7 10 0	„
„ Boiler Plates .... „	8 10 0 „	9 0 0	„
Scotch Pig, M.-Nos. Warrants, at Glasgow..... „	2 11 6	2 12 0	nett
Do. No. 1, Good Brands „	2 11 0 „	2 13 0	„
Scotch Bars ..... „	7 5 0 „	8 0 0	3
Swedish Bars, in London „	13 10 0 „	15 0 0	2½
COPPER, Sheet and Sheathing per lb.	0 1 0½		3
Tough Cake and Tile „ ton	112 10 0		„
Best Selected..... „	115 10 0		„
Australian ..... „	112 10 0		„
South American .... „	104 0 0		„
Yellow Metal Sheathing..... per lb.	0 0 10½		„
STEEL, Swedish Keg ..... pr. ton	20 0 0		2½
„ Faggot ..... „			„
TIN, English, Block ..... pr. cwt.	6 6 0		2½
„ Bar..... „	6 7 0		„
Foreign, Banca ..... „	6 15 6		nett
„ Straits..... „	6 13 6		„
TINPLATES, Charcoal, I.C. .. pr. box	1 12 0 „	1 14 0	3
Coke, I.C. ..... „	1 6 0 „	1 7 0	„
LEAD, Pig, English ..... pr. ton	22 15 0 „	23 5 0	2½
„ Spanish ..... „	22 5 0 „	22 10 0	„
Sheet ..... „	23 5 0 „	23 10 0	„
SPELTER, on the spot ..... pr. ton	22 7 6 „	22 10 0	nett
for arrival..... „	22 7 6		„
ZINC, English, Sheet ..... „	28 0 0 „	30 0 0	1½
QUICKSILVER ..... per btl.	7 0 0		1½

REMARKS.—Iron: Rails are firm, very much owing to the demand for Indian railroads, for which tenders to the extent of 11,000 tons are invited. Merchant Bars are easier, and manufactured Iron is altogether quiet. Scotch Pigs have receded to 51s. 6d. cash. Copper is very quiet; foreign manufactured is lower in price than the fixed prices of English according to the relative value. Tinplates are rather higher. Spelter is a shade easier. Business in Metals very limited.

LAWRIE AND HAGGER, Metal Brokers.
33 Lombard-street, E.C.

IRON AND OTHER METALS.

[FROM OUR OWN CORRESPONDENT.]

The Iron Trade generally—Cleveland and South Wales Districts—Yorkshire and Staffordshire—United States, Continental, East India Demand; more Rails required for India—Glasgow Pig Iron Market—On Change at Birmingham and Wolverhampton; Influence of the Dissolution upon Trade—Hardware and General Trades of Birmingham, Wolverhampton, and District—The Far-famed Soho Works and what is being done There—The Sheffield Trade.

THE iron trade remains very quiet in most of the different districts, districts where railway work is turned out in the largest quantity having the most to do. The houses that have laid themselves out for this department of the trade in the South Wales and the Cleveland beds are therefore well employed.

Indeed, less cannot be said of the works of repute in Yorkshire and Staffordshire, whose products are in so high repute the world over for their adaptability to the machinist and the civil engineer.

The United States orders in the week have been few of no great value. The Continent of course is not much in the market. India is the best customer at present. The demands for that dependency are many and of great worth, calling into activity for a time some of the best machinists, and tending to the prosperity of certain of the iron works first adverted to. On Wednesday the East India Railway Company were in the market for 11,000 tons more of rails with the accompanying requirements in the shape of plates, screws, and the like. A favourable illustration of the demand of that market for machinery will be found in our remarks upon the trade of Birmingham.

At Glasgow on Tuesday nothing is reported to have been doing. The quantity of iron shipped in the week was shown to be 13,331 tons against 15,300 tons in the corresponding week last year. The rates realised were, for No. 1, 52s. to 52s. 3d.; mixed No.'s, warrants, 52s. to 52s. 4d.; ditto, makers' iron, 52s. to 52s. 3d.; No. 3, 52s. to 52s. 3d.

Respecting the South Staffordshire trade, we have to report that only little business was transacted to-day (Thursday) in Birmingham, or yesterday (Wednesday) at Wolverhampton, nor had matters improved in the week upon the state of things reported by us in our last. The talk was more upon election business than upon business, with regrets that all hope of an improved state of things must now be abandoned for weeks to come. The dissolution will seriously affect the iron trade, and the step which Government has taken has, therefore, been condemned by masters who are unable to foresee any political benefit from the dissolution at all commensurate with the injurious effects which will follow its dislocation of trade. The first quarterly meeting, which will be held next Wednesday in Wolverhampton, is not looked forward to with any expectation that the haze which hung over the preliminary meeting, will give place to other than increased uncertainty as to the trade prospects of the ensuing three months, both foreign and also home politics having so unsettled an aspect. By some, alarm is now beginning to be felt and expressed in regard to the immediate future of the Continent. All these causes combined were too powerful for even weather of unexampled brilliancy to produce a cheerfulness at Wolverhampton and Birmingham that could affect any tangible good upon orders or prices. These latter for manufactured iron are maintained in the new transactions for the quarter entered into by first-class houses, for bars, £7 10s., hoops, £8 10s., and plates, £9 10s. To get orders, however, second-rate firms still consent to execute at prices considerably below this quotation. Pig iron is by no means scarce, and for samples not first-class terms continue to get a little easier.

The hardware and general trades of Birmingham, Wolverhampton, and the surrounding district are without much alteration from their condition last week. Of the two scarcely so many orders have been received in the past seven days as in the previous corresponding period.

The leading machine and casting firm of the district of Birmingham (the far-famed Soho) are very well off for orders. It is stated that such is the state of their books, that they have enough work in hand to afford employment to their numerous workpeople for the next two years. Among the orders now under execution, is one for machinery for the City of Dublin Company steamers, which are designed to attain a speed of from 21 to 22 miles an hour. Of so large dimensions is this machinery, that the two cylinders require each for their casting upwards of 30 tons of molten metal. The vessels are to be 2,000 tons burden. Messrs. Watt and Co. are also making a number of marine engines for English frigates and men-of-war. Among the miscellaneous machinery upon which this firm is now in active operation, are all the apparatus necessary to a mint, with steam engines of 100 horse to work it. The boilers of this engine, which will be of copper, will cost between £9,000 and £10,000. The whole is for export to Calcutta, for the use of the Mint there.

In Sheffield the country firms report things as flat. A few of the rolling mills are in full work, which would be more gratifying were it not so partial. The American advices are again spoken of as rather better, and though there is not a positive improvement in sales, the orders sent home being principally for stock, yet this betokens a more hopeful feeling, and shows that the prospects for the future are cheering. We hear there is a slight improvement in the continental orders, in spite of the uncertainty which still hangs over the future course of events.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

NORTHERN LIGHTHOUSES.—1. On Skerville, or the Iron Rock, a lighthouse tower, with dwelling-house, on the island of Jura. 2. On Stourhead, on western coast, county of Sutherland. 3. On the butt of the Lewis. Information at the office, 84 George-street, Edinburgh, up to April 16, when tenders.

RAILS, CHAIRS, &c., *East India Company.*—11,000 tons of rails, 100 tons of bolts and nuts, 3,000 tons of chairs, 300,000 keys, 225 tons of twisted spikes, 600 tons of fishing plates. Specifications and forms of tender, Company's offices. Tenders to Secretary, April 19.

CREOSOTED TIMBER, BOLTS, &c., *East India Railway Company.*—100,000 cubic feet of creosoted timber for girders, and 100 tons of bolts, nuts, &c. Specifications, forms, and delivery of tenders, as next above.

COPPER, *Navy.*—100 tons of English tough cake for Chatham. Tenders, Somerset-place, 2 o'clock, April 12.

REBUILDING DEDDLESPOOL HALL, *near Betley, Staffordshire.*—Plans, &c., there; and further information of the architect, Mr. T. Bower, jun., Town-hall, Nantwich, to whom tenders, April 11.

POLICE LODGE, CLOCK TOWER, AND DRINKING FOUNTAIN, *Nottingham.*—On the Recreation Ground. Drawings, &c., town clerk; and of Mr. Edwards, architect, 4 St. James's terrace, Camden Town, April 12.

SEWER WORKS, TUNNELLING, &c., *Blackburn.*—Execution of portions of main outlet sewer, consisting of about 500 lineal yards of sewer, 6 feet by 20 feet, together with branch sewers, &c., connected therewith. Plans, &c., Mr. Brierley, Borough Surveyer. Tenders to Town Clerk, April 30.

SEWERAGE AND DRAINAGE WORKS, *Stoke-upon-Trent.*—The making and fixing of pumps and connections, the supply of iron tank, the providing, laying, and fixing water pipes and cocks: construction of sewerage reservoirs, the supply of stoneware glazed pipes, laying down a system of complete drainage and alteration of privies, at the workhouse of the above parish. Plans, &c., at the parish office. Tenders by ten forenoon, to the guardians, May 4.

BRIDGE ROADS AND DRAINS, *Salford.*—The Justices of the Peace for the county of Lancaster invite tenders for the keeping in repair for seven years the roads, footpaths and drains of the twenty-five bridges which the inhabitants of the hundred of Salford are liable to keep in repair. Particulars, Bridgemaster's office, 41 Dalton-street, Manchester, to which place tenders, May 9.

IRON ROOF, *Winchester.*—For the roofing in of the centre part of the Winchester Corn Exchange. Plans, &c., Mr. John Colson, architect, St. Swithen-street, Winchester, April 11. Tenders, C. Bailey, Esq., solicitor, Winchester, April 22.

WORKS AND REPAIRS, *Stations of the London District of the War Department.*—May 1, 1859, to March 31, 1862. London, Windsor, Hounslow, Hampton Court, Kneller Hall and Richmond; Croydon and Carshalton; Barnet, Halfield, and Uxbridge. Schedules, forms, &c., St. James-street, Buckingham-gate, April 16, War-office, Pall-mall.

SEWERS, *Chelsea.*—For about 480 feet run of brick sewer, &c., according to specification and drawing at office of vestry, Manor-house, 111 King's-road, Chelsea, where tenders by 3 o'clock, April 12.

CHURCH, *Newcastle-upon-Tyne.*—Clayton Memorial Church in the Cemetery Road. Tenders to Mr. Andrew M'Leod, Chairman of the Committee, 11 New Bridge-street, Newcastle, April 26. Plans, &c., Mr. Dobson, architect, Newcastle-upon-Tyne.

RESTORATION OF LANGTOFT CHURCH.—Plans, &c., Mr. E Browning, architect, Stamford, April 11. Tenders to Churchwardens, April 19.

CHURCH, *Cardiff.*—New church, parish of St. John's. Plans, &c., Messrs. Pritchard and Leddon, Llandaff; and 6 Whitehall, London. Tenders to same at Llandaff, April 23.

CHURCH, *Suffolk.*—Rebuilding parish church at Farnstead. Plans in school-room, April 11. Tenders to Rev. the Rector, April 23.

EPISCOPAL CHAPEL, *Lower Sydenham.*—Alterations, new chancel, &c. Plans, &c., Mr. Brown. Information and bills of quantity, Messrs. Poulton and Woodman, architects, Reading, to whom tenders April 15.

CHURCH, *Kirkby Woodhouse, Notts.*—Particulars, Messrs. Hine and Evans, architects, Nottingham.

CHURCH, *Larton, Notts.*—Rebuilding parish church. Plans, &c., Messrs. Hine and Evans, as above.

CHAPEL, *Diss.*—New Baptist chapel. Plans, &c., Crown Hotel, Diss, Norfolk. April 12.

CHAPEL AND SCHOOL-ROOMS, *Burley Lawn, Leeds.*—Drawings, &c., Mr. Geo. Smith, surveyor and architect. April 13.

RECTORY HOUSE, *Uppingham, Rutland.*—Alterations, &c. Plans and bill of quantities, Mr. E. Flaw, architect, Northampton. April 16.

SCHOOLS, *Workington.*—The building of Workington Free Schools for 500 scholars, with residences for master and mistress. Plans, &c., Mr. Lamposts, to whom tenders, and further information of Mr. T. Nicholson, architect, Hereford. April 23.

CHURCH OF ENGLAND SCHOOLS.—*Workington.*—Plans, Mr. Charles Eagle-field, architect, Maryport. April 12.

CEMETERY, *Yorkshire.*—Burial ground at Handsworth Woodhouse, and also two chapels thereon. Plans, &c., Mr. S. F. Holmes, surveyor to Burial Board, 7 St. James's-row, Sheffield. April 11.

FIREPROOF MILL, *Hunslet, Yorkshire.*—Erection of a fireproof mill. Plans, &c., Mr. Shaw, 2 Belgrave-square, Leeds, April 11. Tenders to 18th April.

COVERED MARKET, *Workington.*—Plans, &c., Mr. Boroman, Green Dragon Hotel, Workington. Information, Mr. Charles Eaglefield, architect, Maryport. April 12.

ALTERATION TO RESIDENCES, *King's Newton, near Derby.* Alterations and additions. Plans, &c., Mr. B. Wilson, architect, Alpeton, and Mr. Jos. Beresford, King's Newton. April 25.

HOUSES, *Hartlepool.*—Dockmaster's and deputy-dockmaster's house for the North Eastern Railway Company. Plans, Mr. T. Prosser, architect, Central Station, Newcastle-on-Tyne. Tenders to Mr. J. Cleghorn, secretary, York, April 13.

RAG STONE, *Gravesend to Sheerness.*—For supplying the above according to specification. The contracts to be for such time and as shall be mentioned by the justices. Tenders, April 27.

VALUATION AND PARTIAL SURVEY, *Holywell.*—Parish of Holywell for the purpose of the parochial assessment. Tenders to Mr. W. Macintosh, clerk of Union, April 20.

SURVEYOR, *Longton.*—Whole time, salary, £150. The duties may be known from W. Webberley, Chief Bailiff, Longton, Staffordshire.

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1½	,, ,,	0	5	— 0 6	4	,, ,,	3	0	— 3 4	3½	,, ,,	2	4	— 2 9
2	,, ,,	0	7	— 0 8	5	,, ,,	3	9	— 4 1	4	,, ,,	2	10	— 3 2
2½	,, ,,	0	9	— 0 10	6	,, ,,	4	6	— 4 10	4½	,, ,,	3	0	— 3 3
3	,, ,,	1	0	— 1 2	7	,, ,,	5	4	— 5 10	5	,, ,,	3	4	— 3 8
4	,, ,,	1	6	— 1 8	8	,, ,,	6	6	— 7 0	5½	,, ,,	3	6	— 3 9
5	,, ,,	1	10	— 2 1	9	,, ,,	7	6	— 8 0	6	,, ,,	3	9	— 4 3
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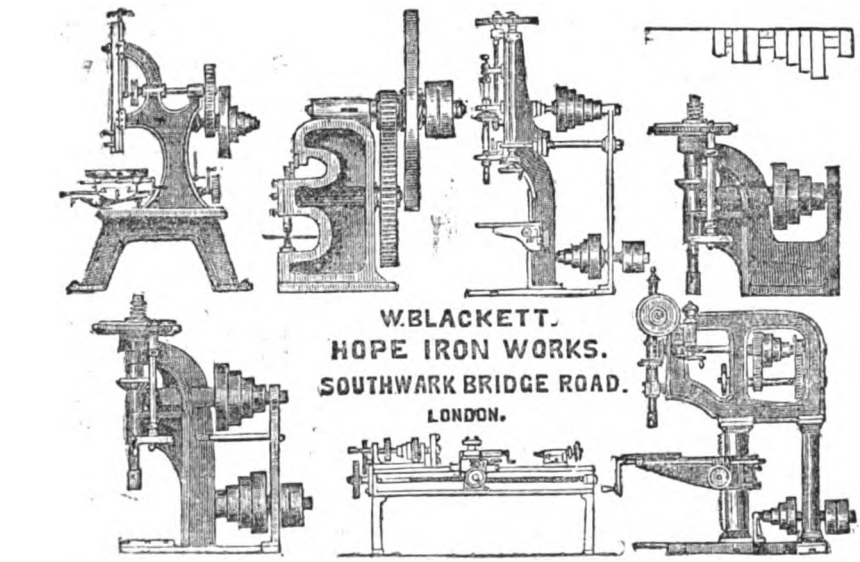

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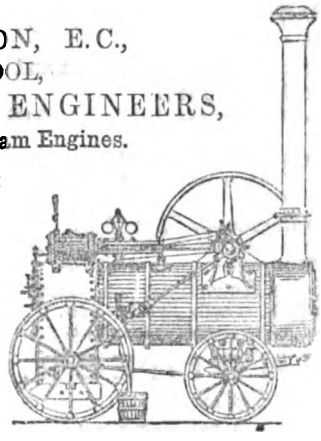

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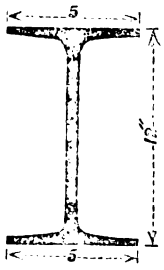

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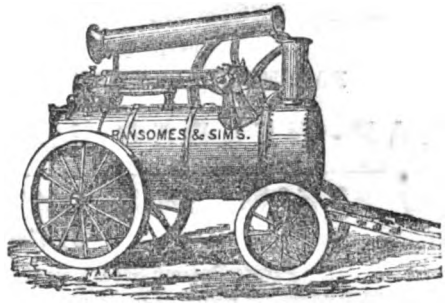

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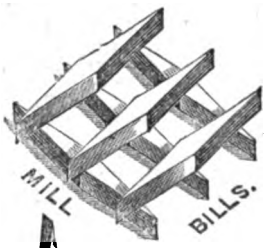

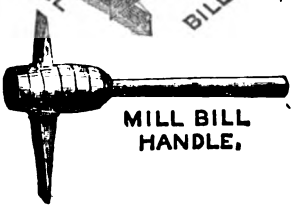

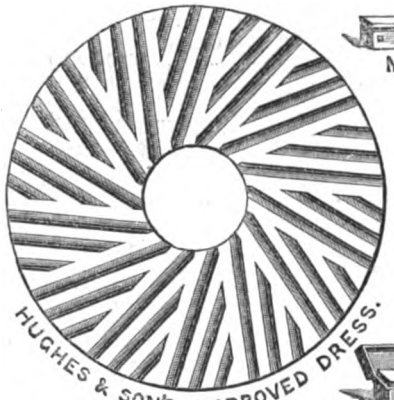

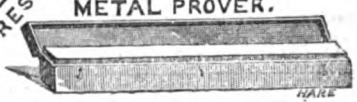

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Published by RICHARD ARCHIBALD BROOMAN, at the MECHANICS' MAGAZINE Office, 166 Fleet-street, in the Parish of St. Dunstan's-in-the-West, in the County of Middlesex; and printed by JAMES JUDD, of 14 Holford-square, Pentonville, in the County of Middlesex, and HENRY ALEXANDER GLASS, at their Office, 28A New Bridge-street, in the Parish of St Anne's Blackfriars, in the City of London—Friday, April 8 1859.

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AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 16. [NEW SERIES.]

LONDON: FRIDAY EVENING, APRIL 15, 1859.

PRICE, FOURPENCE. BY POST 5d.

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The Board do not bind themselves to accept the lowest, or any tender, and the party whose tender shall be accepted, will be required to provide two approved sureties for the due performance of the work.

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COTTON GINS.

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TO COTTON GIN MAKERS, MACHINISTS, AND INVENTORS.

THE Committee of the Cotton Supply Association have received from the Bombay Chamber of Commerce two Indian Churkas, or Hand-roller Gins of native construction, and such as are now used by the natives of India, with the request that they should be submitted to the Machinists of this country, with a view to obtaining, if possible, a superior machine. Your attention is therefore respectfully requested to the construction of this "Churka," which may be seen at the offices of this Association. The objects to be aimed at in the making of an improved machine, are—

1. That the machine do no injury to the cotton, in the process of separating the seed from the fibre. It is said that "no machine can possibly separate the cotton from the seeds with less injury to the staple than does the Churka."
2. That the machine, as far as possible, do rid the cotton from leaf and impurities.
3. That the machine be of simple construction, and durable.
4. That the machine be easily repaired by the native Indian.
5. That it be portable.
6. That the cost be as low as possible. The "Churka" costs only two rupees, or 4s. It is necessary that the improved machine should be within the ability of the natives to purchase.
7. That the machine be able to do its work faithfully, in spite of carelessness or neglect.
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The Committee submit the above conditions to the consideration of Machine Makers, and Mr. Haywood, the Secretary of this Association, will be prepared to afford any further information that may be required.

It is proposed, in furtherance of the wishes of the Bombay Chamber of Commerce, to hold a trial of the merits of the different Gins that may be constructed to meet the above conditions, in two or three months from this date. Due notice of the day of trial will be given.

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G. R. HAYWOOD,
Secretary of the Cotton Supply Association.

1 Newall's Buildings, Manchester,
March 25th, 1859. (196)

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FOR SALE, a Self-acting Slide LATHE, 11-inch Centres, and Bed 12 feet long, complete; and TWO PORTABLE PUNCHING and CUTTING MACHINES, one suitable for ½-inch plates, and the other for ¾-inch plates, both adapted for steam or hand power.

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The Company possess Five Patents relating to this Frictional System, including (in addition to their Bevel and Mitre Wheels) a System of Disc Clutches and Clutch Movements, Wheel Clutching, Reversing, Differential, Speed Ring, Varying Speed, and Break Movements, and of Shafting, Pillow Blocks, Shafting Hangers, &c.

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HUGHES AND SONS,

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SUPERIOR LEATHER MILL BANDS,

WELL STRETCHED AND PURE OAK BARK TANNED.

SINGLE BANDS.				DOUBLE BANDS.				EDGE BANDS.			
		s. d.	s. d.			s. d.	s. d.			s. d.	s. d.
1 inch,	per foot,	0 3	to 0 4	3 inch.,	per foot	2 2	to 2 6	3 inch.,	per foot,	2 0	to 2 2
1½	,, ,,	0 5	— 0 6	4	,, ,,	3 0	— 3 4	3½	,, ,,	2 4	— 2 9
2	,, ,,	0 7	— 0 8	5	,, ,,	3 9	— 4 1	4	,, ,,	2 10	— 3 2
2½	,, ,,	0 9	— 0 10	6	,, ,,	4 6	— 4 10	4½	,, ,,	3 0	— 3 3
3	,, ,,	1 0	— 1 2	7	,, ,,	5 4	— 5 10	5	,, ,,	3 4	— 3 8
4	,, ,,	1 6	— 1 8	8	,, ,,	6 6	— 7 0	5½	,, ,,	3 6	— 3 9
5	,, ,,	1 10	— 2 1	9	,, ,,	7 6	— 8 0	6	,, ,,	3 9	— 4 3
6	,, ,,	2 4	— 2 7	10	,, ,,	8 6	— 9 0	6½	,, ,,	4 1	— 4 4
7	,, ,,	2 10	— 3 2	,,	,, ,,	,, ,,	— ,, ,,	7	,, ,,	4 4	— 4 10
8	,, ,,	3 4	— 3 8	,,	,, ,,	,, ,,	— ,, ,,	8	,, ,,	4 6	— 5 6

N.B.—These Bands are celebrated for being well stitched and rivetted at joints, and being also of equal thickness throughout.

H. & SONS beg to call particular attention to their having always on hand a Large Assortment of Improved Screw-socket Rivets, varying in size, from ¼-inch upwards, for fastening Mill Bands, Elevator Cups, &c., also White and Brown Laces. (206)

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LEISTON WORKS, SAXMUNDHAM, SUFFOLK,

(ESTABLISHED A.D. 1778),

EARNESTLY solicit the continued support of their numerous Friends, Agriculturists, Shippers, and others; the additions made to their Works during the present year, in the erection of new sets of Workshops, fitted with the best mechanical appliances for producing Machinery of the most improved construction, expeditiously and economically, justifies their soliciting increased support, while their leading reputation as Inventors and Manufacturers of FIRST CLASS Agricultural Machinery, is a sufficient guarantee that every Machine supplied from Leiston Works will prove to the entire satisfaction of the purchaser.

R. G. & S. are now manufacturing the following Machines and Implements, which they guarantee to be thoroughly efficient in every respect:—

PORTABLE AND FIXED STEAM ENGINES. } From 4 to 40 Horse Power, suited for every kind of work
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MILLWRIGHTS' WORK of all kinds.
SAWING MACHINERY, from 4 to 20 Horse Power.
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IMPROVED SETS OF FARM MACHINERY, for Large Occupations.
PORTABLE AND FIXED MACHINERY, for Thrashing and Dressing Corn.
THE PRIZE BOLTING AND OPEN-DRUM HORSE-POWER THRASHING MACHINES.
CORN DRESSING MACHINES, for Hand, Horse, Water, and Steam Power.
BARLEY AVELLING MACHINES.
CHAFF CUTTERS, for Hand, Horse, Water, and Steam Power.
PATENT TURNIP CUTTING AND PULPING MACHINES.

THE PRIZE CORN AND SEED DRILLS.
PRIZE CORN AND SEED DRILLS WITH MANURE APPARATUS.
PRIZE SEED AND MANURE DRILLS.
LIQUID, SEED, AND MANURE DROP DRILLS.
CHAMBER'S PATENT BROADCAST MANURE DISTRIBUTOR.
GARRETT'S PATENT HORSE HOE for all Crops.
PATENT REVOLVING HOES for Root Crops.
IMPROVED PLOUGHS AND REAPING MACHINES.

&c. &c. &c.

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ADDRESS—R. GARRETT & SONS, LEISTON WORKS, SAXMUNDHAM, SUFFOLK. (161)

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PYRO-PNEUMATIC FIRE-LUMP WARMING AND VENTILATING STOVE GRATES,

WITH the cheerful, open fire, producing healthful warmth, with continuous Self-acting Ventilation, for Churches, Schools, Public Buildings, Banking Houses, &c. These Grates are manufactured solely by PIERCE, the Inventor, for which he received the Prize Medals of London in 1851, and of Paris in 1855.

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WITH ALL RECENT IMPROVEMENTS.

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ENORMOUS REDUCTION IN THE COST OF STEAM POWER.

TO RAILWAY COMPANIES, STEAM SHIP PROPRIETORS, AND MANUFACTURERS.—A saving of Fuel equal to one-third of the entire consumption is effected by the introduction of "DUNCAN'S PATENT SPIRAL HEAT DIFFUSERS," which arrest the heat in its passage through the flues or tubes, and convert into impelling power the large measure that without these appliances would (even in the very best boilers) escape along with the smoke. They can be fitted in an hour or two at a small cost, and without any alteration in the existing arrangements of boilers now in use. These results are prepared to be guaranteed, and a part of the value of fuel saved by the use of the Apparatus will be accepted for royalty.

Hitherto, steam navigation to distant parts of the world has proved a commercial failure. The remedy is provided, and the vast numbers of large and splendid vessels can soon be made valuable paying property.

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STEAM ENGINES FOR SALE.

PORTABLE STEAM ENGINES, from 6 to 12 horse power,
STATIONARY STEAM ENGINES, from 4 to 50 horse power,
TUBULAR BOILERS, from 4 to 50 horse power,
CORNISH BOILERS, from 4 to 50 horse power,

Are in hand, and can be despatched on eight days' notice. Prices moderate. Workmanship and Material of the best description.

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GLADSTONE & Co., CONTRACTORS and ENGINEERS.

2 John-Street, Minories, London, E.C.,

Are prepared to ESTIMATE FOR and CONSTRUCT BRIDGES, PIERS, JETTIES, &c., in Iron, Wood, or Stone. Also to supply Cranes, Girders, Turntables, and Railway Work and Plant generally. (199)

A VALUABLE PATENT to be DISPOSED OF.—The Patentee will either dispose of the Patent or grant Licences to any party wishing to manufacture, or would join a person with capital to carry out the Patent.

Address, A. Z., MECHANICS' MAGAZINE Office, 166 Fleet-street. (163)

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Just Published, Price 1s.

ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY, in respect to Dimensions, Form, Means of Propulsion, and Powers of Attack and Defence: together with a Letter on the Steam Navy of France. By Mr. E. J. Reed, late of Her Majesty's Dockyard, Portsmouth; one of the Editors of the Mechanics' Magazine. (Republished by permission of the Council of the Society of Arts.)

ROBERTSON, BROOMAN, AND CO., Mechanics' Magazine and Patent Offices, 166 Fleet-st., London. (159)

NEW MONTHLY PERIODICAL.

On the 30th inst. next will be Published, Price 6d., No. 1 of

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THE LITERARY RECORD will, in many respects, render a service hitherto unperformed by any Publication, as it will contain Articles of General Interest on Literature and Education, Analytical Notices of New Books, a complete Monthly Catalogue of New Publications, Indices of the principal Magazines and Reviews, a Classified Index of the *Times*, a Digest of the Literary, Scientific, and Educational History of the Month, and a great variety of other useful Information on Literature, Publishing, &c.

London: Kent & Co. (219)

Just Published, Crown 8vo, Cloth, Price 3s. 6d.

THE EARTH WE INHABIT: its Past, Present, and Probable Future. By Captain Alfred W. Drayson, R.A.

In this little book the Author brings forward extracts from the works of the most eminent Astronomers, Surveyors, and Geologists, both of the present time and of past years. These extracts uniformly prove that the Earth, in common with all objects upon its surface, is *continually increasing in volume*.

London: A. W. Bennett, 5 Bishopsgate Without. (229)

Third Edition. Price 1s. 6d., or on Black Rollers and Varnished, 3s. 6d.

A REDUCED ORDNANCE MAP of England and Wales, and the Southern Parts of Scotland; with all the Lighthouses, Sands, and Soundings round the Coast accurately laid down, and showing all the Railway and Mail Packet communications. By J. Cooper. Also, a MAP of the BRITISH ISLES, 5 ft. 6 in. by 5 ft., mounted on Mahogany Rollers and Varnished, price 30s. The same Map, on Black Rollers and Varnished, 25s.

Published by W. Everett and Son, 34 Bouverie Street, City, E.C. (179)

"The Story of our Lives from Year to Year."
Shakspeare.

On Saturday, the 30th April, 1859, will be published, Price Twopence, the First Number of

ALL THE YEAR ROUND. A Weekly Journal, Designed for the Instruction and Entertainment of all Classes of Readers, and to assist in the Discussion of the Social Questions of the Day. Conducted by CHARLES DICKENS.

Published also in Monthly Parts and in Half-Yearly Volumes, at the Office, 11 Wellington Street North, Strand, W.C.: also by Chapman & Hall, 193 Piccadilly, London, W.

On Saturday, 28th May, 1859, Mr. Charles Dickens will CEASE TO CONDUCT HOUSEHOLD WORDS; that Periodical will be DISCONTINUED by him; and its partnership of Proprietors dissolved. (189)

"The Story of our Lives from Year to Year."
Shakspeare.

The First Number, Price Twopence, of the New Weekly Journal,

ALL THE YEAR ROUND, will contain the First Part of a New Story, entitled,
A TALE OF TWO CITIES;
By CHARLES DICKENS.
To be continued from week to week until completed. (190)

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MESSRS. BOOTH & CO., AUCTIONEERS and BUILDERS' SALESMEN, having opened Registers for Public and Private Sales of all kinds of JOB LOTS, Surplus Stock, Stores, Tools, Implements, &c., &c., (either Old or New,) beg to call the attention of all parties to the only medium established of the kind, and to state that they are prepared to receive consignments of any weight, bulk, or value, and of any class of Goods for immediate Sale. Full particulars may be had for two stamps, at the BUILDING TRADES REGISTRY OFFICES, (established 1857,) 13 EASTCHEAP, LONDON, E.C. The Public Sales by Auction are held Weekly, on Every Tuesday, at One o'Clock, and for the present at the BUILDERS' SALE GROUNDS, (established 1858,) 23 and 24 MARYLEBONE ROAD, REGENT'S PARK, W. Catalogues by Post for One Stamp. Advances on New Goods. All communications are held private and confidential. (204)

STEAM ENGINES.

FOR SALE, a superior HIGH PRESSURE HORIZONTAL STEAM ENGINE of 6-horse power, 8-inch cylinder, and 1-foot 6-inch stroke. One of 8-horse power, 10-inch cylinder, and 1-foot 6-inch stroke. One of 10-horse power, 12-inch cylinder, and 2-feet stroke. Two of 14-horse power, 14-inch cylinders, and 2-feet stroke; and one of 30-horse power, 20-in. cylinder, and 3-ft. stroke.

Apply to Messrs. PAGE and CAMERON, 64 Old Broad Street, E. C., London. (124)

THE IMPERIAL IRON TUBE COMPANY,
(SUCCESSORS TO GEORGE B. LLOYD & CO.)
GAS STREET AND BERKLEY STREET,
BIRMINGHAM,
Manufacturers of Wrought Iron Tubes & Fittings,
FOR GAS, STEAM, AND WATER.
PATENT GLASS ENAMELLED AND GALVANIZED TUBES,
AND
LAP-WELDED IRON BOILER TUBES. (193)

TO STEAM SHIP OWNERS, ENGINEERS, AND OTHERS.

How's Patent Steam Engine Counters, can be read at sight.

These Counters register the number of revolutions made by an engine or other mechanism. They may be used for ascertaining the duty of Pumping Engines and Water-wheels; the revolutions on board a steam-vessel; to calculate the slip of the propeller; and in a locomotive to test the slip of the wheels.

How's Patent Salinometer, for Steam Boilers using Salt Water.

By these, the density of the water in the Boiler is at all times accurately shown, and a saving of boiler and fuel is effected. They are adopted by the Admiralty, the Honorable Trinity Corporation, and others. Copies of Testimonials from Messrs. Penn, Messrs. Maudslay, and others, will be forwarded on application.

How's Engine-Room Telegraph, for communicating between Captain and Engineer.
Society of Arts Prize Medal, 1855.

is a Mechanical Telegraph, and by its peculiar construction, error or misunderstanding is rendered impossible. It now extensively adopted, and gives great satisfaction.

How's Patent Fresh Water Apparatus for Ships' Use.

This apparatus is designed for the distillation of Fresh from Salt Water; and on long voyages, and where the supply of water is scanty, it will be found invaluable. Testimonials may be seen.

Patent Steam Pump and Fire-Engine for Ships' Use.

This Steam-pump occupies but a small space; works perfectly noiselessly, and throws an immense volume of water. An Illustrated Circular of Fresh Water Apparatus and Steam-pump combined, free on application.

How's Patent Machine for Cutting Bolts, Rods, Spindles, Wire, &c.

Simple in construction, inexpensive, occupies but little space, and will not easily get out of order.

A Pamphlet Illustrative of the above, sent free by post, on application to

A. P. HOW, ENGINEER,
81 MARK LANE, LONDON.
EVERY DESCRIPTION OF ENGINEERS' TOOLS, ENGINE ROOM STORES, &c., &c., SUPPLIED. (59)

WATER POISONED BY LEADEN PIPES.

"The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight. The water has cut these deep pits almost through the pipe, and not only upon the portion which we have illustrated, but has formed similar chasms throughout the entire length."—*Expositor.*

Poisoned Water Preventable.

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

From Dr. MURRAY, Hull.

"It is impossible to conceive of anything more injurious, or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha. Nothing can be better. I have also recommended it to others, who have adopted the expedient.

Resistance for Frost.

The Gutta Percha Company have been favoured with the following Letters in reference to the non-conducting properties of Gutta Percha Tubing, in the resistance of Frost.

From J. ARMSTRONG, Esq., M.D., Gravesend.

"My private house, which was supplied with your Gutta Percha Tubing some five or six years ago, has never required the slightest attention; and previously, there was no winter passed that we were not deluged in consequence of the bursting of the leaden pipes."

From HENRY BROWN and SONS, Western Works, 108 Rockingham-street, Sheffield.

"We have now a positive proof of the frost-resisting properties of the Gutta Percha Piping. On our premises we have a leaden Pipe and a Gutta Percha one lying side by side. The leaden one has been completely frozen up at least ten days, and the Gutta Percha one is still unaffected.

Every Variety for Gutta Percha Articles

SUCH AS

Mill-bands,
Tubing for Watering Gardens, &c., &c.,
Soles,
Sheet,
Pump-buckets,
Fire-buckets,
Bottles,
Bosses,
Union-joints,
Flasks,
Bowls,
Chamber-vessels,
Galvanic Batteries,
Toilet-trays,
Sponge-bags,
Curtain-rings,
Talbotype-trays,
Photographic Baths, &c., &c.

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GUTTA PERCHA COMPANY,

And Sold by their

WHOLESALE DEALERS IN TOWN AND COUNTRY,

Submarine and Subterranean Telegraph Wires Insulated with Gutta Percha.

The Gutta Percha Company, Patentees,

18 WHARF-ROAD, CITY-ROAD, LONDON. (51)

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PRICES CURRENT OF METALS,
London, 15th April, 1859.

		£ s. d.		£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N. of England	pr. ton	6 5 0	to 6 10 0		nett
Welsh Bars, in Wales	„	6 0 0	„ 6 2 6		3
Staf. Bars at the Works	„	7 0 0	„ 7 10 0		2½
„ Hoops	„	8 0 0	„ 8 10 0		„
„ Sheets, Singles	„	8 15 0	„ 9 0 0		„
„ Nail Rods	„	7 0 0	„ 7 10 0		„
„ Boiler Plates	„	8 10 0	„ 9 0 0		„
Scotch Pig, M.-Nos. Warrants, at Glasgow	„	2 11 6		2 12 0	nett
Do. No. 1, Good Brands	„	2 11 0	„ 2 13 0		„
Scotch Bars	„	7 5 0	„ 8 0 0		3
Swedish Bars, in London	„	13 10 0	„ 15 0 0		2½
COPPER, Sheet and Sheathing	per lb.	0 1 0½			3
Tough Cake and Tile	„ ton	112 10 0			„
Best Selected	„	115 10 0			„
Australian	„	112 0 0	„ 113 0 0		„
South American	„	104 0 0			„
Yellow Metal Sheathing	per lb.	0 0 10½			„
STEEL, Swedish Keg	pr. ton	20 0 0			2½
„ Faggot	„				„
TIN, English, Block	pr. cwt.	6 9 0			2½
„ Bar	„	6 10 0			„
Foreign, Banca	„	6 16 0			nett
„ Straits	„	6 13 0	„ 6 14 0		„
TINPLATES, Charcoal, I.C.	pr. box	1 13 0	„ 1 14 6		5
Coke, I.C.	„	1 6 6	„ 1 7 6		„
LEAD, Pig, English	pr. ton	22 15 0	„ 23 5 0		2½
„ Spanish	„	22 5 0	„ 22 10 0		„
Sheet	„	23 5 0	„ 23 10 0		„
SPELTER, on the spot	pr. ton	22 10 0	„ 22 12 6		nett
for arrival	„	22 10 0			„
ZINC, English, Sheet	„	30 0 0			1½
QUICKSILVER	per btl.	7 0 0			11

REMARKS.—Iron: The Market is quiet; in Scotch Pigs a considerable business has been done, but at a shade lower prices. Copper is quiet. Tin: English has been advanced £3 per ton on common and £4 on refined. Spelter is rather firmer and inclined to advance.

LAWRIE AND HAGGER, Metal Brokers.
33 Lombard-street, E.C.

IRON AND OTHER METALS.

[FROM OUR OWN CORRESPONDENT.]

Iron Trade of the Country: by what affected—South Staffordshire Quarterly Meeting: very quiet: Prices—North Staffordshire Iron Trade: Preliminary Meeting—Additional Blast Furnaces in South Staffordshire—Monmouthshire and South Wales—Derby, York, and Lancaster—Whitby District and the Coasting Trade—Glasgow Market—The Iron Trade of Ireland; Attempt to Revive it—Birmingham, Wolverhampton, and Sheffield Hardwares—Metal Market.

THE iron trade of the country has not experienced a week of prosperity. In every district the lowering of the political horizon is exercising an unfavourable influence, which becomes increasingly perceptible.

The first current quarterly meeting of the South Staffordshire Ironmasters' Association was held on Wednesday in Wolverhampton, and the second yesterday (Thursday) in Birmingham. At neither was there any perceptible movement; nor was the attendance scarcely so influential and numerous as is usual on such occasions. There were merchants present from London and Liverpool, and the north; but the orders given out by them were not so many as were received from the same firms last quarter. In fact, many of the orders which were booked at the last-named period are yet wanting their specifications. Consumers, whose necessities are not immediate, expressed their determination to abide the development of the preliminaries recently initiated in regard to continental and home politics. The existing uncertainty in relation to the course which the former of these in particular will take, was referred to on every hand, as the chief cause of the quietude so perceptible, as well in Birmingnam as in Wolverhampton. Whilst, however, very little business was done, there was no feeling of despondency, it being the general conviction that if customers delayed purchasing at once, so low were their stocks, that they must soon be in the market, and that if the Italian difficulty should issue in a Continental war, and England become embroiled, the consequent retarding of the progress of home improvements would be in a measure compensated by the requirements of a state of war. The prices recommended by the preliminary meeting were adopted for manufacturing iron, but the little pig iron sold went at 1s. 3d. under the prices obtained a fortnight ago.

Additional blast furnaces are shortly to be put up in South Staffordshire. Messrs. Round, colliery proprietors of Tividale, are about to erect two; and Messrs. Dawes, of the Bromford Lane works, near West Bromwich, have a similar intention.

On Thursday the quarterly meeting of the North Staffordshire Coal and Ironmaster's Association was held at the Railway Hotel, Stoke-upon-Trent; the president, Robert Heath, Esq., in the chair. Masters were not loud in their complaints of the present state of trade; but shrugged their shoulders when the future came to be referred to. The meeting was an influential one, and the wages question was fully entered into—the present demand for increased rate—which the Association are determined to resist.

From Monmouthshire and South Wales our advices are of an improved description. There is more being done throughout that extensive district at the various ironworks than for any previous part of the year. Some of the houses have good continental orders on hand.

In the district of Derby, York, and Lancaster, underselling is complained of by the first-class works; who nevertheless are tolerably active for finished iron of almost every description. The demand for pig-iron is said to be otherwise than slack, with prices firm.

In the Whitby district we learn that the iron trade is being pushed forward with extra vigour. Messrs. Palmer and Co., of Port Mulgrave, for instance, having lately put furnaces in blast at the Jarrow Iron Works, Newcastle-on-Tyne, are especially marked in this respect. A new company denominated the Albert Iron and Cement Works, succeed at Wreckbills, that called the Victoria Iron and Cement Works, which has been wound up. The new company propose to work their ore into stock till they can use it themselves. The new company intend to rebuild the two furnaces, whose foundations, when the property belonged to the Victoria, gave way a twelvemonth ago. The weather in the past winter has been remarkably favourable to the shipping transactions of the works situated along the beach.

In Glasgow, on Tuesday, No. 1 realised from 51s. to 51s. 3d. Market drooping. Shipped this week, 13,629 tons; corresponding week last year, 10,319 tons.

An attempt is being made to revive the iron trade of Ireland by the formation of a joint-stock company, who propose to manufacture with peculiarly prepared peat, which is said to possess all the advantages of both coal and charcoal, without the disadvantages of either.

In Birmingham things are clouded. The orders for general goods have seriously fallen off during the past week.

In Wolverhampton there seems rather to be a slight improvement in the hardware trade generally. There the foreign orders are tolerably good.

Respecting the trade of Sheffield, we may say that with the Continental question still unsettled, and a general election pending it cannot be expected that any improvement has taken place. As compared with January, the exports, under the head of hardwares and cutlery, show a slight diminution. Of the metal market it may be said that spelter continues to display an upward tendency. The market is insufficiently supplied.

Judging from the quantity of tin at present in the market, and from the quantity that is expected to be available at the next July, the direction of that metal also is upward. The next sale takes place in June, and the utmost quantity expected to be offered is 150,000 tons.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

RAILWAY WORKS, *Maryport and Carlisle Railway.*—Station house, dwelling house, and head offices at Maryport. Plans, Company's offices, Maryport. Tenders April 22.

RAILWAY WAGGONS, as above.—Forty coal waggons after a pattern, to be seen at Maryport. Tenders, April 22.

SEWERS, *Islington.*—For the construction of 320 feet of sewer, 3 feet 9 inches high by 2 feet 6 inches wide, Seven Sister's-road. Forms of tender, &c., at Vestry Office. Tenders, April 27.

MAIN DRAINAGE OF THE METROPOLIS.—Main brick sewers, 9 miles 2,940 feet in length, and other works in connection therewith from Deptford Creek to High-street, Clapham. Also a branch to extend from Broadway, Deptford, to junction of Effra Sewer at Dulwich and Norwood, and for the maintenance of such works in complete repair for twelve calendar months. Parties desirous to submit tenders may, upon payment of £3, obtain plans, sections, specifications, form of tender, and other particulars on application at the office of the Metropolitan Board of Works, No. 1 Greek-street, Soho, where tenders before 4 o'clock, May 19.

SEWERAGE WORKS, *Preston.*—For laying 2,250 yards of pipe sewers from 9 to 18 inches in diameter. Plans, &c., at the office of local board, 16 Church-street, Preston. Tenders to Mr. J. Newton, surveyor, the 20th inst.

WATERWORKS, *Dunbar.*—For a water wheel, gearing, pumps, &c., 3,500 yards of cast-iron pipes. Plans, &c., at Town Clerk's offices, Dunbar, or J. Leslie, Esq., C.E., George-street, Edinburgh.

CLEANSING HARBOUR, *Hull.*—Plans, Mr. D. Thorp, surveyor. Tenders to noon, April 25.

ROADS, *Great and Little Usworth and North Biddock.*—Finding material and keeping in repair for twelvemonths. Particulars of Mr. Snowdon, of Usworth. Tenders to Rev. T. Thackeray, Usworth, 20th April.

ROAD, *near Dorking, Surrey.*—Through Betchworth park. Plans, &c., Mr. Grantham, 7 Great Scotland-yard, London, S.W. Tenders, April 27.

CHURCH, *Greetland, near Halifax.*—Specifications, Messrs. Sowerby's warehouse, Upper George-yard, Halifax. Tenders to Rev. T. Snow, Greetland.

RESTORATION, *Reading.*—Abbey gateway, and fitting it for the purposes of a residence for the curator of public pleasure grounds and offices for their surveyor. Plans, &c., Mr. Marshall, 73 Oxford-street, Reading. Tenders to the mayor, April 19.

CONGREGATIONAL CHAPEL, *Bishop Stortford, Herts.*—Also a temporary building. Plans, &c., by the 25th, at vestry of present chapel, where tenders, May 4. Information and bills of quantities, Messrs. Poulton and Woodman, Reading.

NATIONAL SCHOOLS, *Andover.*—Plans, Star Hotel, Andover, or 30A Wimpole-street, London, W., from the 18th to the 28th. Tenders, Rev. H. M. White, Andover, May 2.

SCHOOLS, *Middlesbro', Yorkshire.*—And two teachers' residences. Plans, Mr. J. S. Peacock, town clerk; information, Mr. Norton, architect, 24 Old Bond-street, W., London. Tenders, April 23.

BATHS, *London.*—Time extended for receiving tenders for works at the bath in Orange Wharf, Leicester-square, to April 26. Forms, &c., Messrs. Balam and Lee, 10 Buckingham-street, Adelphi.

HOUSES, *Hipperholme.*—Two semi-detached villas. Plans, Mr. T. C. Hope, architect, 31 Kirkgate, Bradford, April 20.

HOUSES, *Edgware-road.*—Taking down and rebuilding No. 118 Edgware-road and No. 6 Harrow-road. Drawings on the premises to 19th inst. No date given.

OFFICES, *Bolton.*—For the *Bolton Chronicle*. Plans, &c., Messrs. Best, architects, 1 Acresfield, Bolton. Tenders, April 25.

COTTAGES, *Reigate.*—Twelve cottages for the Redhill and Reigate Cottage Improvement Society. Drawings, &c., Mr. E. Baxendell, 7 Beaufort-buildings, Strand, W.C., and P. Martin, Esq., Station-road, Redhill. Tenders to Mr. A. Ross, Gatton Park, Reigate. April 21.

ALTERATION, *Seaford, Sussex.*—Seaford House. Drawings, specifications, and gratuities, Mr. W. Habershorn, 38 Bloomsbury-square, London. Tenders, April 21.

GASOMETERS, *Rochdale.*—Re-sheeting two, each 40 feet diameter. Specifications, Mr. R. Bell, manager. Tenders to the Town Clerk, April 20.

LAMP-POSTS.—Construction of lamp-posts upon a novel principle. Abbot, Barton, and Co., advertisement contractors, 2 Upper Wellington-street, Strand.

WATERING THE TOWN OF GUILDFORD.—For three years. At what rate per day, not less than 80 days per year. Tenders to Mr. J. Hockley, Clerk to Commissioners, April 20.

BRICKMAKING, *Scotland.*—Making and burning 60,000 or 80,000 bricks at Dalbeattie, near Dumfries. Particulars, Mr. H. Maxwell, Terraughty, Dumfries.

COAL, *Navy.*—2,500 tons of Welsh for the Naval Yard, Haulbowline. Tender, April 19.

ROYAL NATIONAL LIFE-BOAT INSTITUTION.—The Committee of this Institution would call attention to the fact that 206 persons were saved from wrecks during the past year by the Society's Life-boats and those of other bodies; that it has now eighty-one life-boats under its management; that it has several more boats nearly ready to be sent to their stations; and that a large number of additional life-boats are wanted on the coasts. The constant demands on the limited funds of the Institution are, therefore, necessarily very heavy, and the Committee earnestly appeal to the public at large for assistance.

THOMAS BARING, Chairman.
THOMAS CHAPMAN, Deputy-Chairman.

April, 1859.

Contributions are received by all the Metropolitan and Country Bankers, and by the Secretary at the Institution, 14, John-street, Adelphi. (221)

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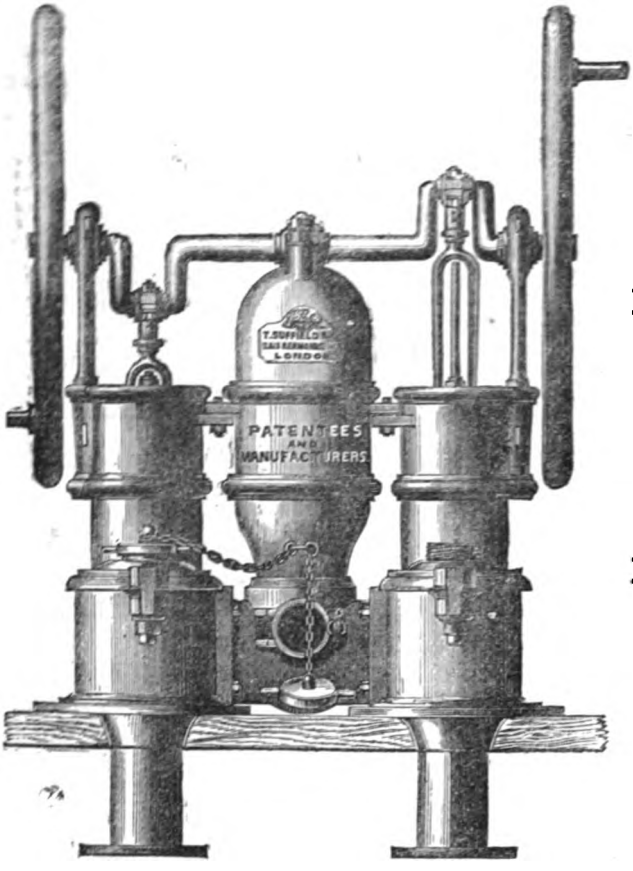

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Fire Engines,

Fixed and Portable.

WITH

Patent Valves

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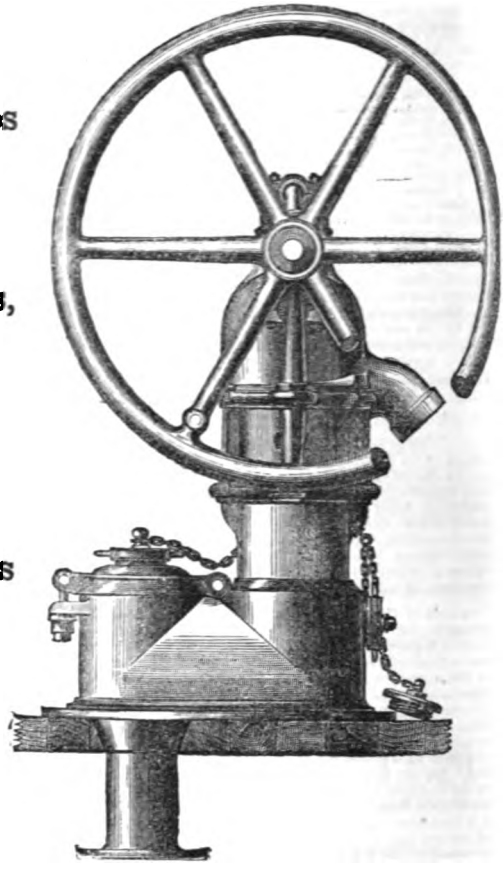
Improvements.



These Pumps are free from that liability to choke which is common to other Pumps, and their Working Parts are not susceptible of derangemen either from wear or from being long out of use. They pass entirely through them, with ease, any substance that may enter the Suction Pipes. The Novelties in these Pumps are their adaptation to the varied duties of Ships' Pumps; the facilities they afford for Cleansing the Suction Pipes, and for Sounding or Examining the Valves; the readiness with which they may be used for Ventilating the Bilge, or for acting as a Syphon either for Watering the Ship, or for extinguishing Accidental Fires on board; the rapidity with which they can be converted into Fire Pumps, or be applied to the Washing of Decks; and their capability of Pumping from Several Compartments.

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Windlass to Eight-horse Engine, with Patent Self-moving Anchor, Headland Ropes, Rope Porters, and all necessary Tools	£160 0 0
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Communications to be sent to the Patentee, J. SCOTT, 111 Drummond Street, Euston Square, London, N.W. (48)

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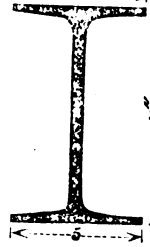

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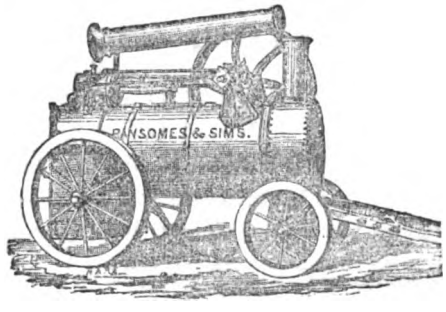

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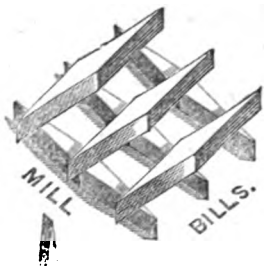

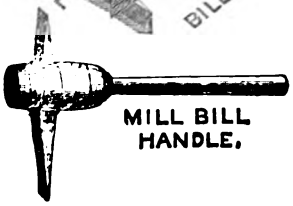

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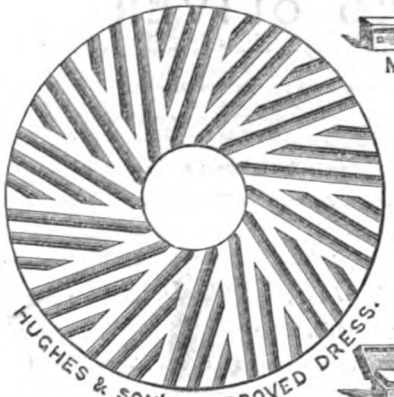

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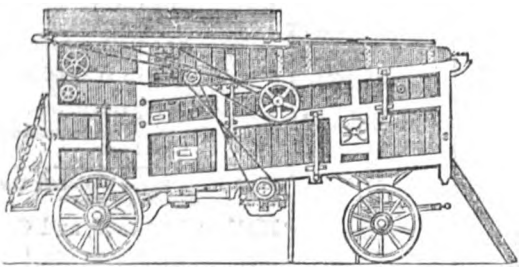

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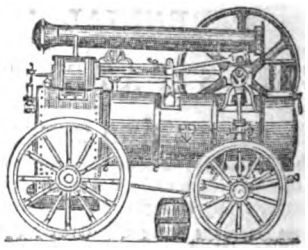

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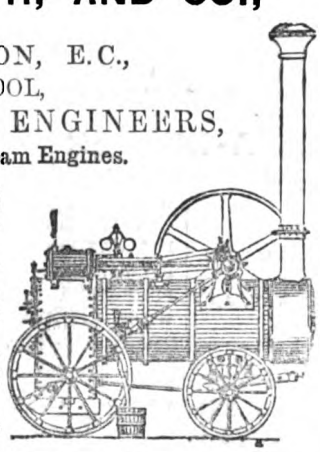

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 17. [NEW SERIES.]

LONDON: FRIDAY EVENING, APRIL 22, 1859.

PRICE, FOURPENCE. BY POST 5d.

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THOMAS BARING, Chairman.
THOMAS CHAPMAN, Deputy-Chairman.

April, 1859.

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THE COTTON SUPPLY ASSOCIATION.

COTTON GINS.

IMPROVEMENT UPON THE INDIAN CHURKA.

TO COTTON GIN MAKERS, MACHINISTS, AND INVENTORS.

THE Committee of the Cotton Supply Association have received from the Bombay Chamber of Commerce two Indian Churkas, or Hand-roller Gins of native construction, and such as are now used by the natives of India, with the request that they should be submitted to the Machinists of this country, with a view to obtaining, if possible, a superior machine. Your attention is therefore respectfully requested to the construction of this "Churka," which may be seen at the offices of this Association. The objects to be aimed at in the making of an improved machine, are—

1. That the machine do no injury to the cotton, in the process of separating the seed from the fibre. It is said that "no machine can possibly separate the cotton from the seeds with less injury to the staple than does the Churka."
2. That the machine, as far as possible, do rid the cotton from leaf and impurities.
3. That the machine be of simple construction, and durable.
4. That the machine be easily repaired by the native Indian.
5. That it be portable.
6. That the cost be as low as possible. The "Churka" costs only two rupees, or 4s. It is necessary that the improved machine should be within the ability of the natives to purchase.
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8. That the machine be able to clean a fair quantity of cotton per day, with the labour of one person (male or female).

The Committee submit the above conditions to the consideration of Machine Makers, and Mr. Haywood, the Secretary of this Association, will be prepared to afford any further information that may be required.

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Premiums of £20, £10, and £5 will be paid by the Association to the exhibitors of the Gins which rank 1st, 2nd, and 3rd in order of merit.

G. R. HAYWOOD,
Secretary of the Cotton Supply Association.
1 Newall's Buildings, Manchester,
March 25th, 1859. (196)

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2	,,	,,	0	7 — 0 8	5	,,	,,	3	9 — 4 1	4	,,	,,	2	10 — 3 2
2½	,,	,,	0	9 — 0 10	6	,,	,,	4	6 — 4 10	4½	,,	,,	3	0 — 3 3
3	,,	,,	1	0 — 1 2	7	,,	,,	5	4 — 5 10	5	,,	,,	3	4 — 3 8
4	,,	,,	1	6 — 1 8	8	,,	,,	6	6 — 7 0	5½	,,	,,	3	6 — 3 9
5	,,	,,	1	10 — 2 1	9	,,	,,	7	6 — 8 0	6	,,	,,	3	9 — 4 3
6	,,	,,	2	4 — 2 7	10	,,	,,	8	6 — 9 0	6½	,,	,,	4	1 — 4 4
7	,,	,,	2	10 — 3 2	,,	,,	,,	,,	,, — ,, ,,	7	,,	,,	4	4 — 4 10
8	,,	,,	3	4 — 3 8	,,	,,	,,	,,	,, — ,, ,,	8	,,	,,	4	6 — 5 6

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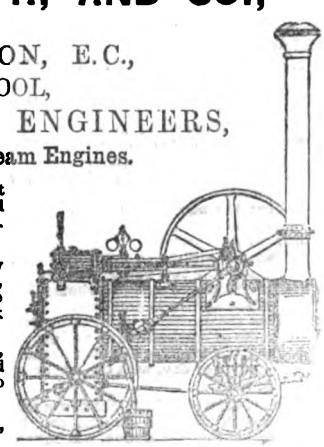

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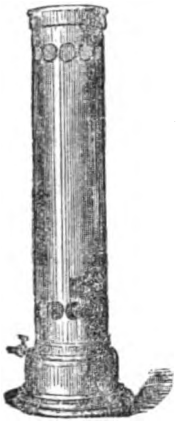

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PYRO-PNEUMATIC FIRE-LUMP WARMING AND VENTILATING STOVE GRATES,

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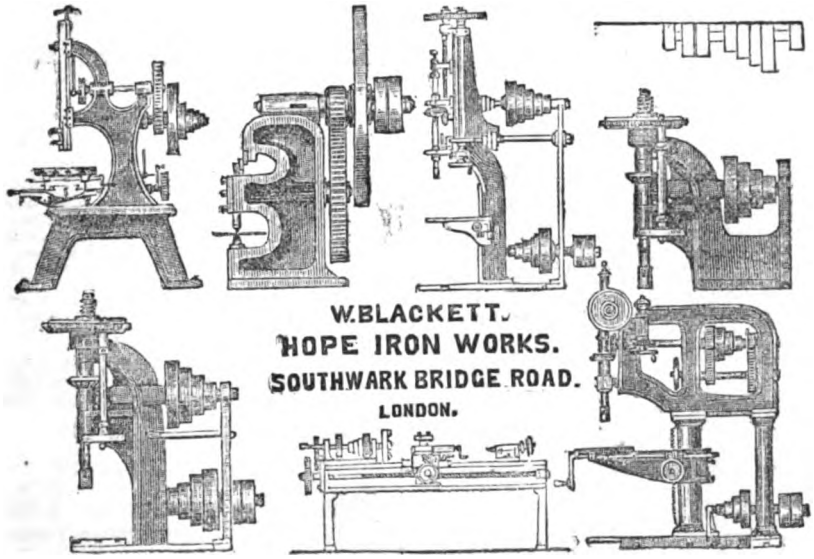

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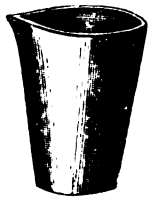

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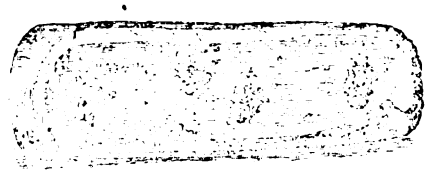

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NOTICE.

In consequence of the early publication which Good Friday has forced upon us, we have failed to secure our country correspondent's letter on the Metal Trades and the Prices Current of Metals in time to give them as usual.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

PAINTING, *North Eastern Railway.*—The stations on main line between York and Normanton and Newcastle and Gateshead. Particulars to Mr. Prosser, Central Station, Newcastle. Tenders, April 27.

COAL, *French Navy.*—3,000,000 kilogrammes, Newcastle. Particulars at office of Consul General, 36 King William-street, City. Tenders to the Maritime authorities at Toulon, May 2.

GAS COAL, OR NUTS, *Stafford.*—5,000 tons at Gasworks the next two years. Tenders, May 3.

PLANS FOR GASWORKS, *Scotland.*—The Aberlour Gas Light Company want plans, specifications, and estimates for the erection of gasworks in Charlestown. Information of Mr. C. Grant, Secretary of Company, schoolhouse of Aberlour. Tenders, May 2.

CANNEL, *Dukinfield Gas Company.*—Particulars, Mr. Dore, at the Works.

PUMPING ENGINES WANTED.—Of about 100 horse. Captain Ninness, Warston Cottage, Ashbourne, Derbyshire.

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CONSTRUCTION OF RAILWAY.—From Junction of Lancashire and Yorkshire Railway at Ashton-under-Lyne to Oldham. Plans, J. G. Blackburn, Esq., C.E., Oldham. Tenders to Mr. Ross, Secretary, to Guide Bridge Junction Railway, London-road Station, Manchester, April.

COAST GUARD STATION, *Freshwatergate, Isle of Wight.*—Drawings, &c., at coast guard watch room to 30th inst. Tenders to Admiralty Coast Guard Office, London, 2nd May.

GASWORKS, *Oughtibridge*—Machinery, gasholder, apparatus, mains, &c. Drawings and specifications, Mr. Cashin, C.E., 16, Branch-street, Sheffield. Tenders to Mr. G. Garside, Secretary, April 28

GASHOLDER, *Stone.*—Thirty feet in diameter, and 11 feet 3 inches deep, with columns, girders, &c. Tenders to J. Grundy, Secretary, April 30.

GASOMETER, *Sowerby.*—50 feet diameter and 12 feet deep for Sowerby bridge gas works. Specifications at the office. Tenders to the Gas Company till May 1.

MAIN SEWER, *Royal Victoria Hospital.*—Extension 350 yards. Drawings, &c., Royal Engineer Office, Netley; to which place tenders, May 9.

BRICK TANK, *Nottingham*, for the reception of gas-holder, 120 feet diameter. Drawings at Offices of Company on 18th April, and bills of quantities, a guinea. Tenders to 28th April, at Gas Offices, George-street, Nottingham.

SEWERS, *Blackburn.*—500 yards of brick sewer, 6 feet by 4 feet, 410 yards of which will be tunnelling with branch sewers and the like. Tenders, April 30, to Mr. Briercly, borough surveyor.

PAVING WORKS, *Manchester.*—In the district of the Bradford Local Board of Health. Sections, &c., at the office of said Local Board, Mill-lane, Bradford, where tenders, May 2.

CEMETERY, *Brightside Bierlow, Sheffield.*—Chapels, superintendent's house, lodge, &c. Plans, &c., Messrs. Flecton and Son, architects, East Parade, Sheffield, on April 25. Tenders, May 9.

NEW CONGREGATIONAL CHAPEL, *Brixton.*—Plans at Mr. C. Bates's, News-rooms, Crescent, Brixton, until April 23rd. Tenders to Rev. T. G. Potter Fairfield, Brixton, to April 27th.

RESEATING PARISH CHURCH, *Wyke Regis, near Weymouth, Dorsetshire.*—Plans at the Vestry-room. Tenders to Rev. H. Pigou, on 28th inst.

PARSONAGE HOUSE, *Whitley, Cheshire.*—Plans for alterations and additions at the Chetwode Arms, Whitley, from 29th to 30th April. Tenders to Mr. R. Jennings, architect, Atherstone, on May 3rd.

BLUE COAT SCHOOL, *Bath.*—Drawings till May 7th. Tenders to Messrs. Manners and Gill, architects, to May 7th.

FOREST HILL NATIONAL SCHOOL, *Sydenham.*—Drawings at office of architect, 9 Spring Gardens, London, S.W. Tenders to the same until May 2nd.

THE SAME WITH TEACHER'S HOUSE, *Lepton, near Huddersfield.*—Plans, &c., Red Lion Inn, Lepton. Tenders, April 27.

PAROCHIAL SCHOOLS, *Parish of Deane*, between *Bolton and Wigan.*—Plans, 32 St. Ann-street, Manchester. Tenders to April 27th.

RECTORY, *Catherington, near Horndean, Hants.*—Plans, &c., Ship and Bell, Horndean; and of Mr. C. E. Davis, 3 Westgate-buildings, Bath. April 28.

BANK, *Nottingham.*—Alterations to Messrs. Wright's Bank. Drawings, &c., and quantities, Mr. C. H. Edwards, 4, St. James's Terrace, Camden Town; and the Bank, Carlton Street, Nottingham. Tenders May 3.

HARBOUR OFFICE, *Swansea.*—Plans at the present harbour offices, and at Mr. R. Gribbles, architect, 22, Spencer Villas, Putney, May 4.

GAS LIGHTING, *London.*—Tenders at per lamp for three years from Midsummer day next, to the Guildhall, 10th May.

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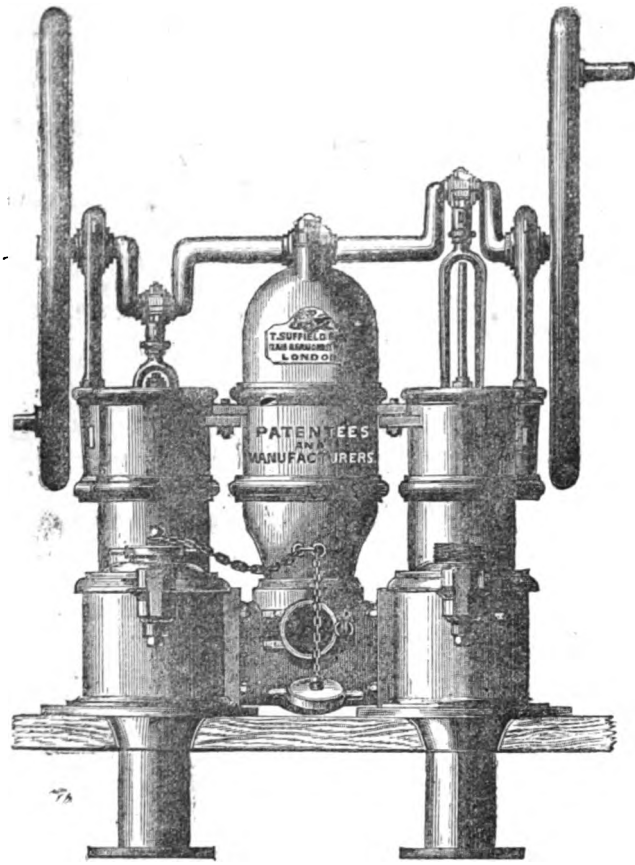

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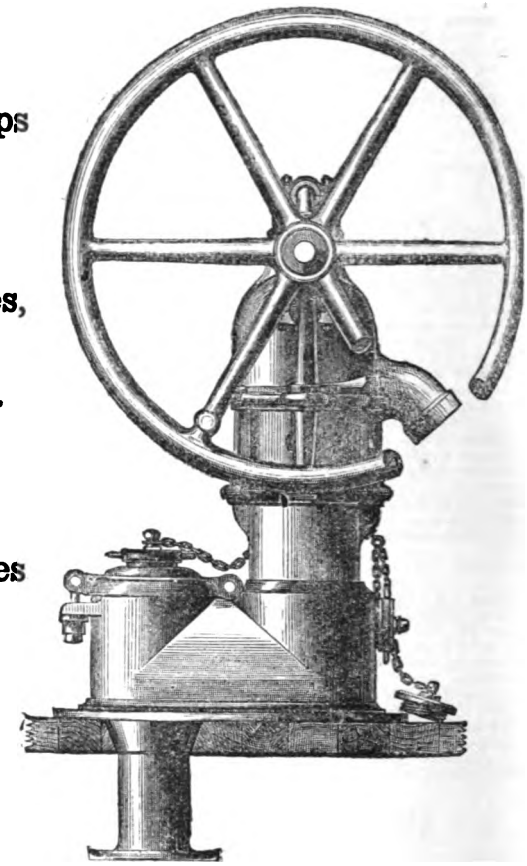

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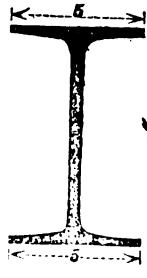

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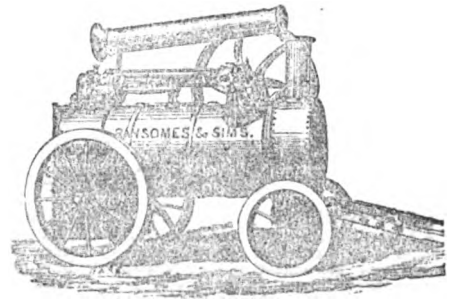

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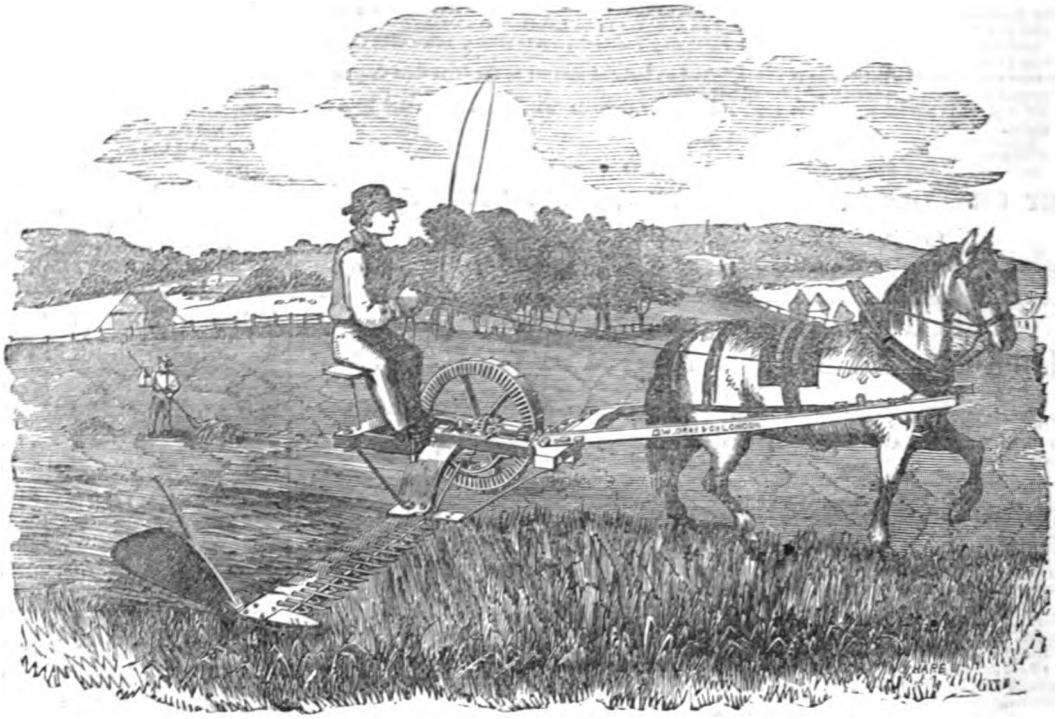

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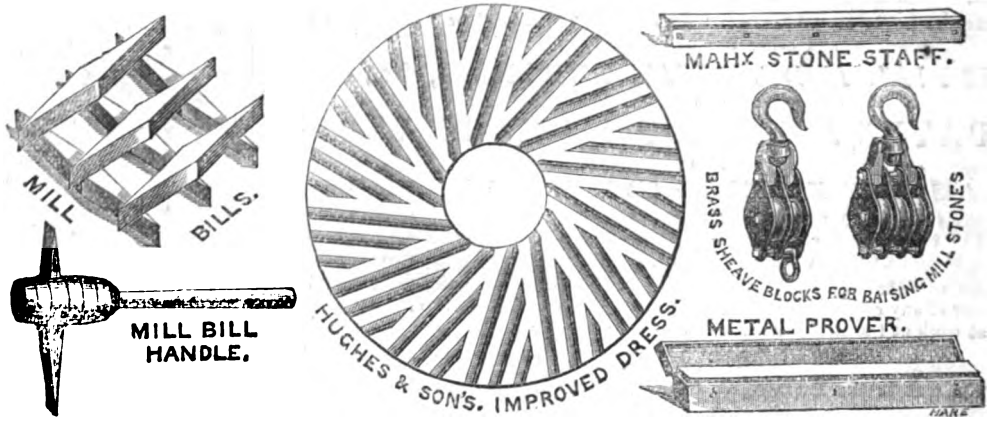

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 18. [NEW SERIES.]

LONDON: FRIDAY EVENING, APRIL 29, 1859.

PRICE, FOURPENCE. BY POST 5d.

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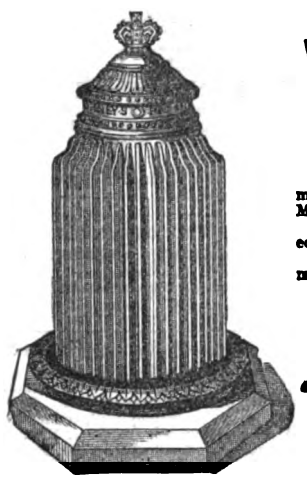

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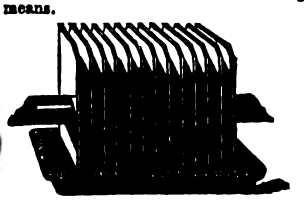

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1½ 1¾ 2 2¼ 2½ 2¾ 3 3½ 4 4½ 5 ins. diam.
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Also Manufactory for Captain John Grant's much improved Cooking Apparatus. (44)

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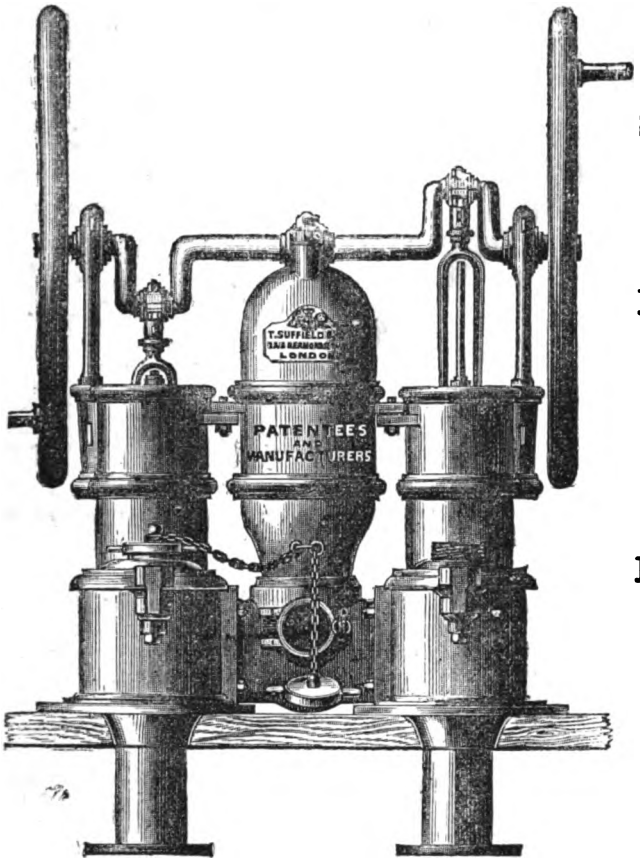

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Fixed and Portable.

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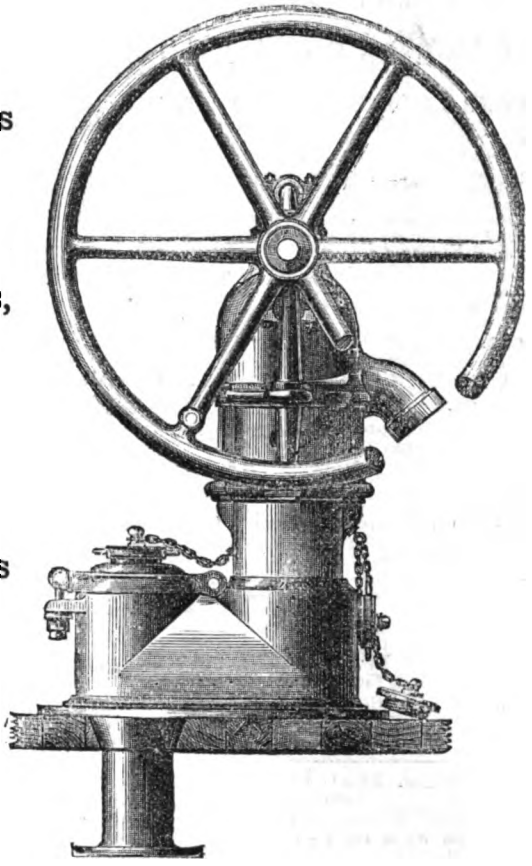

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ROBERTSON, BROOMAN, AND CO., MECHANICS' MAGAZINE and Patent Offices, 166 Fleet-st., London. (159)

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THE LITERARY RECORD will, in many respects, render a service hitherto unperformed by any Publication, as it will contain Articles of General Interest on Literature and Education, Analytical Notices of New Books, a complete Monthly Catalogue of New Publications, Indices of the principal Magazines and Reviews, a Classified Index of the *Times*, a Digest of the Literary, Scientific, and Educational History of the Month, and a great variety of other useful Information on Literature, Publishing, &c.

London: KENT & Co. (219)

"The Story of our Lives from Year to Year."
SHAKSPEARE.

On Saturday, the 30th April, 1859, will be published, Price Twopence, the First Number of

ALL THE YEAR ROUND. A Weekly Journal, Designed for the Instruction and Entertainment of all Classes of Readers, and to assist in the Discussion of the Social Questions of the Day. Conducted by CHARLES DICKENS.

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On Saturday, 28th May, 1859, Mr. CHARLES DICKENS will CEASE TO CONDUCT HOUSEHOLD WORDS; that Periodical will be DISCONTINUED by him; and its partnership of Proprietors dissolved. (225)

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The Gutta Percha Company have been favoured with the following letter,

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SUCH AS

Mill-bands,	Flasks,
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Sheet,	Galvanic Batteries,
Pump-buckets,	Toilet-trays,
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London, 29th April, 1859.

		£ s. d.		£ s. d.	Dia. p. ct.
IRON, Rails in Wales and N. of England	pr. ton	6 5 0	to	6 10 0	nett
Welsh Bars, in Wales	"	6 0 0	"	6 2 6	3
Staf. Bars at the Works	"	7 0 0	"	7 10 0	2½
" Hoops	"	8 0 0	"	8 10 0	"
" Sheets, Singles	"	8 15 0	"	9 0 0	"
" Nail Rods	"	7 0 0	"	7 10 0	"
" Boiler Plates	"	8 10 0	"	9 0 0	"
Scotch Pig, M.-Nos. Warranta, at Glasgow	"	2 9 3		2 9 6	nett
Do. No. 1, Good Brands	"	2 10 0	"	2 13 0	"
Scotch Bars	"	7 5 0	"	8 0 0	3
Swedish Bars, in London	"	13 10 0	"	15 0 0	2½
COPPER, Sheet and Sheathing	per lb.	0 1 0½			3
Tough Cake and Tile	" ton	112 10 0			"
Best Selected	"	115 10 0			"
Australian	"	111 0 0			"
South American					"
Yellow Metal Sheathing	per lb.	0 0 10½			"
STEEL, Swedish Keg	pr. ton	20 0 0			2½
" Faggot					"
TIN, English, Block	pr. cwt.	6 9 0			2½
" Bar	"	6 10 0			
Foreign, Banca	"	6 15 0			nett
" Straits	"	6 13 0			"
TINPLATES, Charcoal, I.C.	pr. box	1 13 0	"	1 14 0	3
Coke, I.C.	"	1 6 6	"	1 7 6	"
LEAD, Pig, English	pr. ton	22 10 0	"	23 0 0	2½
" Spanish	"	21 10 0	"	22 0 0	"
Sheet	"	23 0 0			"
SPELTER, on the spot	pr. ton	20 0 0			nett
for arrival	"	20 0 0			"
ZINC, English, Sheet	"	28 0 0			1½
QUICKSILVER	per btl.	7 0 0			1½

REMARKS. — Business in Metals has been thoroughly paralysed through the warlike intelligence of the week. Where we do not quote lower prices, as Scotch Pigs fallen to 49s. 3d. per ton, and Spelter to £20, the quotations are nearly all nominal.

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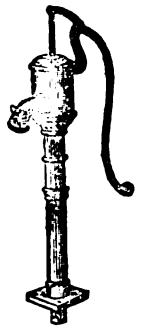
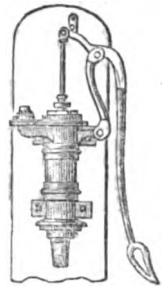
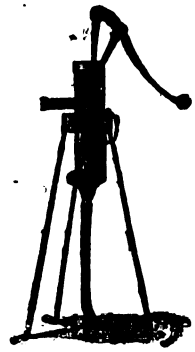






PATENT CAST-IRON PUMP fitted with J. Warner and Sons' Patent Bucket and Sucker, which cannot clog in action, for Farms, Cottages, and Wells, not exceeding 28 feet.

Dia.	Height.	£ s.
2½ in. short	1 ft. 7 in.	1 10
2½ in. long	3 " 3 "	1 14
3 "	6 " 6 "	2 8
3½ "	3 " 6 "	3 3
4 "	3 " 6 "	3 3
4½ "	3 " 6 "	3 3

2½ in. short, with 15 feet of Lead Pipe attached, ready for fixing 2 14
2½ in. long. do. do. 2 18

PATENT BRASS LIFT AND FORCE PUMP, on Plank, for House purposes, supply of Cisterns, &c.

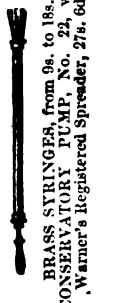
	£ s.
2½ inch	6 0
3 "	7 5
3½ "	8 0

A lighter Pump of 3 inches diameter, can be supplied if required 5 15

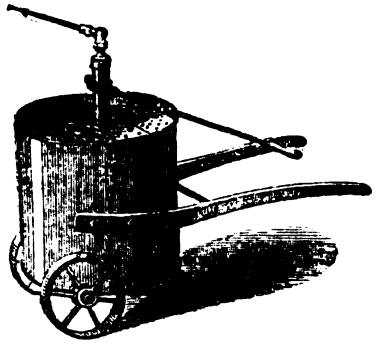
IMPROVED LIQUID MANURE, OR GENERAL PORTABLE PUMP.

These Pumps are fitted with J. Warner and Son's Patent Bucket and Sucker, and cannot clog in action. The Barrel is of Galvanized Iron, not likely to corrode, and can be raised or lowered at pleasure. The legs will fold together, and the whole may be carried on shoulder to any pond or tank required.

4½ in. Liquid Manure Pumps, with legs, £3 3s.; 1¼ in. Gutta Percha Suction Pipe, 1s. 11d. per foot; 2 in. Flexible Rubber and Canvass Suction Pipe, on Wires, 3s. 3d. per foot. The Barrel is 27½ inches long, and the legs are 5 feet high. Larger sizes of the above if required.

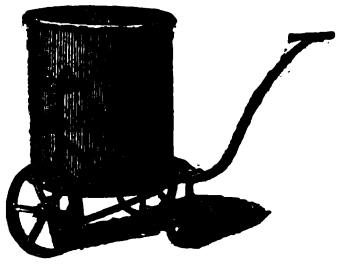


BRASS SYRINGES, from 9s. to 18s.
CONSERVATORY PUMP, No. 22, with Warner's Registered Spreader, 27s. 6d.



Galvanized Iron Tub GARDEN ENGINE, with Warner's Registered Spreader, is strongly recommended for durability and low price, viz., £2 19s., to hold Ten Gallons. Larger sizes, in either wood or iron.

WARNER'S SWING WATER-BARROW.
(To hold Thirty Gallons), £3 3s.,



is intended for all large Establishments where much watering is done by the watering-pot. By its use much time and labour of the Gardener are saved, particularly where the Tank, Pond, or Pump is at a distance from the garden.

MUSICAL SHEEP BELLS, with Straps, in sets of 6, 19s.; ditto, in sets of 8, 25s.; ditto, in sets of 12, 38s.

WARNER'S CATTLE AND SHEEP BELLS, in sets of 6, with Straps, 13s. per set.

Bells for Churches, Chapels, Colleges, Schools, Turret Clocks, &c., cast for any size, note, or weight, singly or in peals. Tuned by machinery. Stocked and wheeled ready for fixing. Old Bells re-cast or taken in exchange.

The great 16-ton Bell, for the Houses of Parliament, was made by JOHN WARNER and SONS, 1856, under their Patent.

May be obtained of any Ironmonger or Plumber, in town and Country; or of the Patentees and Manufacturers, as above. (30)

INDIA-RUBBER VALVES FOR STEAM ENGINES, PUMP PACKING, &c. — Explanatory Drawings and Information as to the best modes of fitting and arranging the above, and all other Mechanical Applications of VULCANISED INDIA-RUBBER, are furnished post-free by

CHARLES MACINTOSH & Co., Patentees, Cambridge-st., Manchester, and 3 Cannon-st. West, London.
MANUFACTORY and DEPÔT, Cambridge-st., Manchester.
GENERAL WAREHOUSE, 3 Cannon-street West, London, E.C.—C. M. and Co.'s only Establishments. (139)

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FOR SALE, a superior HIGH PRESSURE HORIZONTAL STEAM ENGINE of 6-horse power, 8-inch cylinder, and 1-foot 6-inch stroke. One of 8-horse power, 10-inch cylinder, and 1-foot 6-inch stroke. One of 10-horse power, 12-inch cylinder, and 2-feet stroke. Two of 14-horse power, 14-inch cylinders, and 2-feet stroke; and one of 30-horse power, 20-in. cylinder, and 3-ft. stroke.

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MAKERS OF

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For Gas, Water, and Steam,

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FOG WHISTLES, for Seagoing Steamers.

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GAUGE COCKS, GLAND COCKS, GREASE COCKS, CUPS and SYPHONS.

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IMPROVED BRASS VALVES, for Steam, Water, and Gas,

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38 Upper Thames-street, London, E. C. (153)

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(SUCCESSORS TO GEORGE B. LLOYD & CO.)

GAS STREET AND BERKLEY STREET,

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Manufacturers of Wrought Iron Tubes & Fittings,

FOR GAS, STEAM, AND WATER.

PATENT GLASS ENAMELLED AND GALVANIZED TUBES,

AND

LAP-WELDED IRON BOILER TUBES.

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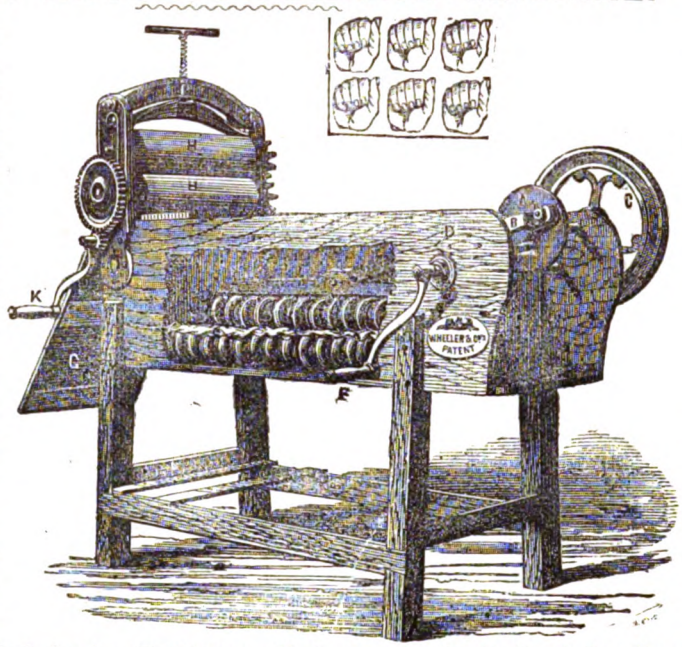
T. WHEELER AND CO.'S

"OXONIAN KNUCKLE WASHING MACHINE."



The Improvements in these New Inventions are the non-exposure of the user's hands to the dangerous parts of the Machine, and the rapidity with which the work is done. These Machines have neither bands or wheels passing on the outside, wherein lies the liability to accident. The rubbers are the truest representation of the knuckles or hand washing yet brought out; the compensating floating rubbers work at right angles, backward and forward, in the same manner as does the hands. These Machines can be supplied with rubbers that represent a person's hand in the action of rubbing; the knuckles, finger nails, and palm of the hand being truly modelled. They are capable of Washing Clothes of every description whatsoever, the largest bedding to the most delicate piec of muslin can be washe without breaking a singl thread; in fact, such is the delicacy of the action of these Machines, that the paper you are now reading can be passed between the rubbers without sustaining any injury, at the same time being thoroughly effective in cleansing. The Patentees confidently recommend these Machines to the notice of Laundresses, Heads of Families, Hotels, Emigrants, &c. So simple is the action of this Machine, that a boy or girl of 10 or 12 years of age can work it; the only skill required is to soak the clothes one hour before placing them in the Machine, placing a portion of the clothes at the handle end of the Machine; laying on the rubbers a part of them; turn the handle, and the clothes will pass through between the rubbers to the opposite end, effecting a saving of at least 50 per cent.

Prices: Washing Machines, £1 6s., £2 6s., £3 6s., £4 10s., £5 15s.; Washing, Wringing, and Mangling, £8 £10 15s., £14 14s.—Full Instructions sent with every Machine. Testimonials or References sent on application.

MANUFACTORY, ALBION WORKS PARK END STREET, OXFORD (114)

TO STEAM SHIP OWNERS, ENGINEERS, AND OTHERS.

How's Patent Steam Engine Counters, can be read at sight.

These Counters register the number of revolutions made by an engine or other mechanism. They may be used for ascertaining the duty of Pumping Engines and Water-wheels; the revolutions on board a steam-vessel; to calculate the slip of the propeller; and in a locomotive to test the slip of the wheels.

How's Patent Salinometer, for Steam Boilers using Salt Water.

By these, the density of the water in the Boiler is at all times accurately shown, and a saving of boiler and fuel is effected. They are adopted by the Admiralty, the Honorable Trinity Corporation, and others. Copies of Testimonials from Messrs. Penn, Messrs. Maudslay, and others, will be forwarded on application.

How's Engine-Room Telegraph, for communicating between Captain and Engineer.

Society of Arts Prize Medal, 1855.

is a Mechanical Telegraph, and by its peculiar construction, error or misunderstanding is rendered impossible. It now extensively adopted, and gives great satisfaction.

How's Patent Fresh Water Apparatus for Ships' Use.

This apparatus is designed for the distillation of Fresh from Salt Water; and on long voyages, and where the supply of water is scanty, it will be found invaluable. Testimonials may be seen.

Patent Steam Pump and Fire-Engine for Ships' Use.

This Steam-pump occupies but a small space; works perfectly noiselessly, and throws an immense volume of water. An Illustrated Circular of Fresh Water Apparatus and Steam-pump combined, free on application.

How's Patent Machine for Cutting Bolts, Rods, Spindles, Wire, &c.

Simple in construction, inexpensive, occupies but little space, and will not easily get out of order.

A Pamphlet Illustrative of the above, sent free by post, on application to

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SEYMOUR HOUSE, JUBILEE PLACE, CHELSEA.

HOT-HOUSE BUILDERS

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Hot-Water Apparatus Manufacturers.

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RECENT IMPROVEMENTS.

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ENORMOUS REDUCTION IN THE COST OF STEAM POWER.

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PORTABLE STEAM ENGINES, from 6 to 12 horse power,
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TUBULAR BOILERS, from 4 to 50 horse power,
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Are in hand, and can be despatched on eight days' notice. Prices moderate. Workmanship and Material of the best description.

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Are prepared to ESTIMATE FOR and CONSTRUCT BRIDGES, PIERS, JETTIES, &c., in Iron, Wood, or Stone. Also to supply Cranes, Girders, Turntables, and Railway Work and Plant generally. (199)

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VALVES for Marine and other Steam Engines.
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CHANDLER AND OLIVER

HAVE much pleasure in being able to state that they are now prepared to execute orders for their PATENT STEAM WINDING ENGINES AND PLOUGHS, for Cultivating Land by Steam.

The WINDING TACKLE can be fitted to Engines of any maker, and the Plough can be made to take any kind of apparatus necessary for Cultivating the Soil, such as Scarrifier Tines or Broad Shares, &c. Any Engine now used by Farmers can be fitted with the Tackle. It is light and simple, and an ordinary Farm Labourer can work it.

The Engine can be used for Thrashing without taking the Ploughing Tackle off, not requiring more than three or four horses to take it from place to place.

These Engines are very useful for Pile Driving or Drawing Ballast up inclined planes; at the same time they can be used for Pumping. Farmers will find them most useful for all purposes.

Messrs. CHANDLER and OLIVER are prepared to receive orders for separate Windlasses, which are light and simple, and generally useful.

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GREAT REDUCTION IN THE PRICE OF

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From the great Improvements recently made, JOHN FOWLER is prepared to execute Orders at the following prices:—

Windlass to Eight-horse Engine, with Patent Self-moving Anchor, Headland Ropes, Rope Porters, and all necessary Tools	£160 0 0
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The advantages to be derived in the working of this Tackle over others are, no belt is used, consequently no delay is caused from its slipping in showery weather; it can be efficiently worked by two men and two boys; and it is not confined to scarifying only, but a two-furrow balance plough can be worked by it. From the direct action of the draught, a small engine will effect a larger quantity of work than the same engine on the "round-about system;" only half the rope is required for the same length of furrow, and a whole field can be done without shifting. The windlass can be attached to any agricultural engine, and the weight added would only be 12 cwt. The Tackle can be set at work within an hour of entering the field intended to be cultivated. The Drums on which the Rope is worked are four feet in diameter, and from its being wound in grooves, all crushing is avoided, and by these means a great saving in wire rope is effected.

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SCOTT'S
PATENT GRASS SEED SEPARATOR,

which entirely extracts the Seeds of "COUCH," "TWITCH," "SPEAR," or "HAIR" GRASS and other impurities from

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SCOTT'S PATENT CARROT SEED BEARDING

AND

CLOVER AND TREFOIL MILLING OR DRAWING MACHINE,

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These Machines were admittedly the most novel, and, at the same time, the most useful and important to the Farmer of any exhibited at the late SMITHFIELD CLUB SHOW.

They may be seen at work at the Establishment of the Manufacturer,

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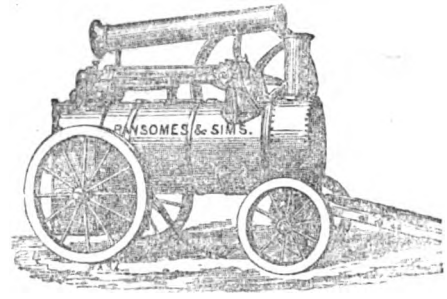

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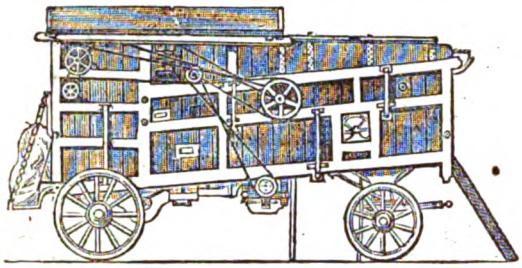

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SMITH'S PATENT STEAM PLOUGHS,
PATENT PRIZE COMBINED THRASHING MACHINES, containing R. P. and Co.'s NEW PATENT CORN CLEANER,
SAWING MACHINERY, CIRCULAR and VERTICAL of all Sizes,
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PUMPS, CRANES, CRABS, SCREW-JACKS, &c.

Illustrated Catalogues, with full Particulars and Testimonials, may be had by applying as above.

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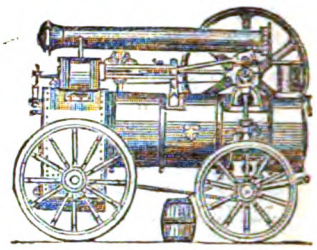

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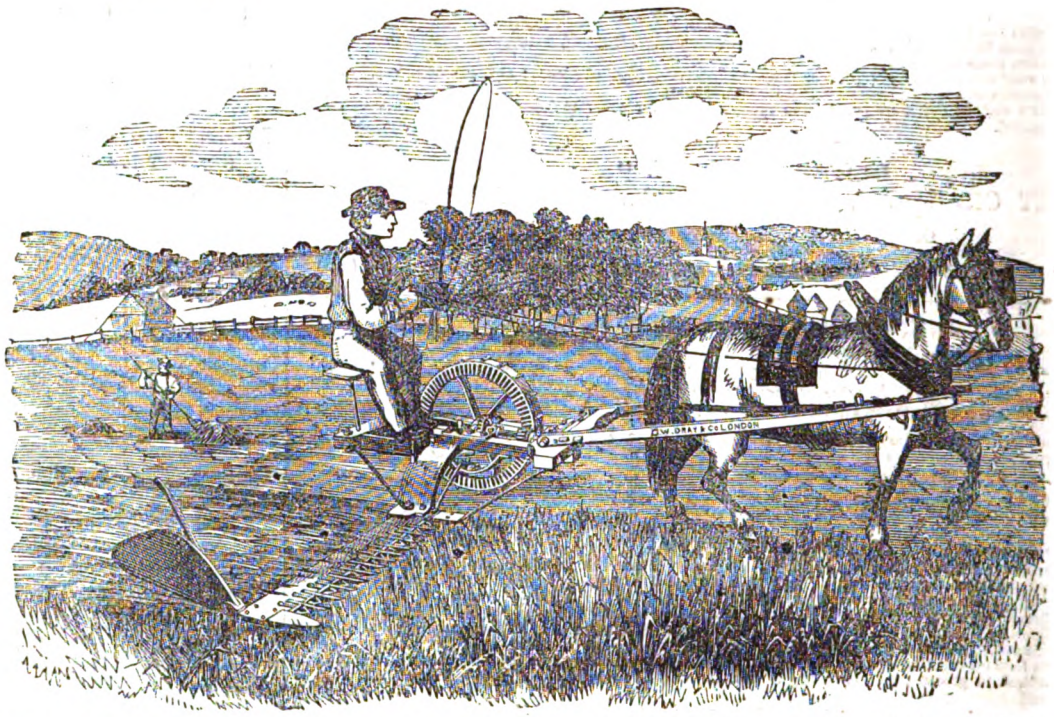

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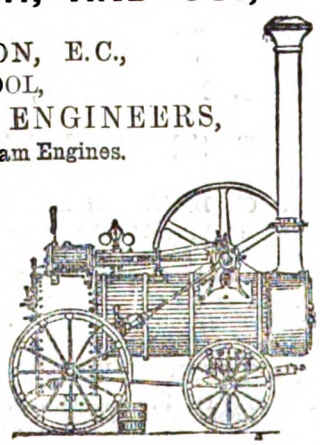
And Manufacturers of Portable and Fixed Steam Engines.



Combined Threshing Machines, which dress the corn ready for market at one operation. Grinding Mills, Saw Benches, Pumps for Irrigation and Mining purposes, with all necessary gearing for being driven by steam power. Full particulars and estimates given on application to the above address.

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 19.
[NEW SERIES.]

LONDON: FRIDAY EVENING, MAY 6, 1859.

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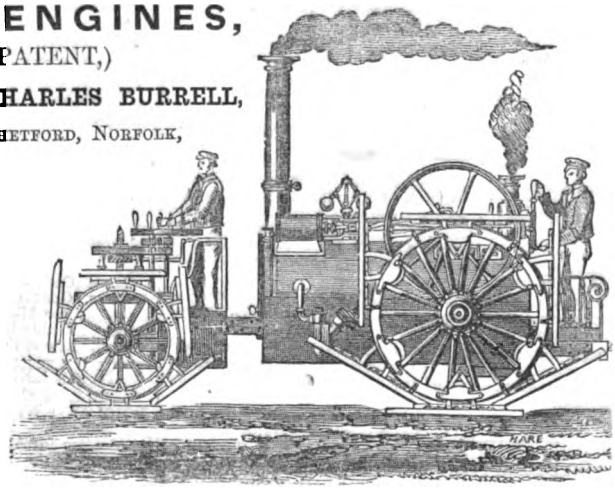

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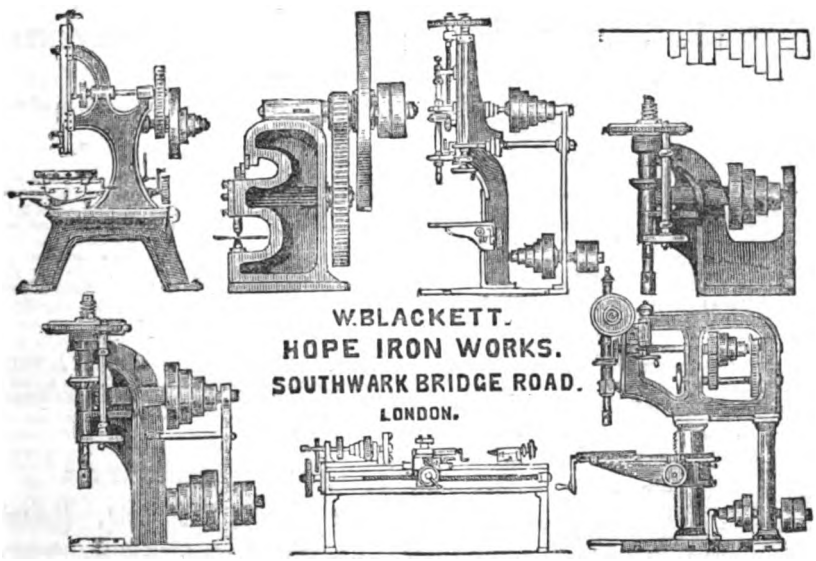

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From TRUMAN, HANBURY, BUXTON, & Co., Brewery, London.

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From JAMES ABERNETHY & Co., Fury Hill Foundry Aberdeen.

"We have now had Gutta Percha Bands working here *for three years*. One of them has been driving the fan blast for our smith's shop for all that time, and for anything we see, may drive it as long again. The speed of the fan is but 1,200 per minute. We have used them with complete satisfaction, driving circular saws, and in some cases where leather bands would have been quite inapplicable from damp. We have uniformly endeavoured to have the drums and pulleys so proportioned to the strain, as that there is no chance of the band slipping; and with this precaution, and taking care in using *cross bands that they do not rub*, we are quite satisfied that they are superior in every respect to leather—stronger at the same weight, and keeping quite straight in working—requiring no lacings, and very seldom any repairs."

WATER POISONED BY LEADEN PIPES.

The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight.

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London, 6th May, 1859.

	£ s. d.	£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N.			
of England ..... pr. ton	6 0 0 to	6 5 0	nett
Welsh Bars, in Wales .. „	5 0 0		3
Staf. Bars at the Works „	7 0 0 „	7 10 0	2½
„ Hoops ..... „	8 0 0 „	8 10 0	„
„ Sheets, Singles .. „	8 15 0 „	9 0 0	„
„ Nail Rods ..... „	7 0 0 „	7 10 0	„
„ Boiler Plates .... „	8 10 0 „	9 0 0	„
Scotch Pig, M.-Nos. Warrants, at Glasgow..... „	2 8 0	2 8 3	nett
Do. No. 1, Good Brands „	2 9 0 „	2 12 0	„
Scotch Bars ..... „	7 5 0 „	8 0 0	3
Swedish Bars, in London „	13 10 0 „	15 0 0	2½
COPPER, Sheet and Sheathing per lb.	0 1 0½		3
Tough Cake and Tile „ ton	112 10 0		„
Best Selected..... „	115 11 0		„
Australian ..... „	111 0 0		„
South American			„
Yellow Metal Sheathing.....per lb.	0 0 10½		„
STEEL, Swedish Keg .....pr. ton	20 0 0		2½
„ Faggot			„
TIN, English, Block .....pr. cwt.	6 9 0		2½
„ Bar..... „	6 10 0		„
Foreign, Banca ..... „	6 14 0 „	6 15 0	nett
„ Straits..... „	6 12 0 „	6 13 0	„
TINPLATES, Charcoal, I.C. ..pr. box	1 12 0 „	1 13 0	5
Coke, I.C. ..... „	1 6 0 „	1 7 0	„
LEAD, Pig, English .....pr. ton	22 10 0 „	22 15 0	2½
„ Spanish ..... „	21 10 0 „	22 0 0	„
Sheet ..... „	23 0 0		„
SPELTER, on the spot .....pr. ton	19 0 0		nett
for arrival..... „	19 0 0		„
ZINC, English, Sheet ..... „	28 0 0		1½
QUICKSILVER .....per btl.	7 0 0		1½

REMARKS.—Nearly a complete stagnation to business in Metals, prices of nearly every article evincing a tendency downwards.

LAWRIE AND HAGGER, Metal Brokers.

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IRON AND OTHER METALS.

[FROM OUR OWN CORRESPONDENT.]

The Iron Trade of Great Britain: Return to work of the Men: General average Work—The State of Things in South Staffordshire: Pigs a Drag—The Glasgow Market—The Scotch Iron Trade generally—Liverpool Metal Market—The Government Returns for March: Increased Export and Import of Metals and Hardware.

We learn from the different iron-producing districts of the kingdom that the excitement consequent upon the elections and the holidays having now subsided the men have returned to their work; and that the various mills and forges have, with some exceptional instances, assumed their wonted activity. Though the demand for first-class iron is not of a very brisk nature, yet it is sufficient to keep the works of the leading members of the trade fairly in gear. The demand from the continent is dull, but the advices from the United States are of a more satisfactory nature. This, combined with a tolerably active home trade, keeps for the present the best-known houses in fair average work. How long this will last is, however, a serious problem.

At Birmingham, yesterday, and at Wolverhampton, on Wednesday, pig iron was a complete drag. Most of the malleable iron makers are well supplied with it, and the make has not yet been reduced. In consequence of there being no demand it was difficult to obtain a quotation. The best makers continue to ask £3 12s. 6d., and the inferior makes are still quoted at £3 5s. There is, however, more margin in the latter than in the former descriptions. So great is that margin that there are instances in which 100 tons of a tolerably good pig of the latter class could be had—terms, cash on delivery—for as small a sum as £300. Such instances exist, but they are rare, and would not exist perhaps on the following day after they were entered into. That such pigs can be made at a profit and sold for that money is next to impossible.

There were loud complaints at Birmingham and at Wolverhampton at the increased railway and canal rates for the carrying of Ulvertone ore—an increase which will seriously run up the price of the material of which good pigs are made, and thereby increase the present difficulties of the pig-iron maker. The makers of malleable iron reported a falling off in orders received from both home and foreign markets. They are able to keep most of their houses employed.

Respecting Tuesday's market at Glasgow, we are advised—"Our pig-iron market has been flat again to-day, and a large business was done at 48s. 6d., and 48s. 9d. one month open, closing nominally at these rates. Nos. 1 and 3, G.M.B., 48s. 9d. In their circular, dated Friday last, Messrs. Shaw and Thompson, of Glasgow, state that during the past month the course of the Scotch pig-iron market has been an almost uninterrupted decline."

In Liverpool the approach of war has caused prices of pig iron to give way considerably. A large business has been done at reduced quotations.

From Birmingham and Wolverhampton we learn that most of the general traders in nearly every description of hardware and fancy goods are experiencing the early effects of the continental war. The merchants engaged in the Italian trade have suspended all their orders; and the Mediterranean trade generally is entirely stopped. The American trade continues dull; a similar remark applies to the South American. There is little doing with the East Indies; indeed there is scarcely a branch of the export trade which can be said to be otherwise than languid. The home trade cannot fail to suffer from the events which led to the stoppage of so important a part of the continental trade.

The Government returns for the month of March show that the iron and hardware trades have largely participated in the benefits accruing from an increased export demand.

There was an increased exportation of wrought-iron to all countries except Holland, but the total was below the trade of the corresponding month of 1857. In railway iron of all kinds the increase was very great, especially to India and the United States. The cast-iron exports continue to be large, India taking large quantities, though the shipments to Egypt and the United States have fallen off.

There was a large increase in the pig-iron exports to France and the United States, but the trade in this commodity with Russia and Holland continued to decline, and the total, though a considerable increase upon last year, was below the exports of 1857.

The imports were on a similar scale with the exports.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

LOCOMOTIVES, *Victorian Railway.*—Four locomotive tank engines. Specifications, De Pass and Sons, 4 Abchurch-lane, E.C.; further information, J. K. Brunel, Esq., 18 Duke-street, Westminster. Tenders, May 14, to Messrs. De Pass and Son.

STEAM ENGINES AND PUMPS, *West Ham.*—For the supply and erection of duplicate steam engines and boilers complete, 30-horse power—steam to be worked expansively: as, also, for supply and erection of sewage pumps. Specification, Mr. W. J. Barsham's, Clerk to the West Ham Local Board, Stratford-green, E.; and R. Robinson, Esq., C.E., 34 Parliament-street, Westminster. Tenders to the clerk, May 16.

RAILWAY VIADUCT AND STATION, *London and North-Western.*—Rebuilding the Spon-end Viaduct, near Coventry, and erection of station at the Avenue-road, Leamington. Particulars, Engineer's Office, Euston-station. Tenders, 4 o'clock, May 11.

RAILWAY STORES, *Glasgow and South-Western.*—For supply of iron and steel, iron castings, nails and spikes, malleable iron forgings, copper, &c. To extend to six or twelve months from June 1. Schedules, &c., Local Superintendent, Kilmarnock. Tenders to Secretary, Bridge-street Station, Glasgow, May 23.

GAS-HOLDER WANTED.—Second-hand. Fifty to sixty feet diameter, fifteen to twenty feet deep. A.B., Mr. Clifford, Inner Temple-lane, London.

RAILWAY, *Oldham, Ashton-under-Lyne, and Guide Bridge Junction.*—Plans &c., Mr. J. G. Blackburne, C.E., Oldham. Tenders to May 11.

WATERWORKS ENGINES, *Stockholm, Sweden.*—Four Engines, with boilers, machinery, &c., for the Stockholm Waterworks in Sweden, and for the Stockton and Middlesborough Waterworks in England. Drawings, Mr. Hawksley, C.E., 30, Great George-street, Westminster, S.W. Tenders, May 14.

CHURCH, *Oldham.*—For the erection of St. Peter's. Drawings, &c., Messrs. Holden and Son, 64 Cross-street, Manchester. Tenders to Building Committee, at Messrs. Fallows and Kaymer, Barker-street, Manchester, May 11.

CHURCH, *Stourbridge, Worcestershire.*—Plans, &c., Messrs. Oates and Perrins, Stourbridge. Tenders, May 25th.

WESLEYAN CHAPEL AND SCHOOL, *Liverpool.*—At Prince's Park. Drawings, &c., Clerk of the Works, Trinity Chapel, Grove-street, Liverpool. Tenders, May 9, to Chairman of Committee, at 16 Berry-street, Liverpool.

CHURCH, *Yspythy, Denbighshire.*—Plans and particulars, Rev. J. Morgan, Yspythy, Parsonage, Corwen.

LITTLE CAWTHORPE CHURCH, *near Louth.*—Plans, &c., bill of quantities, &c., of Mr. Withers, 51 Doughty-street, London, W. C. Tenders to Rev. E. Huff, the Vicarage, Little Cawthorpe, near Louth, May 17.

AUCTION ROOMS, *Woolwich.*—Plans, &c., Messrs. William Gosling and Son, architects, &c., 82 Wellington-street, Woolwich, 12th instant. Tenders May 18, to Mr. H. Kemp, Auctioneer, Church-street.

ROADS, *Scotland.*—Making several miles of new farm roads, in two or three separate divisions on the estates of Sorne and Quinish, near Tobermory, Island of Mull. Particulars, J. Forsyth, Esq., 73 Guildford-street, Russell-square, London, W. C.

GAS LIGHTING, *London.*—The Commissioners of Sewers will at Guildhall, on May 10, receive tenders for lighting the city lamps for three years, from Midsummer next. Specifications at the Sewer's office, Guildhall.

STONE, *Manchester.*—Samples of good building stone, at per cube foot. F. C. Halton, Clerk to the Assize Court Committee, Manchester, forthwith.

HOTEL, *Highbridge, Somersetshire.*—Plans, Mr. R. Down, Architect, Eastover. Tenders, May 16.

SCHOOLS, *Kenilworth, Warwickshire.*—Plans at the Bank, Kenilworth. Tenders to May 16 to Rev. W. F. Bichmore.

SCHOOL, *St. Chads, Shrewsbury.* Plans, &c., Office of Mr. Haycock. Tenders to May 18.

MILITIA STORES, *Cardiff.* Plans, &c., at Office of Clerk of the Peace, Cardiff. Tenders to May 13.

VILLA RESIDENCE, *Haygrove, Bridgwater.* Plans, Mr. Robert Down, Eastover. Tenders to May 10.

HOUSE, STABLES, &c., *Belmont, near Starbeck, Harrowgate.* Plans, Messrs. J. Child and Son, Architects, 23 Park-row, Leeds, to May 3, and at Tenter Lodge, Knaresborough, from 4th to 10th of May. Tenders, May 11.

DESIGNS FOR DRINKING FOUNTAINS.—Prizes of £20, £10, and £5 respectively will be given by the Metropolitan Free Drinking Fountain Association for designs to fulfil the following conditions:—1. The cost, when erected, not to exceed £50; 2, To have a receptacle for a filter and ball-cock cisterns; 3, To yield one small stream of water; 4, To protect the water from the extreme changes of Temperature; 5, To occupy small space. Designs, May 25, No. 12 Pall Mall, West.

TRAFFIC MANAGER WANTED.—For the Banff, Portsoy, and Strathisla Railway. Salary from £150 to £250 per annum. Applications May 16, with Mr. Forbes, Sol., Portsoy; or Messrs. C. and E. Blyth, C.E., Edinburgh,

TO INVENTORS AND PATENTEES.

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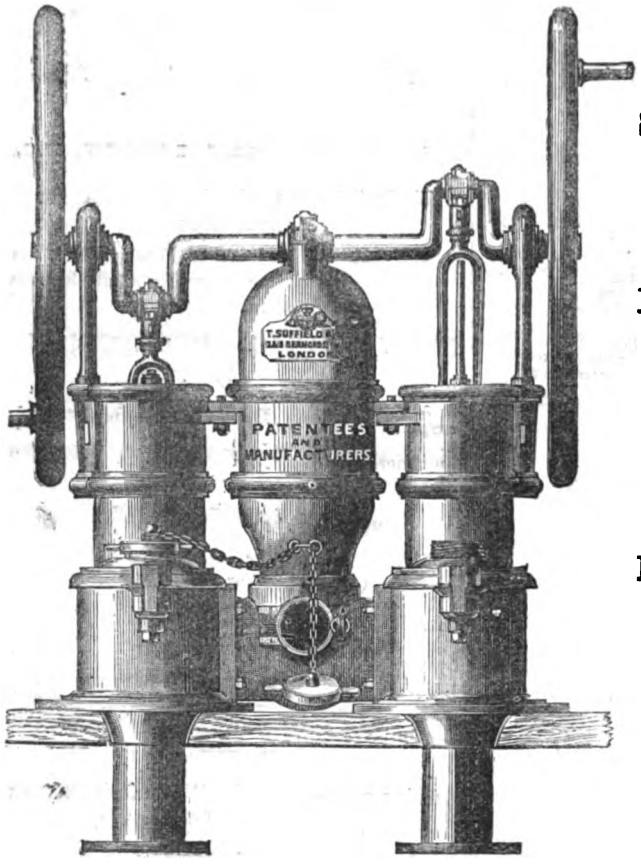

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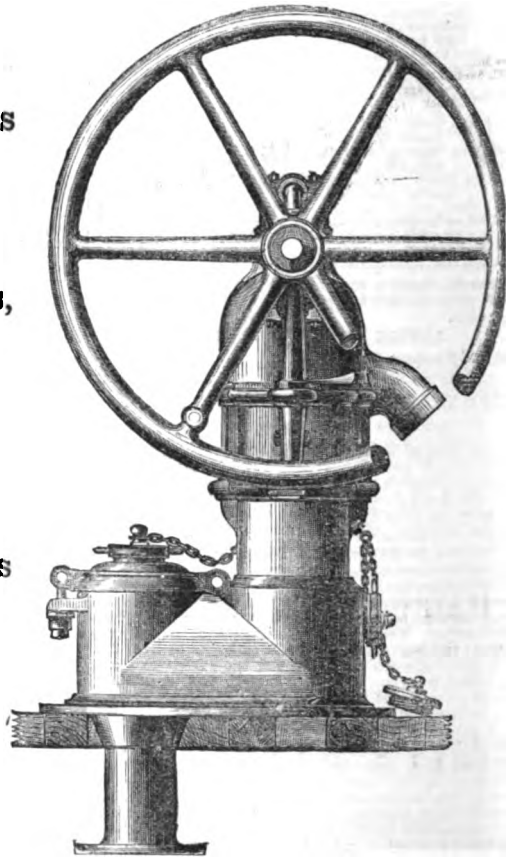

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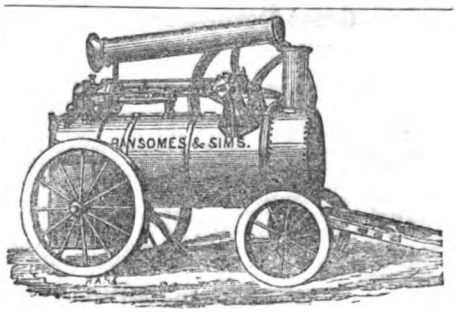

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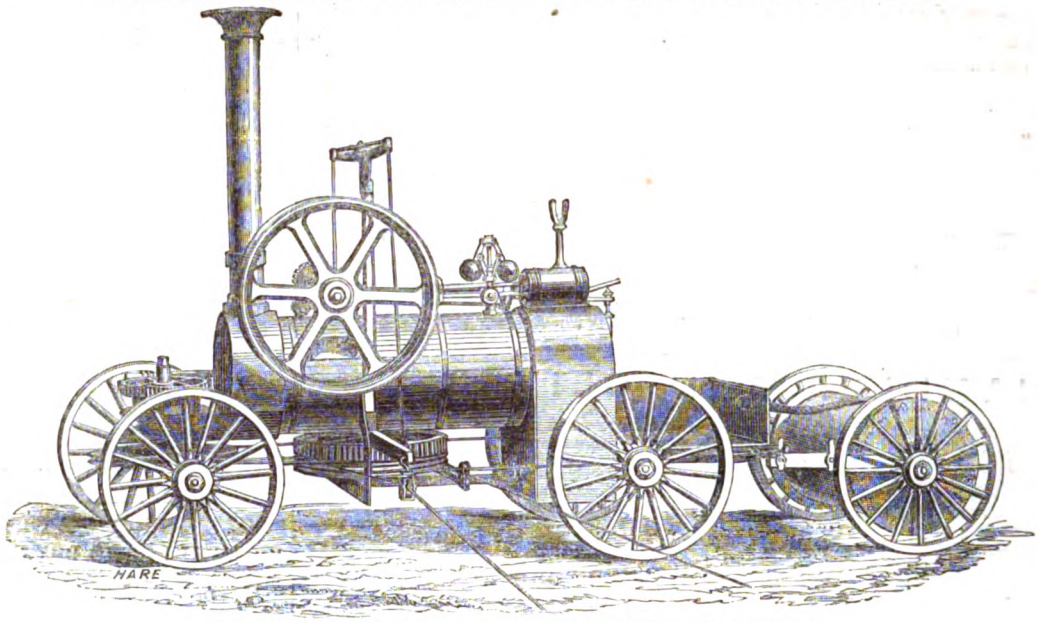

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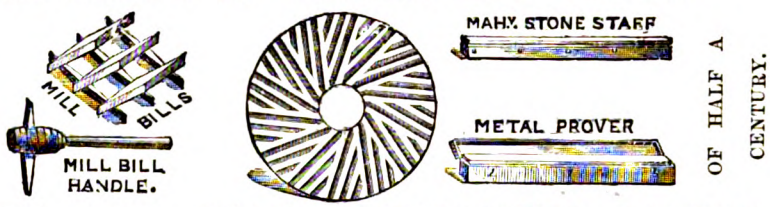

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 20. [NEW SERIES.]

LONDON: FRIDAY EVENING, MAY 13, 1859.

PRICE, FOURPENCE. BY POST 5d.

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Poisoned Water Preventable.

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Soles,
Sheet,
Pump-buckets,
Fire-buckets,
Bottles,
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Union-joints,
Flasks,
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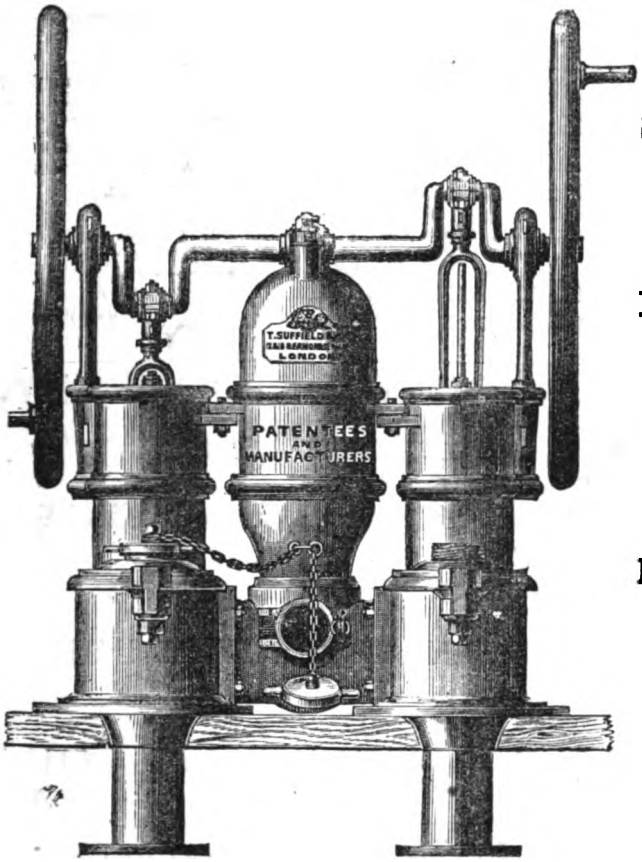

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AND

Fire Engines,

Fixed and Portable.

WITH

Patent Valves

AND OTHER

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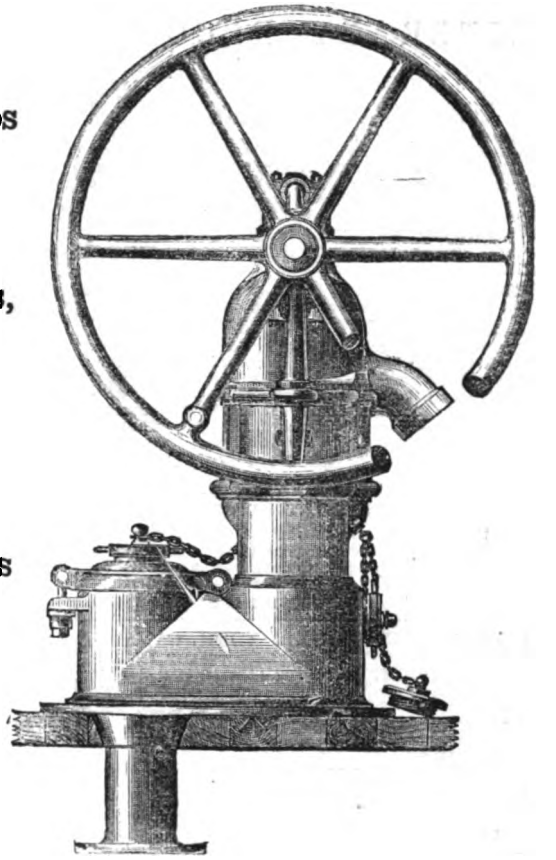

These Pumps are free from that liability to choke which is common to other Pumps, and their Working Parts are not susceptible of derangement either from wear or from being long out of use. They pass entirely through them, with ease, any substance that may enter the Suction Pipes. The Novelties in these Pumps are their adaptation to the varied duties of Ships' Pumps; the facilities they afford for Cleansing the Suction Pipes, and for Sounding or Examining the Valves; the readiness with which they may be used for Ventilating the Bilge, or for acting as a Syphon either for Watering the Ship, or for extinguishing Accidental Fires on board; the rapidity with which they can be converted into Fire Pumps, or be applied to the Washing of Decks; and their capability of Pumping from Several Compartments.

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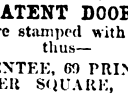

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These Machines were admittedly the most novel, and, at the same time, the most useful and important to the Farmer of any exhibited at the late SMITHFIELD CLUB SHOW.

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London, 13th May, 1859.

	£ s. d.	£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N. of England .....pr ton	6 0 0 to	6 5 0	nett
Welsh Bars, in Wales .. „	6 0 0		5
Staf. Bars at the Works „	7 0 0 „	7 10 0	2½
„ Hoops ..... „	8 0 0 „	8 10 0	„
„ Sheets, Singles .. „	8 15 0 „	9 0 0	„
„ Nail Rods ..... „	7 0 0 „	7 10 0	„
„ Boiler Plates .... „	8 10 0 „	9 0 0	„
Scotch Pig, M.-Nos. Warrants, at Glasgow..... „	2 9 0	2 9 6	nett
Do. No. 1, Good Brands „	2 10 0 „	2 13 0	„
Scotch Bars ..... „	7 5 0 „	8 0 0	5
Swedish Bars, in London „	13 10 0 „	14 0 0	2½
COPPER, Sheet and Sheathing per lb.	0 1 0½		5
Tough Cake and Tile „ ton	117 10 0		„
Best Selected..... „	110 10 0		„
Australian ..... „	111 0 0		„
South American			„
Yellow Metal Sheathing.....per lb.	0 0 10		„
STEEL, Swedish Keg .....pr. ton	20 0 0		2½
„ Faggot			„
TIN, English, Block .....pr. cwt.	6 9 0		2½
„ Bar..... „	6 10 0		„
Foreign, Banca ..... „	6 14 0 „	6 15 0	nett
„ Straits..... „	6 12 0 „	6 13 0	„
TINPLATES, Charcoal, I.C. ..pr. box	1 12 0 „	1 13 0	5
Coke, I.C. ..... „	1 6 0 „	1 7 0	„
LEAD, Pig, English .....pr. ton	23 0 0 „	23 10 0	2½
„ Spanish ..... „	22 0 0		„
Sheet ..... „	23 10 0		„
SPELTER, on the spot .....pr. ton	19 5 0 „	19 7 6	nett
for arrival..... „	19 7 6		„
ZINC, English, Sheet ..... „	28 0 0		1½
QUICKSILVER .....per btl.	7 0 0		1½

REMARKS.—Iron: a rather better feeling prevails in reference to this article. Scotch Pigs have advanced fully a shilling per ton. In Copper, the smelters have reduced the price ¼d. per lb. in Sheating, and £5 per ton in Cake and Tile. Lead, of soft quality, has been in good demand, and the price is 10s. per ton higher. In Spelter a considerable business has been done at advanced rates.

LAWRIE AND HAGGER, Metal Brokers.
33 Lombard-street, E.C.

IRON AND OTHER METALS.

[FROM OUR OWN CORRESPONDENT.]

The Iron Trade Generally—Glasgow Market—South Staffordshire Trade: Downward Tendency of Prices; On 'Change at Birmingham and Wolverhampton—Birmingham and Wolverhampton General Trades—Sheffield Trade; Orders Countermanded—Manufacturing Districts of Yorkshire and Lancashire—Fall in Copper—Expected Fall in Tin—Tin plates.

THE iron interests of Great Britain are not in a position this week which is an improvement of that of the weekly period preceding our last report. The tendency of prices is downward, and only few orders are coming in to supply those that are being worked out.

At Glasgow on Tuesday No. 1 was quoted at from 49s. 6d. to 49s. 9d.; Mixed Nos. warrants, 49s. 6d. to 49s. 9d.; Makers' iron, 49s. 6d. to 49s. 9d.; No. 3, 49s. 6d. to 49s. 9d. Market steady. Shipped this week, 13,132 tons; corresponding week last year, 12,159 tons.

At Birmingham on Thursday (yesterday), as at Wolverhampton on Wednesday, business was stagnant—malleable iron makers reported the receipt of no orders of note as the result of the week's correspondence from either home or foreign customers; the last American mail brought scarcely anything except information that tolerably large consignments were going out, upon sale, and that very low rates were being accepted by some houses here; these facts, with the circumstances that by this time there has crossed the Atlantic the intelligence of the effect which the Italian war has had upon the commercial classes of this country, lead to the expectation that the Americans will hold back as much as possible for some time, expecting a general fall in prices. In this view home customers are operating, so much so as in some instances to attempt to get their orders countermanded. Except, however, in cases where the war has occasioned a *bond fide* claim to such a consideration, masters refuse to cancel orders—low prices are no doubt already being taken for malleable iron.—A transaction in bars of a very fair quality was booked at Wolverhampton at £7 per ton.—Makers of first-class samples are by no means imperative in their demand of what are known as the "trade rates;" still the difference is not nearly so much as in the instance quoted, in which case the reduction upon those rates is 20s.—Pigs continue unsaleable. The few transactions of the week have been for exceedingly small quantities, and at prices which are regarded as a barometer to the necessities of the makers, which are varied.

The trade of Birmingham is gradually becoming worse. All the departments of the export trade are depressed, and orders are few for America and the East Indies. A general impression exists that the new scale of duties will militate very seriously against trade generally. Accounts are very bad with regard to commercial transactions with South America. There is the least possible doing; and the Exchange is so bad that remittances are sure to be small until an improvement takes place. The principal factors report that in Wolverhampton orders have very much fallen off during the last fortnight.

From Sheffield it is reported that the continental firms there are in receipt of numerous countermands from their correspondents abroad, and no doubt many more may be expected. In some instances the orders thus stopped have been considerable; but no one can question the propriety of these precautionary measures.

From the manufacturing districts of Yorkshire and Lancashire the reports are to the effect that much stagnation prevails, and that buyers of all descriptions of goods will operate only to statiofy immediate requirements.

Copper fell a halfpenny per lb. on Tuesday, making tough cake or ingot £107 10s., and best selected £110 10s. per ton wholesale.

Tin must follow. Tin-plates are receding.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

STEAM ENGINE, *Shrewsbury.*—Forty-horse high-pressure, expansion, and condensing, with boilers, &c., complete; also, a quantity of cast-iron pipes. Particulars, Mr. T. Tisdale, Talbot-chambers, Shrewsbury. Separate tenders for engine and pipes. May 30, to the chairman.

RAILWAY WORK, *Blyth and Tyne.*—For altering and improving the levels of the line from Prospect-hill to Holywell, two miles. Plans, &c., Mr. J. F. Tone, engineer, Market-street, Newcastle-on-Tyne.

GAS PIPES, *Teignmouth.*—1780 yards of eight-inch cast-iron gas pipes, with branches, syphons, &c. Specifications, Mr. T. Braddear, surveyor, Teignmouth. May 17.

RAILWAY MACHINERY, *Victorian Railway.*—Twelve 17-ft. turn-tables; one 10-ton foundry crane; six 3-ton travelling cranes; twenty-four 3-throw switches. Specifications, 4 Abchurch-street-lane, London; and further information from I. K. Brunel, Esq., 18 Duke-street, Westminster. Tenders, May 16, to Messrs. de Pass and Sons, London.

GASHOLDER AND TANK, *Scotland.*—For the Galashiels Gas Company. The tank, 51 ft. diam. and 16 deep; also, a gasholder to work in the same, with counterpoise, 50 ft. diam. and 16 ft. deep; crown, No. 14; sides, No. 15, wire gauge, with 8-inch inlet and outlet pipes, hydraulic valves, six brackets, guide rods, guide wheels, and all necessary matters; to be fitted up by the end of Sept. this year, at the Company's Works, Galashiels. Tenders, May 19; separate tenders, to Wm. Kemp, manager.

STATION BUILDINGS, *Lancashire and Yorkshire, and East Lancashire Railways.*—On the Blackburn line at the Oaks, Bromley Cross, Chapel Town, Entwisle, and Chatburn. Plans, &c., Mr. Izat, Bolton-station. Tenders, to Mr. Mills Fenton, sec. to joint committee, Bury. May 24.

COPPER, *East India Company.*—200 tons in cakes or slabs for coinage. Conditions, at the Secretariat office, where tenders, May 17.

COPPER, *Navy.*—60 tons in ingots; 60 tons of 1¼ cwt; and 80 tons of tough cake. Conditions and form of tender, at Somerset-place, where tenders, May 17.

ROUND CANNEL, *Preston Gas Company.*—For one, three, or five years. Fresh got small cannel; Arley mine coal or Orrel coal. Tenders, May 14, at the Company's offices, Preston.

CHURCH, *Sawbridgeworth, Herts.*—Restoring, &c. Tenders, May 20, Mr. G. E. Pritchett, Bishopsgate-street-without.

SEWERS, *Hackney and Stoke Newington.*—7,260 feet of brick and pipe sewers. Plans, Mr. Lovegrove, Townhall, Hackney. Tenders there, May 18.

LIGNUM VITÆ, *Navy.*—80 tons of St. Domingo, 4½ to 18½ inches diameter, and 5 tons of white Bahama, 3½ to 4 inches diameter. Forms of tender at Somerset-place, where tenders, 2 o'clock, May 17.

SEWERAGE, *Preston.*—Time extended to May 18, tenders for the construction of 700 yards of brick sewers, 4 feet 6 inches diameter, and other works; and 225 yards of brick sewers, 4 feet 6 inches by 3 feet; also the laying and jointing of 850 yards of 18-inch pipe sewers, and other works. Local Board, Mr. Robert Ascroft, Town Clerk.

PAVING, *Nottingham.* — Paving and setting about 1,800 yards of Derbyshire stone curb for the Nottingham Benefit Building Society's estate at Radford. Specifications on May 22, with Mr. S. Collinson, sec. No date given.

CHAPEL, *East Dereham, Norfolk.*—Plans with Rev. L. Whilley, Baptist minister, East Dereham. Tenders, May 18.

RESIDENCES, *Felstead, Essex.*—For head and second master of the grammar school. Names to be sent, May 16, to Messr. Beadel and Co., Chelmsford, of whom particulars and quantities.

NEW ROOF, *Market Hall, Worcester.* — Plans, Messrs. Dean and Son, Forgate-street, Worcester. May 21.

OFFICES, *London.*—At Spring Gardens for the Metropolitan Board of Works. Drawings between twelve and one at 1 Greek-street, Soho-square. Tenders, June 2.

THE SAME, *Oakham.*— With lodge and other buildings. Plans, Mr. Thomas Barlow, Oakham; quantities, Messrs. Bellamy and Hardy, architects, Lincoln.—Tenders, five o'clock, May 23. Another contract for laying out the ground, forming the roads, &c. Plans and quantities, with tenders as with the buildings.

SURVEYOR, *Newton Heath Local Board, Manchester.*—Salary, £60. Applications, May 19, Mr. A. L. Hardman, law clerk to the borough, for the chairman.

INSPECTOR OF NUISANCES, *the same borough as preceding.*—Whole time, Salary, £52.

MINERS.—Fifteen to twenty for the Barnsley thick seam, Leading banks, 5s. 3d. to 5s. 6d. per 10 corves of 10 cwt. each, and 5s. in following-up banks. Messrs. R. Craik and Co., East Gawber Hall Colliery, Barnsley.

MANAGER, *Aberdeen Steam Navigation Company.*—Salary, £250 and house. Applications, stating experience, to Chairman, Offices, Waterloo Quay, Aberdeen, May 31.

AGENT AND MANAGER, *Sutherland Steam Packet Company.*—At the port of Littleferry. D. Gray, Esq., Golspie; or Mr. Christhall, Burghead. Date and salary not mentioned.

GASWORKS MANAGER, *Southport.*—Salary, £100, with house, coals, and gas. Application to the Chairman of Committee, Improvement Commissioners, Town Hall, Southport, May 26.

FOREMAN OF ENGINEERS AND MILLWRIGHTS.—For an establishment in Lancashire; must be capable of making working drawings. State salary and reference, "W.," 142, *Manchester Guardian* office.

ENGINEERING BUSINESS FOR SALE.

OWING to the continued ill health of the Proprietor, the first-class business of an Engineer and Crane and Block Maker is offered for sale. It has been established in the Metropolis for nearly 30 years, and has enjoyed extensive patronage amongst Brewers, Manufacturers, Warehousemen, and others, in and about London; the business done amounting to nearly £8,000 per annum. About £3,200 would be required, (part of which, however, may remain for any reasonable time on good security,) which is the bare value of the tools, patterns, and stock in trade. The premises, including good dwelling-house, very conveniently situated, and capable of accommodating from 60 to 70 hands, are held upon a long lease, at an extraordinary low rental, not exceeding £100 per annum, taxes included. Many of the tools are nearly new, and of the best construction. The present proprietor, who relinquishes the business solely on account of ill health, would give every assistance in his power to those succeeding him; and as his foreman, who has been with him for nearly ten years, is thoroughly acquainted with the practical parts of the business, any gentleman desirous of commencing as a manufacturing engineer would find the present a very favourable opportunity. As all accounts have been, for many years past, collected quarterly, a very small amount, say £800, would suffice as working capital. Full particulars may be obtained by application to E. E. ALLEN, Esq., MECHANICS' MAGAZINE Office, 166 Fleet Street, E.C. (130)

TO INVENTORS AND PATENTEES.

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AND PATENT AGENTS,

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Have Correspondents in France, Belgium, Holland, Austria, Prussia, Portugal, United States, and other Foreign Countries.

ROBERTSON, BROOMAN, & Co.,

"MECHANICS' MAGAZINE" & PATENT OFFICE,

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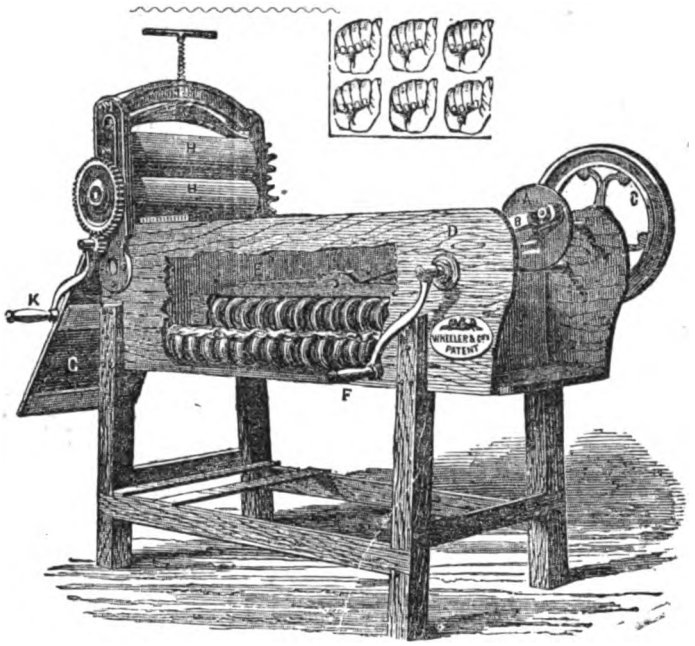
T. WHEELER AND CO.'S
"OXONIAN KNUCKLE WASHING MACHINE."



THE Improvements in these New Inventions are the non-exposure of the user's hands to the dangerous parts of the Machine, and the rapidity with which the work is done. These Machines have neither bands or wheels passing on the outside, wherein lies the liability to accident. The rubbers are the truest representation of the knuckles or hand washing yet brought out; the compensating floating rubbers work at right angles, backward and forward, in the same manner as does the hands. These Machines can be supplied with rubbers that represent a person's hand in the action of rubbing; the knuckles, finger nails, and palm of the hand being truly modelled. They are capable of Washing Clothes of every description whatsoever, the largest bedding to the most delicate piece of muslin can be washed without breaking a single thread; in fact, such is the delicacy of the action of these Machines, that the paper you are now reading can be passed between the rubbers without sustaining any injury, at the same time being thoroughly effective in cleansing. The Patentees confidently recommend these Machines to the notice of Laundresses, Heads of Families, Hotels, Emigrants, &c. So simple is the action of this Machine, that a boy or girl of 10 or 12 years of age can work it; the only skill required is to soak the clothes one hour before placing them in the Machine, placing a portion of the clothes at the handle end of the Machine; laying on the rubbers a part of them; turn the handle, and the clothes will pass through between the rubbers to the opposite end, effecting a saving of at least 50 per cent.

Prices: Washing Machines, £1 6s., £2 6s., £3 6s., £4 10s., £5 15s.; Washing, Wringing, and Mangling, £8 £10 15s., £14 14s.—Full Instructions sent with every Machine. Testimonials or References sent on application.

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CONDY'S PATENT FLUID, or NATURAL DISINFECTANT,

Not only Deoderizes but Disinfects perfectly, and DESTROYS FOR EVER the cause of Infection.

Is not poisonous, as it may be used to purify water. Evolves no noxious or unpleasant gas. Cannot be mistaken for any other fluid, thereby preventing death and disease; and is therefore the best, safest, cheapest, and most pleasant disinfectant ever introduced.

This fluid has been examined and reported upon by the Board of Health, all the most eminent Men and Chemists of the day, in all cases in the most satisfactory manner possible.

The Public are recommended to use this Fluid, properly diluted with water, frequently and habitually in larders, sculleries, dairies, musty cakes, sick rooms, close places, &c., as it has numerous advantages, and can be used with certain immediate success and perfect safety.

Sold in Quart Bottles, 4s.; Pints, 2s.; Half-pints, 1s.; and in bulk, 10s. per Gallon.

Free to Railway on receipt of Order or Stamps. (238)

FOR SALE.

A 12-HORSE HORIZONTAL STEAM ENGINE and a 4-HORSE DIRECT ACTING STEAM ENGINE, with Fly-wheel Governors, &c., complete. Address, W. F. Plummer, 12 Albany-road, Camberwell. (188)

PATENT WEDGE and GROOVED SURFACE FRICTIONAL GEARING.—The PATENT FRICTIONAL GEARING COMPANY, Proprietors of ROBERTSON'S WEDGE SURFACE FRICTIONAL GEARING PATENTS, grant Licences to Users of Machinery, for the unlimited use of the System in their Works, on very moderate terms, enabling them to make or order from any Mechanician the Machinery they require.

The Company possess Five Patents relating to this Frictional System, including (in addition to their Bevel and Mitre Wheels) a System of Disc Clutches and Clutch Movements, Wheel Clutching, Reversing, Differential, Speed Ring, Varying Speed, and Break Movements, and of Shafting, Pillow Blocks, Shafting Hangers, &c.

Frictional Wheels thus formed are applicable to the heaviest as well as the lightest kind of work, and, in addition to their being extensively in use for ordinary gearing purposes, have been in use for a considerable time applied to Mills for Rolling Iron, the Screw-Propeller, Incline-Winding Engines, Saw Mills, Pumping Engines, Flax Scutchers, Fan Blowers, Calico-Printing Machinery, Steam Winches, Cranes, Hoists, &c.

This system gives great facilities for simplifying Machines, and for mechanical combination, and has the advantage of being noiseless and cleanly, there being no oil or grease used on the wheels. Wheel Catalogues and Circulars, giving particulars, sent free by Post; also, a list of manufacturing Agents, and information regarding those who, from locality or experience, are best able to execute orders for the description of work required.

Office, 20 Buchanan-street, Glasgow. (146)

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PATENT BREAD MACHINE.

The Journeyman Baker's and Servant's Friend. It lightens their labour and makes our daily Food clean and pure.

Highly commended at the Royal Agricultural Show, Chester, 1858, the Royal Agricultural Show, Dublin, 13th and 14th April, 1859, and the Society of Arts, Adelphi, London.

C. F. QUINTIN'S Machines are constructed in various sizes, from Half-a-Peck to Ten Bushels.

Prices from 30s. to £20.

A SACK OF FLOUR MADE INTO DOUGH IN SIX MINUTES.

Manufactory—

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Numerous Testimonials can be seen. (249)

WILLIAM WARNE & CO.,

Manufacturers of all descriptions of

VULCANIZED INDIA-RUBBER,

SHEETS, WASHERS,

HOSE-PIPES, TUBINGS, ETC.;

Sole Manufacturers of

WARNE'S PATENT INDIA-RUBBER TUBULAR MATS,

For Doorways, Stairs, Baths, Carriages, Ships, &c., which never clog, require no beating, and, unlike all other Mats, are readily cleansed by water. Indestructible by damp, these Mats are especially suitable for uncovered Passages, and out of door purposes. Seat Mats, Housemaids' Mats, and Brushes for wooden and stone floors.

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Possessing advantages over all the ordinary makes, in exceeding toughness, and flexibility, and consequent durability, while neither heat nor cold has effect upon it. Widths, 3s. 4d., 4s. 4d., 6s. 4d., and 7s. 6d. Substances, ⅛, ¼, and thicker if required. Length, 20 to 25 yards.

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PORTABLE STEAM ENGINES, from 6 to 12 horse power,
STATIONARY STEAM ENGINES, from 4 to 50 horse power,
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Are in hand, and can be despatched on eight days' notice. Prices moderate. Workmanship and Material of the best description.

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Are prepared to ESTIMATE FOR and CONSTRUCT BRIDGES, PIERS, JETTIES, &c., in Iron, Wood, or Stone. Also to supply Cranes, Girders, Turntables, and Railway Work and Plant generally. (199)

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INDIA-RUBBER MANUFACTURES WITH ALL RECENT IMPROVEMENTS.

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WASHERS for Steam and Gas Joints.
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HAVE much pleasure in being able to state that they are now prepared to execute orders for their PATENT STEAM WINDING ENGINES AND PLOUGHS, for Cultivating Land by Steam.

The WINDING TACKLE can be fitted to Engines of any maker, and the Plough can be made to take any kind of apparatus necessary for Cultivating the Soil, such as Scarrifier Tines or Broad Shares, &c. Any Engine now used by Farmers can be fitted with the Tackle. It is light and simple, and an ordinary Farm Labourer can work it.

The Engine can be used for Thrashing without taking the Ploughing Tackle off, not requiring more than three or four horses to take it from place to place.

These Engines are very useful for Pile Driving or Drawing Ballast up inclined planes; at the same time they can be used for Pumping. Farmers will find them most useful for all purposes.

Messrs. CHANDLER and OLIVER are prepared to receive orders for separate Windlasses, which are light and simple, and generally useful.

For further Information apply to

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Or Mr. OLIVER, Farmer, Hatfield, Herts.

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TRACTION ENGINES,

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MANUFACTURED BY CHARLES BURRELL,

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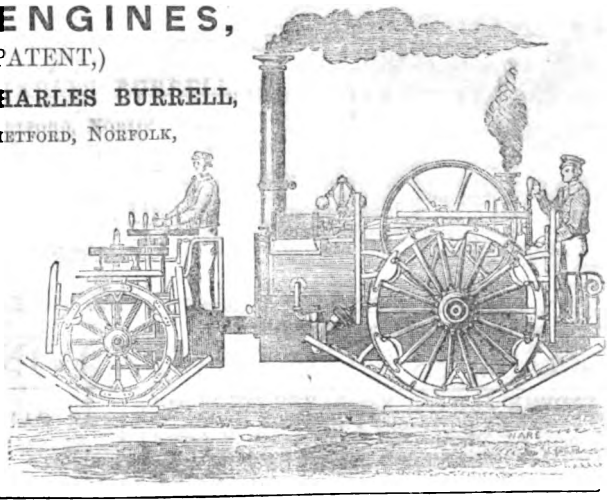

And ordered for India, Australia, and South America, may now be seen, complete and in course of construction at the above works. BOYDELL'S TRACTION ENGINES AND ENDLESS RAILWAY will draw heavier loads over good roads than any other traction engine, and on soft and bad roads will draw heavy loads where no other traction engine can move itself. All objection to the wear and tear of these Engines is entirely removed by the use of Charles Burrell's improved patent Wrought Iron Wheels, fitted with Rails and Tyre, as well as all the wearing parts, of Steel.

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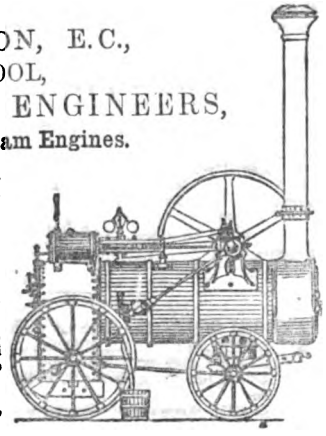


Combined Threshing Machines, which dress the corn ready for market at one operation. Grinding Mills, Saw Benches, Pumps for Irrigation and Mining purposes, with all necessary gearing for being driven by steam power. Full particulars and estimates given on application to the above address.

C. S. and Co.'s PORTABLE STEAM ENGINES are adapted for every purpose to which steam-power can be applied. When intended for winding, they are fitted with reversible link motion and winding gear. They are easy of removal, as may be seen by the engraving, and can be set to work immediately on arrival.

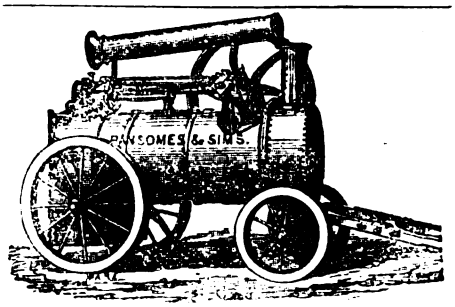
C. S. and Co. are now doing an extensive foreign and colonial business, and are prepared to send off engines and machinery of the before-mentioned kinds in a few days from the date of order. They would also call attention to the important *reduction in prices* made for the new year.

For Exportation.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (23)

VINEGAR.—Patronised by Her Majesty's Government.

CONDY'S PATENT PURE CONCENTRATED MALT VINEGAR.

Families, by using this delicious VINEGAR, insure purity and effect a saving of 50 per cent. See "Report of Dr. Letheby, City Officer of Health, Dr. Hassall, of the 'Lancet' Commission, and others." Sold by the Trade, in Bottles, labelled and capsuled. Wholesale—63 King William-street, London-bridge, E.C. Six Quart Samples sent free to any Railway for 3s. 6d. (216)



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Important to every man who keeps

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Carriage paid to any Station.

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FOG WHISTLES, for Seagoing Steamers.

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STEAM TAPS, RANGE COCKS, &c.

IMPROVED BRASS VALVES, for Steam, Water, and Gas.

W. T. HENDRY & Co., Engineers.

38 Upper Thames-street, London, E. C. (153)

TO MARINE ENGINEERS, OR SHIP-BUILDERS.

THE PROPRIETOR of a VALUABLE PATENT for Double-expansive Marine Engines (by which great economy of space and fuel is obtained) is desirous of entering into arrangements with a respectable firm for the construction of the same. An adequate portion of the patent-right would be assigned by the advertiser to any firm taking the matter up; and he would render all assistance in his power, either in London or elsewhere, amongst ship-owners (to many of whom he is well known), in obtaining contracts, &c. Unexceptionable references given. Address C. E., MECHANICS' MAGAZINE Office, 166, Fleet-street. (76

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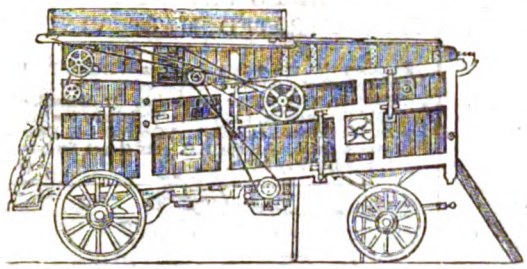

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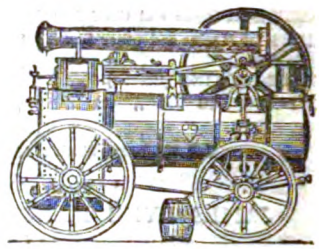

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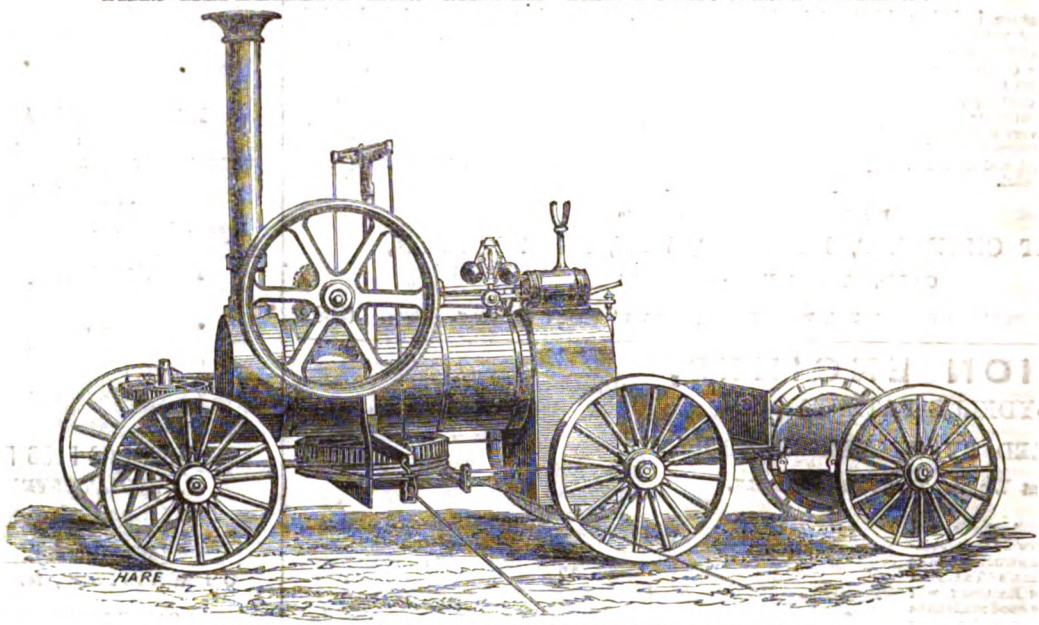

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 21. [NEW SERIES.]

LONDON: FRIDAY EVENING, MAY 20, 1859.

PRICE, FOURPENCE. BY POST 5d.

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THE GUTTA PERCHA COMPANY beg to state that the increasing demand for the Gutta Percha Strapping for Driving-bands, Lathe-straps, &c., fully justifies the strong recommendations they have everywhere received.

Their durability and strength—permanent contractability and uniformity of substance—their non-susceptibility of injury from contact with oils, grease, acids, alkalies, or water—and the facility with which the only joint required can be made in bands of from 200 to 300 feet long—render them superior to leather for almost all working purposes, and decidedly more economical.

TESTIMONIALS.

IMPORTANT ANNUAL SAVING.

From TRUMAN, HANBURY, BUXTON, & Co., Brewery, London.

"In reply to your inquiry, we have much pleasure in bearing our testimony to the advantages, both as regards economy and saving of time, effected by the use of your Patent Gutta Percha Bands in lieu of Leather Straps. The stoppage of one portion of our works through the failing of the leather strap used to be of daily occurrence—but with this annoyance we are now never troubled. We have had these straps in operation for nearly three years, and are assured by our Engineer that *they effect a saving to us of at least* THIRTY POUNDS *a year*."

From JAMES ABERNETHY & Co., Fury Hill Foundry Aberdeen.

"We have now had Gutta Percha Bands working here *for three years*. One of them has been driving the fan blast for our smith's shop for all that time, and for anything we see, may drive it as long again. The speed of the fan is but 1,200 per minute. We have used them with complete satisfaction, driving circular saws, and in some cases where leather bands would have been quite inapplicable from damp. We have uniformly endeavoured to have the drums and pulleys so proportioned to the strain, as that there is no chance of the band slipping; and with this precaution, and taking care in using *cross bands that they do not rub*, we are quite satisfied that they are superior in every respect to leather—stronger at the same weight, and keeping quite straight in working—requiring no lacings, and very seldom any repairs."

WATER POISONED BY LEADEN PIPES.

The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight.

POISONED WATER PREVENTABLE

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

From Dr. MURRAY, Hull.

"It is impossible to conceive of anything more injurious or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha Tubing. Nothing can be better. I have also recommended it to others, who have adopted the expedient."

A variety of Gutta Percha Articles, such as Mill Bands, Tubing, Sheet, Soles, Pump Buckets, Bosses, Union Joints, Bottles, Bowls, Flasks, Curtain and Cornice Rings, Solid Frames, Galvanic Batteries, &c., &c.

MANUFACTURED BY THE

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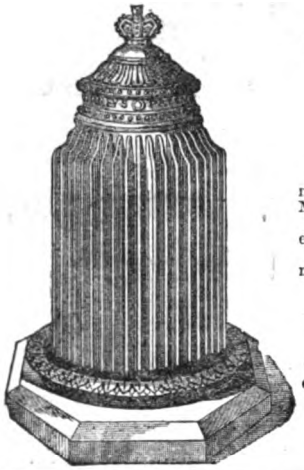

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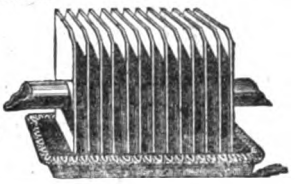

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(12)

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Simple in Construction,
Healthy and efficient in use.

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The 50s. Deflagrator warms 5 to 6,000 cubic feet at a cost of 6d. per day (twelve hours).

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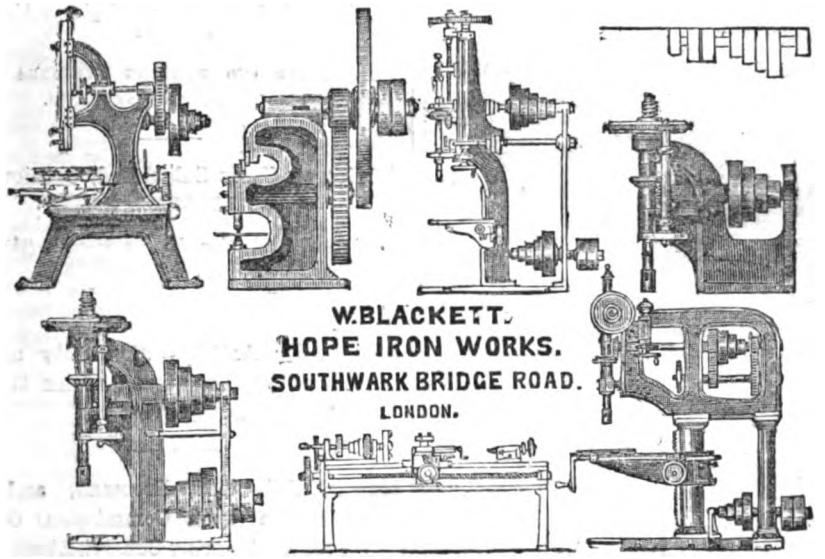
N.B.—Every Stove separately tested before sent out.

The NEW GAS COOKING STOVE for 10 persons, price £3. (103



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USED IN THE ROYAL LAUNDRY,

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WHEN YOU ASK FOR

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PATENT BREAD MACHINE.

The Journeyman Baker's and Servant's Friend. It lightens their labour and makes our daily Food clean and pure.

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PRICES CURRENT OF METALS.

London, 20th May, 1859.

	£ s. d.		£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N. of England ..... pr. ton	6 0 0	to	6 5 0	nett
Welsh Bars, in Wales .. "	6 0 0			3
Staf. Bars at the Works "	7 0 0	"	7 10 0	2½
" Hoops ..... "	8 0 0	"	8 10 0	"
" Sheets, Singles .. "	8 15 0	"	9 0 0	"
" Nail Rods ..... "	7 0 0	"	7 10 0	"
" Boiler Plates .... "	8 10 0	"	9 0 0	"
Scotch Pig, M.-Nos. Warrants, at Glasgow..... "	2 8 3		2 8 6	nett
Do. No. 1, Good Brands "	2 9 3	"	2 12 0	"
Scotch Bars ..... "	7 5 0	"	8 0 0	3
Swedish Bars, in London "	13 10 0	"	15 0 0	2½
COPPER, Sheet and Sheathing per lb.	0 1 0½			3
Tough Cake and Tile " ton	117 10 0			"
Best Selected..... "	110 10 0			"
Australian ..... "				"
South American				"
Yellow Metal Sheathing..... per lb.	0 0 10			"
STEEL, Swedish Keg ..... pr. ton	20 0 0			2½
" Faggot				"
TIN, English, Block ..... pr. cwt.	6 9 0			2½
" Bar..... "	6 19 0			"
Foreign, Banca ..... "	6 16 0			nett
" Straits..... "	6 10 0			"
TINPLATES, Charcoal, I.C. .. pr. box	1 12 0	"	1 13 0	3
Coke, I.C. ..... "	1 6 0	"	1 7 0	"
LEAD, Pig, English ..... pr. ton	23 0 0	"	23 10 0	2½
" Spanish ..... "	22 0 0			"
Sheet ..... "	23 10 0			"
SPELTER, on the spot ..... pr. ton	20 0 0	"	20 5 0	nett
for arrival..... "	20 5 0	"	20 10 0	"
ZINC, English, Sheet ..... "	28 0 0			1½
QUICKSILVER ..... per btl.	7 0 0			1½

REMARKS.—Our Metal Markets continue steady, with a very limited amount of business. Foreign Tin and Spelter have both advanced a shade in price.

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IRON AND OTHER METALS.

[FROM OUR OWN CORRESPONDENT.]

The Iron Trade—In South Staffordshire—In Lancashire—South Wales—At Glasgow—Receding Prices—Movement for Advance of Wages—South Staffordshire Trade—Suspension of Messrs. Cresswell and Sons: Meeting of Creditors—The Birmingham Trades—Sheffield Trade.

The iron trade of the country is not in a worse condition this week than it was last. South Staffordshire is no worse. In Lancashire there is a pretty good enquiry for really good iron, the prices of which do not give way. Pig iron in that district is also lower. In some portions of the South Wales there is a tolerable amount of animation. At Glasgow on Monday No. 1 went at from 48s. 6d. to 48s. 9d.; Mixed Nos. warrants, 48s. 3d. to 48s. 6d.; Makers' iron, 48s. 6d.; No. 3, 48s. 6d. Market flat. Shipped this week, 3,043 tons; last week, 8,244; total, 11,217; corresponding week last year, 11,535 tons.

In most directions prices are really downwards, for both malleable and pig iron.

A new movement has taken place in the labour market. On Wednesday a notice was posted at the several South Staffordshire iron works, demanding in the name of the puddlers of that district an advance of 1s. per ton after a certain date. It proceeds, however, from only a section of the men, and is ridiculous, because there is no probability of the advance being given.

The suspension of Messrs. Cresswell and Sons, iron-masters, Tipton, South Staffordshire, has tended to still further depress the iron trade of that district. At Birmingham on Thursday, as at Wolverhampton on Wednesday, it was evident that there was increased caution, with not a few gloomy forebodings as to this failure standing in the position of the first of others to follow. Scarcely anything has therefore been done. At the same time the malleable iron works of repute continue tolerably well employed. The smaller works also keep on, but only by accepting very low rates.—Pig iron continues almost unsaleable, except at prices so greatly in favour of buyers, that not to purchase would be extremely impolitic. Moneyed firms are deriving considerable advantage from the extremities of some of the producers of pigs. Some small quantities changed hands to-day and yesterday at £3 12s. 6d. for No. 1 best melting, and the same for a good quality of pig for malleable iron.

A meeting of the creditors of Messrs. Cresswell was held at the Queen's Hotel, Birmingham, on Wednesday, when the liabilities were shown to be about £130,000.—The Dudley and West Bromwich bank have £50,000 and £11,000 unsecured. The general creditors accepted an offer of 5s. in the pound—to be paid half in twelve months, and the other half in two years; the principal partner was present, and considerable sympathy was expressed with him by the mass of the creditors.

As in the case of the South Staffordshire iron trade, Birmingham has been otherwise than cheered by a suspension in that town since our last. On Monday the suspension of payment by Messrs. Charles Vilatti and Co.—a firm doing business with South America—was announced. The firm has been brought to a stand by the suspension of Alfred Willers and Co., of Hamburg. A meeting of creditors was to have been held yesterday (Thursday). With this exception matters are looking scarcely so bad this week as last. The shopkeepers report that their returns have very materially fallen off during the last month. The disposition among manufacturers not to make for stock will react upon the labour market until matters become more settled. The orders from Scotland and from Yorkshire and Lancashire, are few. In the foreign trade there is no improvement whatever to report. The disposition to observe the utmost caution in all the movements of trade is spreading, rather than otherwise.

As regards the trade of Sheffield, nothing whatever of importance has come under our notice during the past week, which would indicate any alteration in the state of trade since our last report. Things are still very flat in most of the staple branches.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

RAILWAY, *Stockport, Disley, and Whaley Bridge Railway.*—For the construction of the railway from Whaley Bridge to Buxton, 8¼ miles. Plans, specifications, and forms, Messrs. Locke and Errington, Engineers, 13 Duke-street, Westminster, on and after Monday next. Tenders, June 8, to the secretary, 2 Leadenhall-street, London.

GASWORKS, *Salford.*—For the apparatus, iron roofs, and other castings, for the completion of new gasworks, Regents-road, Salford. Particulars H. Brothers, Engineer; tenders, the chairman of the Gas Committee, May 31.

For the brick and stone-work in the same buildings. Tenders, May 24.

TWO AMMONIA WASHERS, *Stockport.*—With 10 feet diam., with 16 inch pipes, and valves required to connect the same, to be erected at Eaton Norris Works of the borough of Stockport. Tenders, May 25, at the gas offices, Millgate, Stockport, where plans, &c.

SCAVENGERING, *Rochdale.*—Sweeping, cleansing, and water the streets, removal of tenement rubbish, &c. (two contracts.) Particulars, the Inspectors of Nuisances. Tenders, noon, May 28, to the Town Clerk.

CHURCH, *Sturminster Marshall, Dorsetshire.*—Enlarging, repairing, and restoring. Plans, &c., Mr. J. C. Chislett, Wimborne, Dorsetshire. Tenders, Rev. W. Heathcott, Sturminster Marshall, May 24.

OLD RAILS FOR SALE.—The Vale of Neath want offers for 104 tons of Barlow's patent, and 40 tons of the bridge pattern, now lying at the Neath station. John Lovain, secretary, Neath.

GAS LAMP PILLARS AND LAMPS, *Wallasey Local Board of Health.*—One hundred pillars and lamps. Drawings, &c., the offices of the Board, 1 Church-street, Egremont, near Birkenhead. Tenders there before four, May 27.

PIPELAYING, *Merthyr Tydfil.*—For the laying down of fifty miles of cast iron socket pipes and other castings. Printed specifications and forms (a guinea each) of Mr. J. W. Russell, Clerk to the Local Board; or of Mr. Hawksley, 30 Great George-street, Westminster. Tenders to the first-named, June 1.

RESERVOIR, *Halifax.*—Water-works Committee of the Corporation. Drawings, &c., Mr. G. W. Stevenson, borough engineer. Tenders, Town Clerk, May 30.

CHURCH, *Lumley.*—Plans, &c., Mr. M. Thompson, architect, 5 Eldon-square, Newcastle-on-Tyne. Tenders, Rev. John Dodd, Chester-le-street, June 1.

CHURCH, PRESBYTERY, AND SCHOOL, *Liverpool.*—At Much Woolton. Plans, &c., the Priory, Much Woolton, or at the office of Mr. R. W. Hughes, 6 Winckley-street, Preston, from May 23. No date given.

CATHOLIC CHURCH AND PRESBYTERY, *Ripon.*—Plans, &c., Messrs. J. A. Hansom and Son, architects, Devonshire Villa, Clifton, Bristol, who also will say where the plans may be seen at Ripon. No date given.

CHURCH, *Lawbridgeworth, Herts.*—Plans until the 20th inst., at Mr. G. E. Pritchard, 12 Bishopsgate-street Without, and Bishop Stortford, Herts. No date given.

CHAPEL, *Whitley, near Knottingley.*—Chapel of Ease. Plans, Miss Broadhead, Christian Knowledge Society's Depository, Pontefract. Tenders, May 28.

CHAPEL, *New Basford.*—Enlargement of Baptist Chapel, and construction of new School Rooms. Particulars, Mr. John S. Norris, architect, Market-street, Nottingham. No date given.

CHAPEL, *Pullheli.*—Baptist. Whole works, or any separate portion. Drawings till May 21, with Mr. G. Jones, Bryhyfyd, Pullheli, Merchant. Tenders May 28.

SCHOOL, *Haslington, near Crewe, Cheshire.*—New Schools and Master's Residence. Drawings in the Vestry Room of the Church, and further information, Mr. James R. Colling, 6 Ridgemont-place, Hampstead. Tenders, May 25.

SCHOOL-ROOM AND MISTRESSES' HOUSE, *Leer Green, near Beaconfield.*—Specifications at the Parsonage there, and at 102 Guildford-street, Russell-square. Tenders to Rev. Henry Herbert, Leer Green, May 28.

SCHOOLS, *Burlescombe, Devon.*—National School. Plans, the Vicarage, and Mr. John Back's, Welland. Tenders, May 23.

SCHOOLS, *Fraserburgh, Scotland.*—Masons', carpenters', plumbers', plasterers', and slaters' work of schools and teachers' dwelling-houses. One contract, if desired. Plans, Messrs. A. and W. Reid and Mackenzie, architects, 29 Union-street, Aberdeen; or with Mr. Farquhar Smith, Fraserburgh. Tenders, May 23.

TOBACCO PIPE FACTORY, *London.*—In Wharf-road, City-road Basin, for J. M. Morrice, Esq. Plans, &c., Mr. A. B. Frend, 44 Bedford Row.

HOUSES, *Wandsworth Common.*—Finishing five small houses. Drawings, &c., with Mr. W. P. Padmore, 16 Great Marlborough-street, where tenders before noon, May 25.

HOUSE, *Aldmeldrum, Scotland.*—For the masons', carpenters', slaters', and plasterers' works of a dwelling-house to be erected on a fen adjoining Glen Garioch Distillery, Aldmeldrum. Plans, &c., at the Distillery. Tenders, May 28.

HOUSE, *Weston Point, near Runcorn.*—New house for the Harbour Master. Plans, Mr. E. L. Williams, jun., engineer's office, Northwich. Tenders, June 1.

ROAD MATERIAL AND GENERAL SCAVENGERING, *St. Giles's District.*—Particulars, 199 Holborn. Tenders, 10 p.m., May 24.

DUSTING AND SCAVENGERING, *St. Saviour's District.*—For three years. Particulars and form, Board Room, Emerson-street, Bankside, Southwark. Tenders, 5·30 p.m., May 25.

PLANS WANTED.—For School premises at Taunton. Cost not to exceed £4,000. First premium £75, or five per cent; second, £25. Conditions, &c., Rev. G. S. Underwood, Secretary to Independent College, Taunton, Somerset. Plans, June 20.——New Banking House, Swansea. £25 for the approved design. Particulars, the Manager of the Glamorganshire Banking House, Swansea, June 15.——Chapel of Ease, Whipton, near Exeter; to accommodate 200; and to have nave, chancel, and hill turret. Estimates not to exceed £900, with internal fittings. Mr. Rew, Whipton Barton, will show the ground. Plans, &c., to the Vicar of Havitree, May 31.——Police Station, Cardiff. Particulars, Town Clerk. Designs, May 28.——For a Baptist Chapel, Stoke's Croft, Bristol. Instructions, Rev. E. Probort, 4 Clevedon-terrace, Kingsdown. Designs to Messrs. Ashmead and Son, 19 Small-street, Bristol, June 30.

OLD RAILS FOR SALE, *London, Brighton, and South Coast Railway.*—2,000 tons. Forms of tender, Mr. W. Walker, store keeper, Brighton terminus. Tenders to the Secretary, May 26.

GAS WORKS MANAGER.—Quantity of gas, twelve millions per annum. Salary, £100, with house, coals, and gas. Applications to the chairman of the Gas Committee of the Improvement Commissioners, Town Hall, Southport, May 26.

ENGINEERS' FOREMAN.—For a London shop. S. Scadding's Library, Belgrave-road, Pimlico, S.W.

MARINE ENGINE DRAUGHTSMAN.—G. B. R., 6 Holland street, Blackfriars Road, S.

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OWING to the continued ill health of the Proprietor, the first-class business of an Engineer and Crane and Block Maker is offered for sale. It has been established in the Metropolis for nearly 30 years, and has enjoyed extensive patronage amongst Brewers, Manufacturers, Warehousemen, and others, in and about London; the business done amounting to nearly £8,000 per annum. About £3,200 would be required, (part of which, however, may remain for any reasonable time on good security,) which is the bare value of the tools, patterns, and stock in trade. The premises, including good dwelling-house, very conveniently situated, and capable of accommodating from 60 to 70 hands, are held upon a long lease, at an extraordinary low rental, not exceeding £100 per annum, taxes included. Many of the tools are nearly new, and of the best construction. The present proprietor, who relinquishes the business solely on account of ill health, would give every assistance in his power to those succeeding him; and as his foreman, who has been with him for nearly ten years, is thoroughly acquainted with the practical parts of the business, any gentleman desirous of commencing as a manufacturing engineer would find the present a very favourable opportunity. As all accounts have been, for many years past, collected quarterly, a very small amount, say £800, would suffice as working capital. Full particulars may be obtained by application to E. E. ALLEN, Esq., MECHANICS' MAGAZINE Office, 166 Fleet Street, E.C. (130)

INDIA-RUBBER VALVES FOR STEAM ENGINES, PUMP PACKING, &c.—Explanatory Drawings and Information as to the best modes of fitting and arranging the above, and all other Mechanical Applications of VULCANISED INDIA-RUBBER, are furnished post-free by

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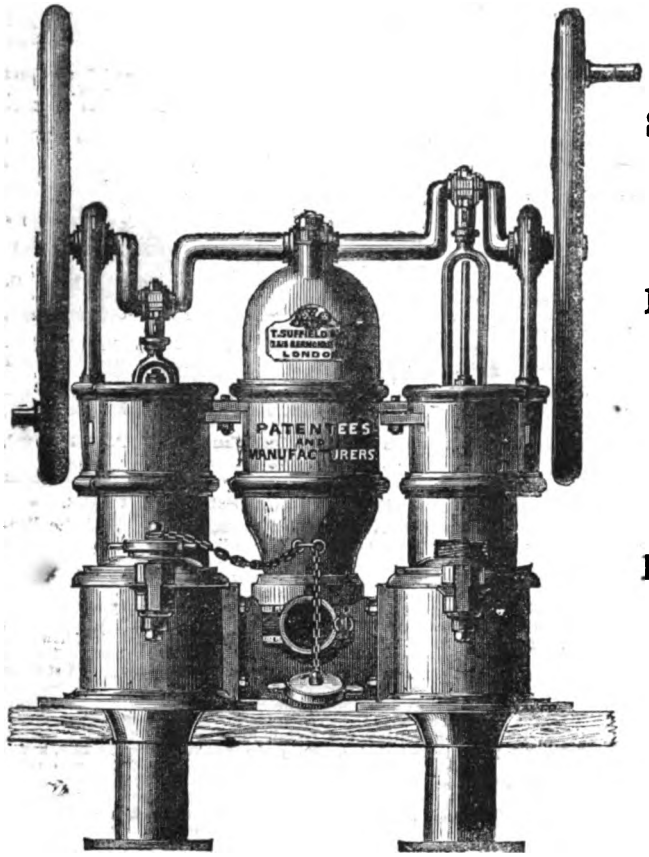

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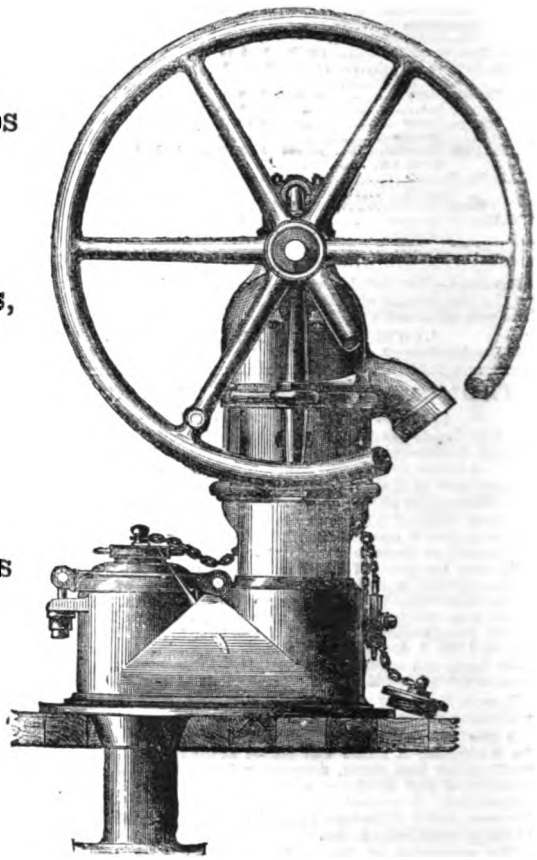

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These Counters register the number of revolutions made by an engine or other mechanism. They may be used for ascertaining the duty of Pumping Engines and Water-wheels; the revolutions on board a steam-vessel; to calculate the slip of the propeller; and in a locomotive to test the slip of the wheels.

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Society of Arts Prize Medal, 1855.

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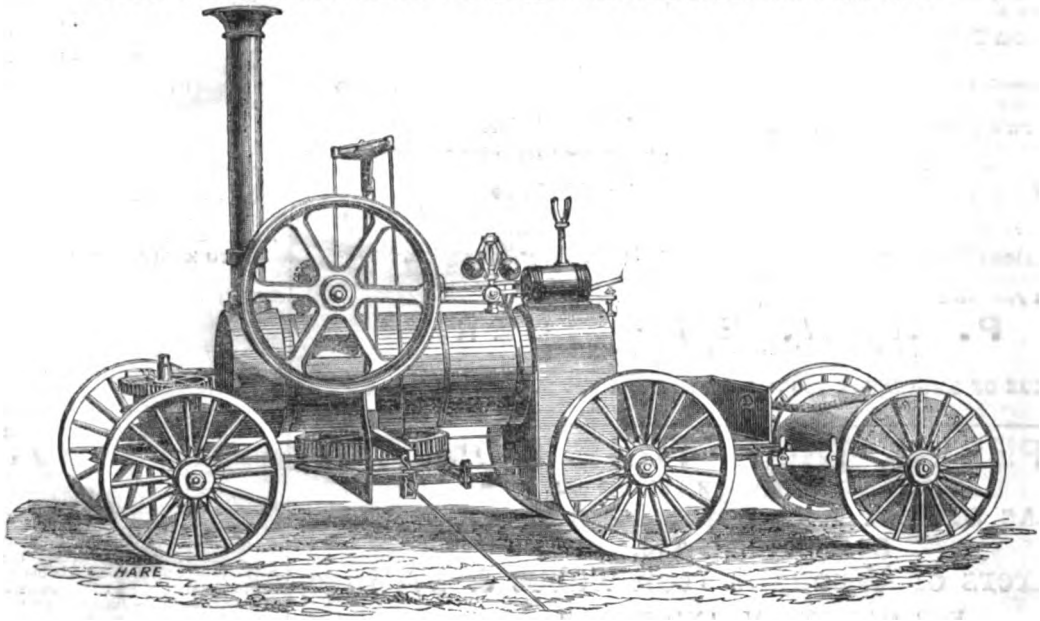

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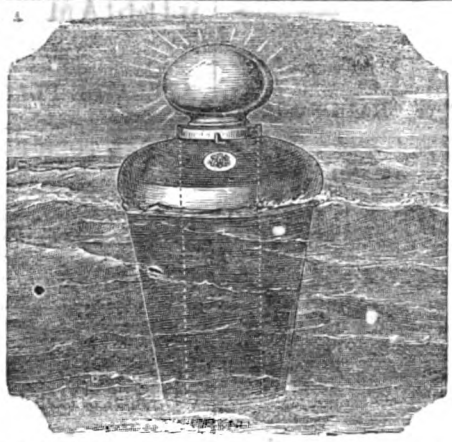

The RECORD BUOY is intended to be kept in some place available for instant use, and to be thrown overboard from a sinking ship, or a Vessel on Fire, so as to intimate disaster, having a paper inserted therein, already filled up with the Ship's Name, Port of Registry, Official Number, &c., and a few last words hastily written, intimating the nature of the calamity, with any further information that can be given at such a time. It has capacity and buoyancy to contain besides these, the Log Book, and several pounds' weight of Papers or Valuables. It is lined with Cork between the Cylinder and outside case, so that, although waterlogged, it will not sink, but keep afloat for a long time, probably for years.

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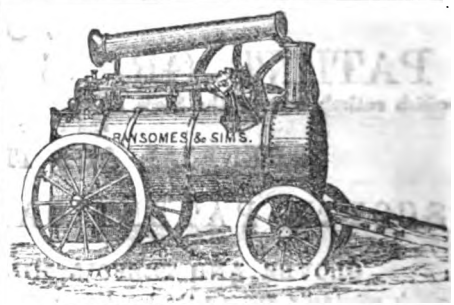

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 22. [NEW SERIES.]

LONDON: FRIDAY EVENING, MAY 27, 1859.

PRICE, FOURPENCE. BY POST 5d.

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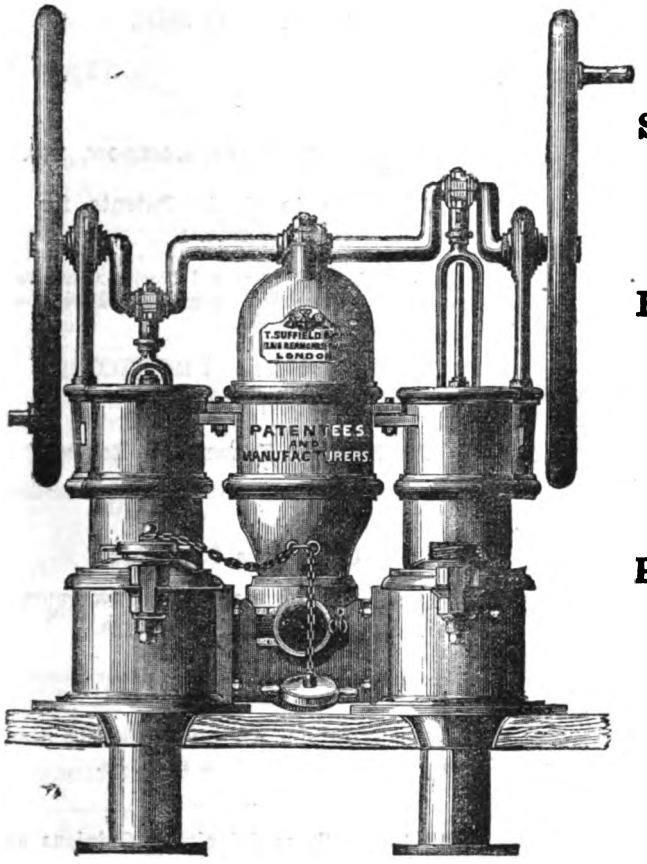

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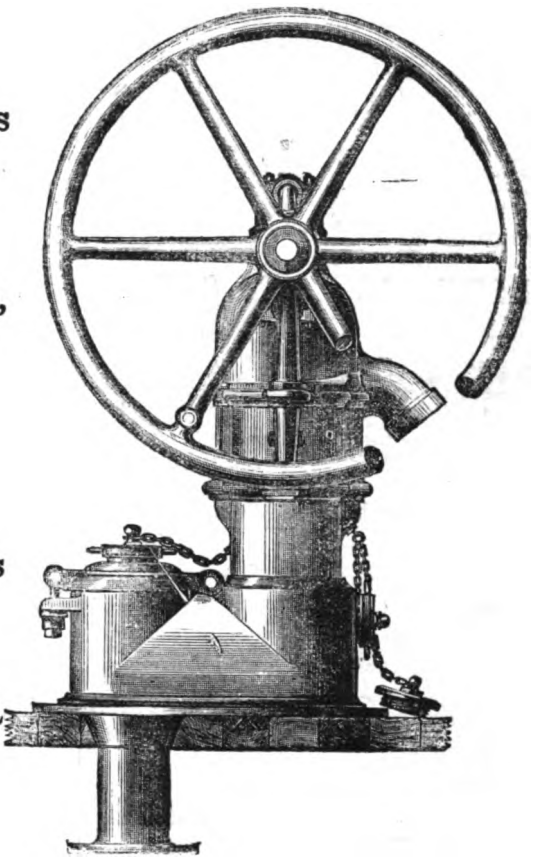

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EDWIN JEWITT, ENGRAVER ON WOOD AND DRAFTSMAN, 1 Pickett-place, Strand, near Temple-bar. Engineering, Scientific, and Mechanical Designs accurately engraved. Manufacturers and Tradesmen's Catalogues Illustrated. W.C. (84)

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PRICES CURRENT OF METALS.

London, 27th May, 1859.

	£ s. d.	£ s. d.	Dis. p. et.
IRON, Rails in Wales and N. of England .....pr ton	6 0 0 to	6 5 0	nett
Welsh Bars, in Wales .. „	6 0 0		3
Staf. Bars at the Works „	7 0 0 „	7 10 0	2½
„ Hoops ..... „	8 0 0 „	8 10 0	„
„ Sheets, Singles .. „	8 15 0 „	9 0 0	„
„ Nail Rods ..... „	7 0 0 „	7 10 0	„
„ Boiler Plates .... „	8 10 0 „	9 0 0	„
Scotch Pig, M.-Nos. Warrants, at Glasgow..... „	2 7 6		nett
Do. No. 1, Good Brands „	2 7 0 „	2 10 0	„
Scotch Bars ..... „	7 5 0 „	8 0 0	3
Swedish Bars, in London „	13 10 0 „	15 0 0	2½
COPPER, Sheet and Sheathing per lb.	0 1 0		3
Tough Cake and Tile „ ton	107 10 0		„
Best Selected..... „	110 10 0		„
Australian ..... „			„
South American			„
Yellow Metal Sheathing.....per lb.	0 0 10		„
STEEL, Swedish Keg .....pr. ton	20 0 0		2½
„ Faggot			„
TIN, English, Block .....pr. cwt.	6 9 0		2½
„ Bar..... „	6 10 0		
Foreign, Banca..... „	6 15 0		nett
Straits..... „	6 10 0 „	6 11 0	„
TINPLATES, Charcoal, I.C. ..pr. box	1 12 0 „	1 13 0	3
Coke, I.C. ..... „	1 6 0 „	1 7 0	„
LEAD, Pig, English .....pr. ton	23 0 0 „	23 10 0	2½
„ Spanish ..... „	22 0 0 „	22 10 0	„
„ Sheet ..... „	23 10 0		„
SPELTER, on the spot .....pr. ton	19 7 6		nett
for arrival..... „	19 7 6		„
ZINC, English, Sheet ..... „	28 0 0 „	30 0 0	1½
QUICKSILVER .....per btl.			1½

REMARKS.—Business is quiet, and there is scarce anything in the position of the different Metals to call for remark.

LAWRIE AND HAGGER, Metal Brokers.
33 Lombard-street, E.C.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

AUSTRALIAN MAIL, *Admiralty.*—For the conveyance of Her Majesty's Mails between Great Britain and Australia, *viâ* Panama. Monthly by Steam Vessel each way. Printed views to be had at the Admiralty, where tenders by half-past one on the first of July.

RAILWAY, *Caledonian.*—For the erection of that part of the Dulmarnock Branch, extending from the Clydesdale Junction Railway to the south embankment of the river Clyde. Plans and information, Mr. Geo. Graham, engineer, Buchanan-street, Glasgow, to June 7, when tenders.

RAILWAY, *Blyth and Tyne.*—Altering and improving the levels from Prospect-hill to Holywell, two miles. Plans, &c., Mr. G. F. Fore, engineer, Market-street, Newcastle-on-Tyne. No date given.

GASHOLDER, &c., *Belper.*—For the erection and construction of tank for new gasholder; new gasholder; purifier, scrubber, condensers, inlet and outlet to new gasholder, governor, and street main. Plans, &c., of Mr. T. Jamison, Field-head, Belper. Tenders to May 30.

GASHOLDER TANK, *Cardiff.*—Gas Light and Coke Company. Excavating, puddling, brick and stone work. Plans at the Company's offices, Cardiff. Tenders to 8th June.

STEAM COOKING APPARATUS, *Waterford.*—At the Workhouse, for 1,000 inmates. Tenders to Chairman of Guardians up to 11 o'clock, June 9.

CHURCH, *Caledfwlch.*—For completing a new church at Caledfwlch. Plans, &c., from Mr. David Gwillim, Parish Clerk, Llandilo Fawr. Further information from the Rev. John Griffiths, Vicar, personally or by letter. No date specified.

CHURCH, *Ile Brewers, Somerset.*—For the rebuilding of the parish church. Drawings, &c., at the vicarage house, and tenders until June 10.

CHURCH, *Herts.*—For the enlargement, &c., of the parish church at King's Langley. Plans, &c., at the National School-room, until June 1st. Tenders until June 1st. Information of Mr. D. Brandon, architect, 24 Berkeley-square, London.

VICARAGE HOUSE, OFFICES, AND STABLE BUILDINGS, *Tisbury, Wilts.*—Plans at office of Mr. James Soppitt, architect, Shaftesbury, Dorset. Tenders to same, till 1st June.

HOSPITAL, *Chesterfield.*—For the erection of a new hospital. Plans, &c., of Mr. Wallis, Market-place. Tenders to June 6.

POLICE STATION AND PETTY SESSIONS ROOM, *Honiton.*—Plans at Offices of the Clerk of the Peace, at the Castle of Exeter, and of Mr. Stamp, Clerk of the Justices, Honiton. Tenders to June 6th.

POLICE STATION, *Andover.*—For making the alterations, &c., necessary for converting the borough gaol of Andover into a county police station. Plans, &c., of the County Surveyor, St. Swithin-street, Winchester. Plans, &c., at the Police Station at Andover. Form of Tender at the Office of Clerk of the Peace, County Hall, Winchester. Tenders to June 1.

HOUSES, *Kirkstall.*—Enlarging, &c., a villa residence at Kirkstall. Plans, &c., of Mr. Thomas Shaw, architect, 2 Belgrave-square, Leeds. Tenders to June 1.

HOUSES.—Completion of four at Tulse Hill, Lower Norwood. Plans, offices of Mr. T. E. Knightley, 25 Cannon-street, City. Tenders at offices of the United Building Land and Investment Company, 29 Poultry, to June 1.

BATHS, *Manchester.*—A third establishment for the Manchester and Salford Baths and Laundries' Company. Particulars, Mr. Worthington, 54 John Dalton-street, to whom names. No date specified.

EIGHT COTTAGES, *Disley.*—Drawings, &c., Mr. E. Ollerenshaw, corn dealer, Disley. Tenders, May 31.

POOR-HOUSE, *Scotland.*—At Tullylumb. Plans, &c., Mr. A. Heighton, architect, Perth. Tenders to the Lord Provost, at the Chief Clerk's, Perth, June 20.

NEW ROAD, *Scotland.*—About three miles in length, near Crigan Ferry, Argyleshire. Plans, &c., with Mr. Hugh Mackenzie, road surveyor, Oban, with whom contracts, May 30.

ROADS, *Bilston.*—The Bilston Turnpike Trust invite tenders for team work and repairs, for one or three years, from the 30th of June next. Tenders June 6, Messrs. Willim and Hall, clerks to the trustees, Bilston.

BRICK BURNING, *Chester and Mold Railway.* — 600,000 common field bricks, to be used this summer, near Padeswood station. To be burnt in clumps. J. B. M., post-office, Hawardine, Flintshire.

STAVES AND IRON HOOPS, *Admiralty.*—For Deptford and Gosport. Separate tenders for each port. Samples at Deptford and Gosport. Conditions of the revised contracts at Gosport, Liverpool, and Bristol. Tenders, half-past one on the 2nd June.

COAL FREIGHTS.—The Directors of the London and Brighton South Coast Railway want tenders for freight of from 18,000 to 22,000 tons of coals from the River Tyne to Kingston Wharf, near Shorcham. Forms and particulars, storekeeper, Brighton terminus. Tenders, June 9.

SEWERAGE WORK, *London.*—For the general work and repairs to the sewers in the district of the vestry of St. James's. Forms, 14 Marshall-street, Golden-square; where tenders, June 15.

SUPPLIES FOR BOARD OF HEALTH, *Borough of Preston.*—For 12 months' iron work, brass, copper, tin, lead, &c., stone, earthenware, pipes, and sundries. Specifications, Offices of the Board, 16 Church-street. Tenders to the Chairman of the "Finance Committee," with the Surveyor by 1st June.

GRANITE AND FLINTS.—*Commercial-road East, London.*—Forms, 3 Crosby-square, Bishopsgate-street. Tenders, June 7.

PARTNERSHIP INTEREST WANTED.—In an engineering or iron ship-building firm, to introduce patents connected with such businesses. L. F. G., 163 Strand.

LOCOMOTIVE TANK ENGINE WANTED. — New or second-hand. Full particulars, Alpha, William Dawson and Sons, 74 Cannon-street, London, E.C.

IMPLEMENT MAKER.—A practical man to take charge of the fitting department, and to be thoroughly conversant with lawn-mowing machines. Q. Y. Z., 163 Strand, W.C.

ASSISTANT DRAUGHTSMAN.—In an engineering and ship-building establishment. Application to state salary, and to be accompanied with a drawing of a pair of marine engines and a practical rigging draught. L. M. N., Belfast Post Office.

LOCOMOTIVE DRAUGHTSMAN.—Y, 163 Strand, with terms.

AN AGENT.—On commission for the sale of a cheap patented article for marine and other steam engines. H. N., Mr. Lindley's, 19 Catherine-street, Strand.

SURVEYOR, *Hulme.*—£200 per annum. Applications to the chairman of the Hulme committee, township offices, Hulme, June 3.

FOREMAN MACHINERY.—To take charge of the work and machinery. Knowledge of shipwright's work advisable. Box 53, Post-office, Sheffield.

PRINTING MACHINE WANTED. — Second-hand, size, 48 inches by 36 inches, or 42 inches by 28 inches. James Hogan, Dudley-road, Wolverhampton.

RANSOME'S PATENT IMPERISHABLE SILICEOUS STONE. — Chimney-Pieces, Balustrades, Capitals, Trusses, Terminals, Fountains, Vases, Monuments, &c., of great beauty, at the most reasonable prices.

For Particulars, Specimens, Illustrations, and Agencies, apply to Mr. Frederick Ransome, Whitehall Wharf, Cannon-row, Westminster; or Patent Stone Works, Ipswich. A Liberal Discount allowed to the Trade or to Shippers. (147)

MR. WALTER HALL is prepared to Grant Licences, or to Dispose of his Patent for working Railway Breaks. Particulars to be had of Mr. HALL, who may be addressed by letter to the care of the MECHANICS' MAGAZINE, 166 Fleet-street, E.C. (217)

ENGINEERING BUSINESS FOR SALE.

OWING to the continued ill health of the Proprietor, the first-class business of an Engineer and Crane and Block Maker is offered for sale. It has been established in the Metropolis for nearly 30 years, and has enjoyed extensive patronage amongst Brewers, Manufacturers, Warehousemen, and others, in and about London; the business done amounting to nearly £8,000 per annum. About £3,200 would be required, (part of which, however, may remain for any reasonable time on good security,) which is the bare value of the tools, patterns, and stock in trade. The premises, including good dwelling-house, very conveniently situated, and capable of accommodating from 60 to 70 hands, are held upon a long lease, at an extraordinary low rental, not exceeding £100 per annum, taxes included. Many of the tools are nearly new, and of the best construction. The present proprietor, who relinquishes the business solely on account of ill health, would give every assistance in his power to those succeeding him; and as his foreman, who has been with him for nearly ten years, is thoroughly acquainted with the practical parts of the business, any gentleman desirous of commencing as a manufacturing engineer would find the present a very favourable opportunity. As all accounts have been, for many years past, collected quarterly, a very small amount, say £800, would suffice as working capital. Full particulars may be obtained by application to E. E. ALLEN, Esq., MECHANICS' MAGAZINE Office, 166 Fleet Street, E.C. (130)

ARTESIAN WELLS, BORING TOOLS, PUMPS, &c. Engineers, Architects, Surveyors, Builders or others requiring a good supply of Water may have any quantity procured by W. SPELLER, 14 York-street, Blackfriars'-road, London, where may be had any quantity of Tools for Sinking or Boring, from 2 to 20 inches diameter, and from 100 to 2,000 feet depth; also Men and Tools to bore for Railroads, Minerals, &c., in any part of the world. Boring Tools and suitable Pipes for exportation, with full instructions for their use.

Builders, Contractors, Brickmakers, Barge and Ship Builders, and others, can be supplied with Wrought or Cast Iron Pumps, Double or Single, for excavation of Deep Wells, from 3 to 14 inches in the bore, and from 6 to 130 feet in length, to work by hand or Steam Power.

Hot-Water Apparatus for Conservatories, &c., on the most economical and improved principles.

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Not only Deodorizes but Disinfects perfectly, and DESTROYS FOR EVER the cause of infection.

Is not poisonous, as it may be used to purify water. Evolves no noxious or unpleasant gas. Cannot be mistaken for any other fluid, thereby preventing death and disease; and is therefore the best, safest, cheapest, and most pleasant disinfectant ever introduced.

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The Public are recommended to use this Fluid, properl diluted with water, frequently and habitually in larders, sculleries, dairies, musty cakes, sick rooms, close places, &c., as it has numerous advantages, and can be used with certain immediate success and perfect safety.

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Free to Railway on receipt of Order or Stamps. (238)

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This system gives great facilities for simplifying Machines, and for mechanical combination, and has the advantage of being noiseless and cleanly, there being no oil or grease used on the wheels. Wheel Catalogues and Circulars, giving particulars, sent free by Post; also, a list of manufacturing Agents, and information regarding those who, from locality or experience, are best able to execute orders for the description of work required.

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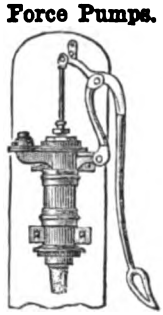
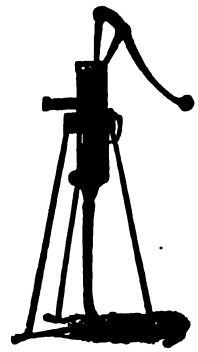
Patent Vibrating Standard Lift and Force Pumps.





PATENT CAST-IRON PUMP fitted with J. Warner and Sons' Patent Bucket and Sucker, which cannot clog in action, for Farms, Cottages, and Wells, not exceeding 28 feet.

Dia.	Height.	£	s.
2½ in. short	1 ft. 7 in.	1	10
2½ in. long	3 ,, 3 ,,	1	14
3 ,,	6 ,, 6 ,,	2	8
3½ ,,	3 ,, 6 ,,	3	3
4 ,,	3 ,, 6 ,,	3	3
2½ ,,	3 ,, 6 ,,	3	3
2½ in. short, with 15 feet of Lead Pipe attached, ready for fixing		2	14
2½ in. long. do. do.		2	18

PATENT BRASS LIFT AND FORCE PUMP, on Plank, for House purposes, supply of Cisterns, &c.

	£	s.
2½ inch	6	0
3 ,,	7	5
3½ ,,	8	0

A lighter Pump of 3 inches diameter, can be supplied if required 5 15

IMPROVED LIQUID MANURE, OR GENERAL PORTABLE PUMP.

These Pumps are fitted with J. Warner and Son's Patent Bucket and Sucker, and cannot clog in action. The Barrel is of Galvanized Iron, not likely to corrode, and can be raised or lowered at pleasure. The legs will fold together, and the whole may be carried on shoulder to any pond or tank required.

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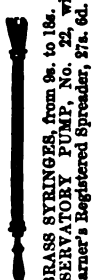

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(To hold Thirty Gallons), £3 3s.,

is intended for all large Establishments where much watering is done by the watering-pot. By its use much time and labour of the Gardener are saved, particularly where the Tank, Pond, or Pump is at a distance from the garden.

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Bells for Churches, Chapels, Colleges, Schools, Turret Clocks, &c., cast for any size, note, or weight, singly or in peals. Tuned by machinery. Stocked and wheeled ready for fixing. Old Bells re-cast or taken in exchange.

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CONDY'S PATENT PURE CONCENTRATED MALT VINEGAR.

Families, by using this delicious VINEGAR, insure purity and effect a saving of 50 per cent. See "Report of Dr. Letheby, City Officer of Health, Dr. Hassall, of the 'Lancet' Commission, and others." Sold by the Trade, in Bottles, labelled and capsuled. Wholesale—63 King William-street, London-bridge, E.C. Six Quart Samples sent free to any Railway for 3s. 6d. (216)

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It effectually cleanses the Crevices of Baby-linen, Collars, Wristbands, &c., without the possibility of injuring the Linen or Collars. Received 500 Testimonials.

PRICES.

No. 2 Washes 9 Shirts in from 3 to 10 minutes; or 4 Sheets in 5 minutes	£5 5 0
No. 3 Washes 12 Shirts in from 3 to 10 minutes; or 6 Sheets in 5 minutes	7 11 0
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USED IN THE ROYAL LAUNDRY,

AND PRONOUNCED BY HER MAJESTY'S LAUNDRESS TO BE THE FINEST STARCH SHE EVER USED.

WHEN YOU ASK FOR

GLENFIELD PATENT STARCH,

SEE THAT YOU GET IT,

as inferior kinds are often substituted.

Sold by all Chandlers, Grocers, &c., &c. (75)

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PATENT BREAD MACHINE.

The Journeyman Baker's and Servant's Friend. It lightens their labour and makes our daily Food clean and pure.

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(ESTABLISHED A.D. 1778),

EARNESTLY solicit the continued support of their numerous Friends, Agriculturists, Shippers, and others; the additions made to their Works during the present year, in the erection of new sets of Workshops, fitted with the best mechanical appliances for producing Machinery of the most improved construction, expeditiously and economically, justifies their soliciting increased support, while their leading reputation as Inventors and Manufacturers of FIRST CLASS Agricultural Machinery, is a sufficient guarantee that every Machine supplied from Leiston Works will prove to the entire satisfaction of the purchaser.

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THE PRIZE CORN AND SEED DRILLS.
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&c. &c. &c.

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OF LINCOLN,

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AGRICULTURAL AND GENERAL ENGINEERS,

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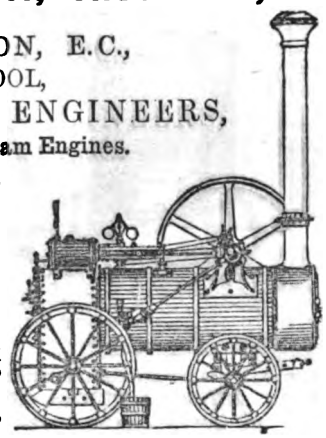

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With Guards, 32/, 37/6 „
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Forsyth's Safety Boiler Plugs, 12/6 and 18/ each.
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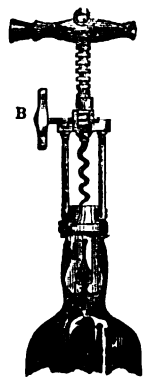

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"The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight. The water has cut these deep pits almost through the pipe, and not only upon the portion which we have illustrated, but has formed similar chasms throughout the entire length."—*Expositor*.

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The Gutta Percha Company have been favoured with the following letter,

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"It is impossible to conceive of anything more injurious, or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha. Nothing can be better. I have also recommended it to others, who have adopted the expedient.

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Bottles,
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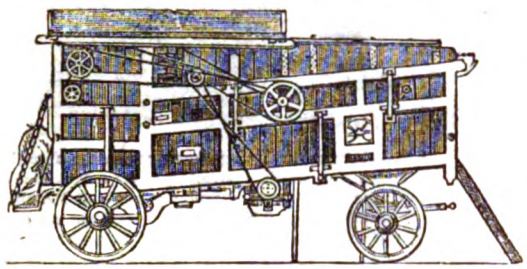

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PUMPS, CRANES, CRABS, SCREW-JACKS, &c.

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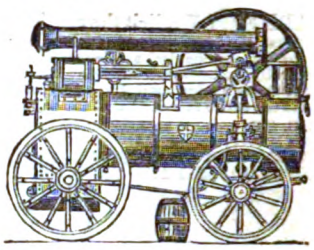
(34)



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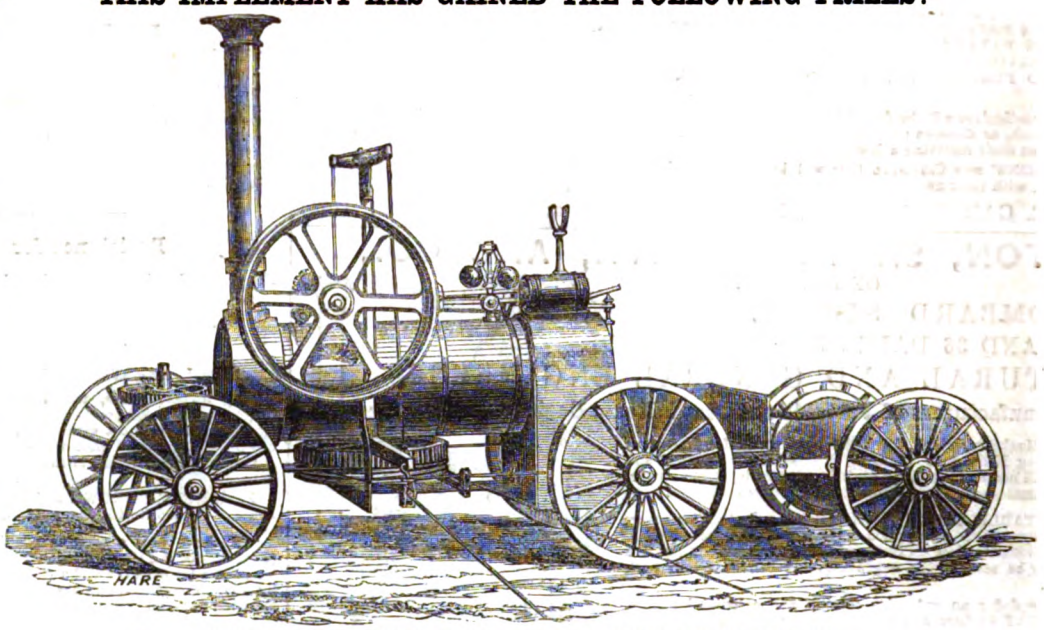

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FOR FURTHER PARTICULARS APPLY TO

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TO ARCHITECTS AND BUILDERS.—In consequence of numerous complaints, the Patentee begs to inform the above, that all genuine

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For Swing Doors, are stamped with Name and Address, thus—

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and that Springs thus marked are warranted.

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are admitted by all to be the most perfect invention for the purpose. Diagrams and List of Prices on application.

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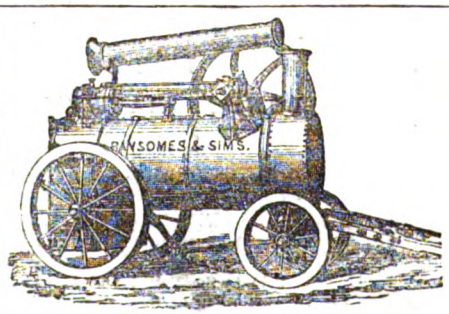
Apply to Messrs. PAGE and CAMERON, 64 Old Broad Street, E. C., London. (124)



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For Gas, Water, and Steam,

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(188)

Published by RICHARD ARCHIBALD BROOMAN, at the MECHANICS' MAGAZINE Office, 166 Fleet-street, in the Parish of St. Dunstan's-in-the-West, in the County of Middlesex; and printed by JAMES JUDD, of 14 Holford-square, Pentonville, in the County of Middlesex, and HENRY ALEXANDER GLASS, at their Office, 38A New Bridge-street, in the Parish of St Anne's Blackfriars, in the City of London.—Friday, May 27 1859.

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 23. [NEW SERIES.]

LONDON: FRIDAY EVENING, JUNE 3, 1859.

PRICE, FOURPENCE. BY POST 5d.

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18th May, 1859. (264)

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IN the matter of Letters Patent granted to EDMUND ALFRED PONTIFEX, of the Firm of PONTIFEX and WOOD, of Shoe-lane, in the City of London, Chemical Manufacturers, for "Improvements in the manufacture of Tartaric and Citric Acids, and Tartrate of Potash and Soda." Dated 12th March, 1856. No. 598.

NOTICE is hereby given that the said EDMUND ALFRED PONTIFEX has applied by Petition to the Commissioners of Patents according to the Statute in that case made and provided, for leave to enter a Disclaimer of certain parts of the Specification of the said Letters Patent.

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AND

LAP-WELDED IRON BOILER TUBES.

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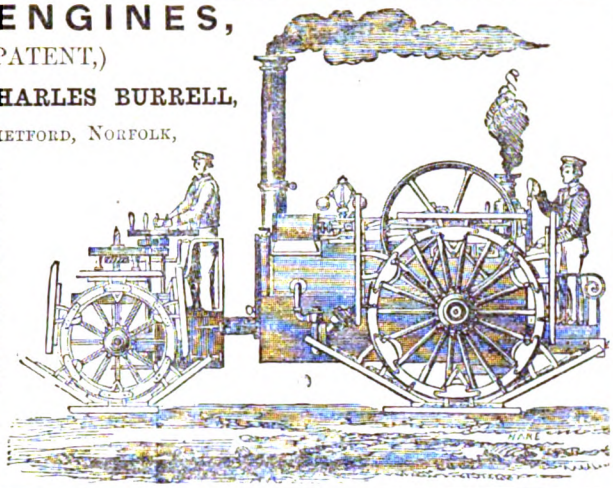

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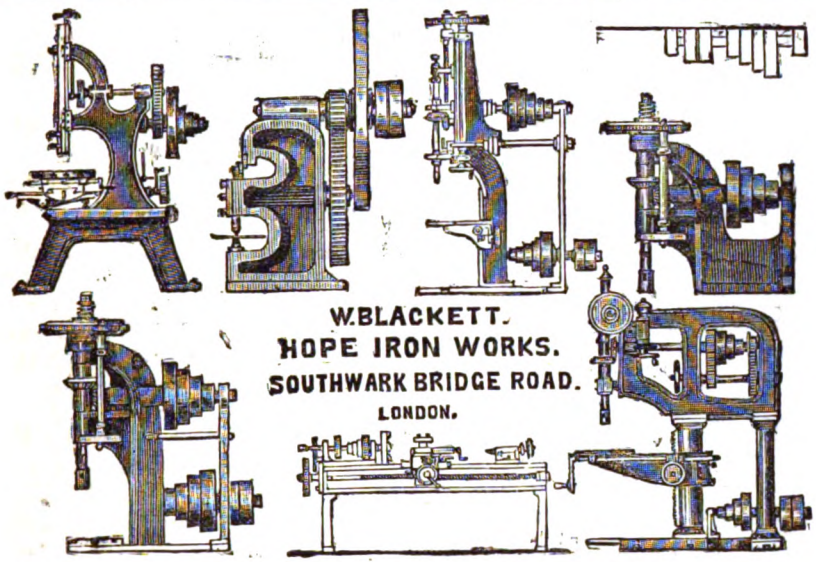

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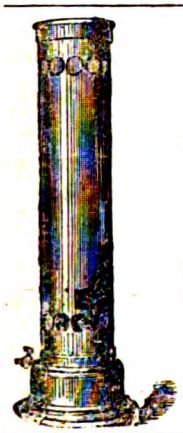

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"MECHANICS' MAGAZINE" & PATENT OFFICE

166 FLEET STREET, LONDON, E.C. (16

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PRICES CURRENT OF METALS.

London, 3rd June, 1859.

	£ s. d.		£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N. of England ..... pr. ton	6 0 0	to		nett
Welsh Bars, in Wales .. "	5 15 0		6 0 0	3
Staf. Bars at the Works "	7 0 0	"	7 10 0	2½
" Hoops ..... "	8 0 0	"	8 10 0	"
" Sheets, Singles .. "	8 15 0	"	9 0 0	"
" Nail Rods ..... "	7 0 0	"	7 10 0	"
" Boiler Plates .... "	8 10 0	"	9 0 0	"
Scotch Pig, M. Nos. Warrants, at Glasgow ..... "	2 8 0	"	2 9 0	nett
Do. No. 1, Good Brands "	3 9 0	"	2 11 0	"
Scotch Bars ..... "	7 5 0	"	8 0 0	3
Swedish Bars, in London "	13 18 0	"	15 0 0	2½
COPPER, Sheet and Sheathing per lb.	0 1 0			3
Tough Cake and Tile " ton	107 10 0			"
Best Selected ..... "	110 10 0			"
Australian ..... "				"
South American				"
Yellow Metal Sheathing ..... per lb.	0 0 10			"
STEEL, Swedish Keg ..... pr. ton	20 0 0			2½
Faggot				"
TIN, English, Block ..... pr. cwt.	6 9 0			2½
" Bar ..... "	6 10 0			
Foreign, Banca ..... "	6 15 0			nett
" Straits ..... "	6 11 0	"	6 11 0	"
TINPLATES, Charcoal, I.C. .. pr. box	1 12 0	"	1 13 0	3
Coke, I.C. ..... "	1 6 0	"	1 7 0	"
LEAD, Pig, English ..... pr. ton	22 0 0	"	23 10 0	2½
" Spanish ..... "	22 0 0	"	22 10 0	"
" Sheet ..... "	23 10 0		21 0 0	"
SPELTER, on the spot ..... pr. ton	19 0 0		19 5 0	nett
for arrival ..... "				"
ZINC, English, Sheet ..... "	28 0 0	"	30 0 0	1½
QUICKSILVER ..... per bott.	7 0 0			1½

REMARKS. — Our Metal Market continues extremely quiet; very little business doing, and scarcely any alterations in price.

LAWRIE AND HAGGER, Metal Brokers.
33 Lombard-street, E.C.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

PIER OR JETTY, *Bournemouth.*—According to plans, &c., by G. Rennie and Sons, C.E., 6 Holland-street, London, where, and at the Commissioners' offices, Bournemouth, they may be seen. Tenders to the Commissioners, June 14.

PIER, *at Fishguard.*—Plans at the office of Messrs. Goode and Owen, High-street, Haverford West, or at Mr. Wm. Vaughns, Main-street, Fishguard. Tenders to June 10.

BARRACK WORKS, *Deconport.*—1st. Two ablution rooms; 2nd. putting up ceilings, &c.; 3rd. building wall to portion of cliff; 4th. building wall; 5th. for completing railroad. Information, Royal Engineer's office, Devonport. Tenders to June 14.

LAYING DOWN PIPES, *Merthyr Tydfil.*—Specifications and forms for a guinea. Mr J. W. Russell's Clerk, to the Local Board of Health. Tenders to June 8.

SEWERS, *West Ham*, within the sub-districts of Hallsville, Caming-town, and Plaistow. Specifications, &c., office of Mr. Wm. J. Barsham, solicitor, Stratford-green, E., or at office of Mr. R. Rawlinson, 34 Parliament-street, Westminster. Tenders to June 13.

ROOFING TEN HUT-STABLES WITH ASPHALTE FELT, *Woolwich.*—Drawings, Royal Engineer Office, Mill-hill, Woolwich.

CHAPEL, *Crediton, near Exeter.*—Drawings, Mr. Wm. Braffords, Park-street, Crediton. Tenders to June 13.

SCHOOL REPAIRING, *Plumbland, Cumberland.*—Information at the School-house. Tenders to June 10.

RESIDENCES.—For second and head masters of the Felstead Grammar School. Plans, offices of Messrs. Beadle, Son, and Chancellor, Chelmsford, Essex. Tenders to June 20.

COTTAGES, *Woods and Forests.*—And the alteration of Potter's Hill Lodge, Whichwood, Oxfordshire. Plans, Churchill Arms, Ascot, Oxon. The sites, by the Clerk of the Works, on the spot. Tenders at noon, 1 Whitehall Place, June 7. Further particulars, Mr. J. Cluton, 9 Whitehall Place.

HOUSE, COTTAGE, AND TWO FARMSTEADS, *South Hyme, near the Sleaford and Boston Railway.*—Plans, Mr. Browning, architect, Stamford. Tenders to June 21st.

HOUSES AND SCHOOL-ROOMS, *Newton in Makerfield.*—Drawings at Offices of Mr. Wm. Poulson, Architect, Newton in Makerfield. Tenders to June 8th.

HOUSES AND FARMSTEAD. — Four on the Counthorpe Estate, between the Corby and Little Bytham stations, on the Great Northern Railway. Plans, &c., Mr. Edward Browning, architect, Stamford. Tenders to June 21st.

PIG LEAD, *India Board.*—Tenders before 11 o'clock, June 7.

PLANS FOR CEMETERY, CHAPELS, AND LODGE, *Oundle.*—Information from Clerk to New Burial Board, Oundle. Plans to June 18th.

BARRACKS WORKS, *Chatham.*—Solitary cells, works, and repairs. Particulars of the Surveyor, Chatham. Tenders June 13, War-office.

CHAIRS AND FASTENINGS, *Victoria Railway.*—2,000 tons of chairs, 250,000 trenails, 125,000 keys. Specifications, 4 Abchurch-lane, London. Further information, S. K. Brunel, Esq., 18 Duke-street, Westminster. Tenders, June 9, to De Pass and Sons.

PLANS AND SPECIFICATIONS FOR GAS WORKS.—Particulars of the Gas Committee, Narbeth, Pembrokeshire. £5 will be given for the plan approved.

BATTERIES, *War Office.*—Extension of the Western, including the construction, of expense, magazines, and shell recesses, at Hurst Castle, near Lymington, Hants. Plans, &c., Royal Engineer, Gosport. Tenders, War Office, June 6.

TO GASFITTERS, *Middlesex.*—Contracts for painting and keeping in repair the lanterns and fittings of the gas-lamps in parish of St. Mary, Islington. Forms of tender and particulars at the vestry offices. Tenders to June 8th.

SEWERAGE, *Middlesex.*—1,790 feet of sewer, 3 feet 9 inches high, 2 feet 6 inches wide. The form of tender and plans and specifications at the vestry offices of St. Mary, Islington (surveyor's department). Tenders to June 8th, 21 Milner-square, Islington.

NEW ROAD, &c., *Tottenham.*—Copy plan, &c., at 10s. 6d.

BRICK TANK at *Carshalton.*—Copy plan, &c., 10s. 6d., on application to Messrs. Gardner and Co., surveyors, 1 and 2 Southampton-street, Camberwell.

HOUSE, COTTAGE, AND TWO FARMSTEADS.—South Kyml, near the Sleaford and Boston Railway. Plans, Mr. E. Browning, architect, Stamford. Tenders to S. Hutchinson, Esq., Manthorpe Lodge, to June 21st.

SURVEYOR WANTED.—For the Pendleton district of the Borough of Salford. Whole time, £150 per annum. Application, Chairman, Pendleton District, Highway Committee, June 8.

CONDY'S PATENT FLUID, or NATURAL DISINFECTANT,

Not only Deoderizes but Disinfects perfectly, and DESTROYS FOR EVER the cause of infection.

Is not poisonous, as it may be used to purify water. Evolves no noxious or unpleasant gas. Cannot be mistaken for any other fluid, thereby preventing death and disease; and is therefore the best, safest, cheapest, and most pleasant disinfectant ever introduced.

This fluid has been examined and reported upon by the Board of Health, all the most eminent Men and Chemists of the day, in all cases in the most satisfactory manne possible.

The Public are recommended to use this Fluid, properl diluted with water, frequently and habitually in larders, sculleries, dairies, musty cakes, sick rooms, close places, &c., as it has numerous advantages, and can be used with certain immediate success and perfect safety.

Sold in Quart Bottles, 4s.; Pints, 2s.; Half-pints, 1s.; and in bulk, 10s. per Gallon.

Free to Railway on receipt of Order or Stamps. (238)

WILLIAM WARNE & CO.,

Manufacturers of all descriptions of

VULCANIZED INDIA-RUBBER,

SHEETS, WASHERS,

HOSE-PIPES, TUBINGS, ETC.;

Sole Manufacturers of

WARNE'S PATENT INDIA-RUBBER TUBULAR MATS,

For Doorways, Stairs, Baths, Carriages, Ships, &c., which never clog, require no beating, and, unlike all other Mats, are readily cleansed by water. Indestructible by damp, these Mats are especially suitable for uncovered Passages, and out of door purposes. Seat Mats, Housemaids' Mats, and Brushes for wooden and stone floors.

Sole Manufacturers of

WARNE'S PATENT MINERALISED IMPROVED KAMPTULICON,

Possessing advantages over all the ordinary makes, in exceeding toughness, and flexibility, and consequent durability, while neither heat nor cold has effect upon it. Widths, 3/4s., 4/4s., 6/4s., and 7/4s. Substances, ⅛, ¼, and thicker if required. Length, 20 to 25 yards.

Patentees of the Red Mineralised India Rubber—the only Rubber not affected by Oil.

Warehouse, 9 Gresham-street West, E.C. Mills, Tottenham, N. (244)

BRASS ENGINE and BOILER FITTINGS.—

Water-Gauges for Glasses, ½ ⅝ ¾ inch diam.
26/, 30/, 35/ each.
With Guards, 32/, 37/6 "
Gauge and Pet-Cocks, from 3/6 each.
Whistles, with 1½ 2 2½ 3 4 inch bell.
12/6, 18/6, 26/, 45/, 50/ each.
Blow-off Cock for Portable Engines, 12/6 each.
Oil Cups, of all kinds, from 18/ per dozen.
Ball Clacks, Balls, Cages, and sets complete.
Forsyth's Safety Boiler Plugs, 12/6 and 18/ each.

WILLIAM WALLER, Uddingston, by Glasgow. (214)

MR. WALTER HALL is prepared to Grant Licences, or to Dispose of his Patent for working Railway Breaks. Particulars to be had of Mr. HALL, who may be addressed by letter to the care of the MECHANICS' MAGAZINE, 166 Fleet-street, E.C. (217)

TO MARINE ENGINEERS, OR SHIP-BUILDERS.

THE PROPRIETOR of a VALUABLE PATENT for Double-expansive Marine Engines (by which great economy of space and fuel is obtained) is desirous of entering into arrangements with a respectable firm for the construction of the same. An adequate portion of the patent-right would be assigned by the advertiser to any firm taking the matter up; and he would render all assistance in his power, either in London or elsewhere, amongst ship-owners (to many of whom he is well known), in obtaining contracts, &c. Unexceptionable references given. Address C. E., MECHANICS' MAGAZINE Office, 166, Fleet-street. (76

GAS EXPLOSIONS PREVENTED.

USE THE TUBES AND FITTINGS MADE BY JOHN RUSSELL and Co. (Established at the commencement of gas-lighting), whose goods are all well tested, and warranted.

J. R. and Co. supplied Thomas Cubitt, Esq., for all his houses in Belgravia, the Queen's Palace, &c., which localit is proverbially free from gas.

J. R. and Co. are the Inventors of the Lap-Welded Tube for Steam Boilers, and have recently obtained a Patent fo an improvement in them.

J. R. and Co. are the holders of the First Prize Medals for Gas-Tubes and Fittings and Boiler Tubes.

WORKS:
THE OLD TUBE WORKS, WEDNESBURY.
THE ALMA WORKS, WALSALL.

WAREHOUSES:
69 UPPER THAMES-STREET, LONDON.
35 GRANBY-ROW, MANCHESTER. (168)

TO ENGINEERS, ARCHITECTS, PATENT AGENTS, &c.

PHOTOGRAPHS OF THE HIGHEST CLASS and of any size, taken and reproduced at a most moderate rate of charge. Reproductions of faultless accuracy, of Machinery, Models, Drawings, &c. Orders attended to in town and country. Estimates forwarded.

SPENCER, READ, & Co., 4 Agar-street, Strand, W.C. (90)

NOTICE OF REMOVAL.

WILLIAM DRAY AND CO.,

FROM SWAN LANE TO

ADELAIDE PLACE, LONDON BRIDGE. (227)

SPIRAL TUBE BRUSHES made with Wire or Whalebone for Tubes of
1¼ 1½ 2 2½ 2¾ 3 3½ 4 4½ 5 ins. diam.
24/, 25/, 26/, 28/, 30/, 32/, 35/, 38/, 42/, 46/, 50/ per doz

Quantities of Two Dozen and upwards delivered in London.

WILLIAM WALLER, Uddingston, by Glasgow. (213)

ARTESIAN WELLS, BORING TOOLS, PUMPS, &c. Engineers, Architects, Surveyors, Builders or others requiring a good supply of Water may have any quantity procured by W. SPELLER, 14 York-street, Blackfriars'-road, London, where may be had any quantity of Tools for Sinking or Boring, from 2 to 20 inches diameter, and from 100 to 2,000 feet depth; also Men and Tools to bore for Railroads, Minerals, &c., in any part of the world. Boring Tools and suitable Pipes for exportation, with full instructions for their use.

Builders, Contractors, Brickmakers, Barge and Ship Builders, and others, can be supplied with Wrought or Cast Iron Pumps, Double or Single, for excavation of Deep Wells, from 3 to 14 inches in the bore, and from 6 to 130 feet in length, to work by hand or Steam Power.

Hot-Water Apparatus for Conservatories, &c., on the most economical and improved principles.

Also Manufactory for Captain John Grant's much improved Cooking Apparatus. (44)

ENGINEERS' TOOLS.

FOR SALE, a Self-acting Slide LATHE, 11-inch Centres, and Bed 12 feet long, complete; and TWO PORTABLE PUNCHING and CUTTING MACHINES, one suitable for ½-inch plates, and the other for ⅝-inch plates, both adapted for steam or hand power.

Apply to Messrs. PAGE & CAMERON, 64 Old Broad Street, E.C. (117)

ENGINEERING BUSINESS FOR SALE.

OWING to the continued ill health of the Proprietor, the first-class business of an Engineer and Crane and Block Maker is offered for sale. It has been established in the Metropolis for nearly 30 years, and has enjoyed extensive patronage amongst Brewers, Manufacturers, Warehousemen, and others, in and about London; the business done amounting to nearly £8,000 per annum. About £3,200 would be required, (part of which, however, may remain for any reasonable time on good security,) which is the bare value of the tools, patterns, and stock in trade. The premises, including good dwelling-house, very conveniently situated, and capable of accommodating from 60 to 70 hands, are held upon a long lease, at an extraordinary low rental, not exceeding £100 per annum, taxes included. Many of the tools are nearly new, and of the best construction. The present proprietor, who relinquishes the business solely on account of ill health, would give every assistance in his power to those succeeding him; and as his foreman, who has been with him for nearly ten years, is thoroughly acquainted with the practical parts of the business, any gentleman desirous of commencing as a manufacturing engineer would find the present a very favourable opportunity. As all accounts have been, for many years past, collected quarterly, a very small amount, say £800, would suffice as working capital. Full particulars may be obtained by application to E. E. ALLEN, Esq., MECHANICS' MAGAZINE Office, 166 Fleet Street, E.C. (180)

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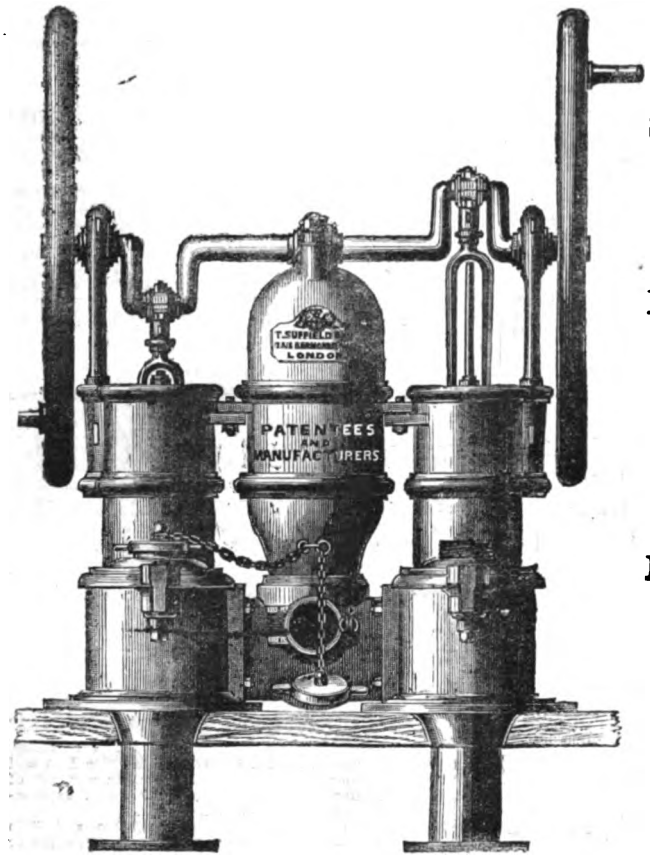
T. SUFFIELD AND CO.

Call the particular attention of

SHIP-OWNERS, SHIP-BUILDERS, AND COMMANDERS OF STEAM AND SAILING VESSELS,

to the Simple and Efficient Arrangements of their

PATENT PUMPS.



Ships' Pumps

AND

Fire Engines,

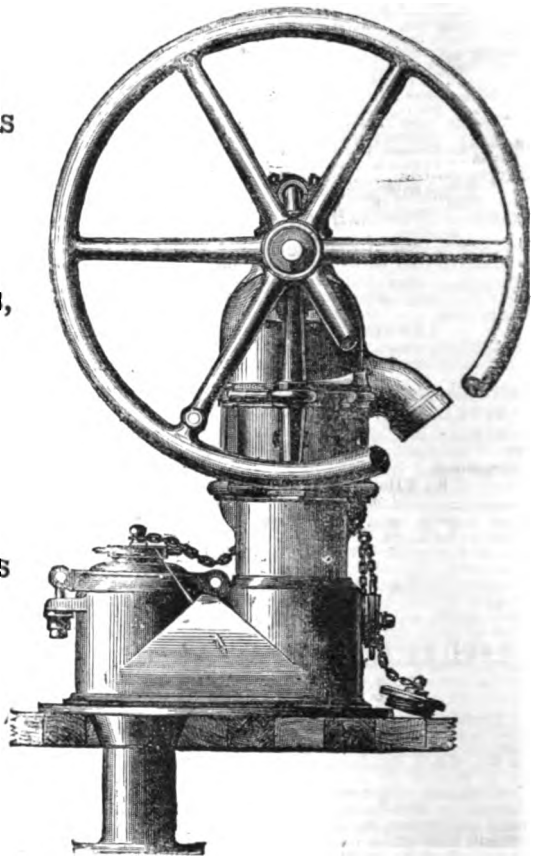
Fixed and Portable.

WITH

Patent Valves

AND OTHER

Improvements.



These Pumps are free from that liability to choke which is common to other Pumps, and their Working Parts are not susceptible of derangement either from wear or from being long out of use. They pass entirely through them, with ease, any substance that may enter the Suction Pipes. The Novelties in these Pumps are their adaptation to the varied duties of Ships' Pumps; the facilities they afford for Cleansing the Suction Pipes, and for Sounding or Examining the Valves; the readiness with which they may be used for Ventilating the Bilge, or for acting as a Syphon either for Watering the Ship, or for extinguishing Accidental Fires on board: the rapidity with which they can be converted into Fire Pumps, or be applied to the Washing of Decks; and their capability of Pumping from Several Compartments.

T. SUFFIELD AND CO.

Also respectfully solicit the attention of STEAM SHIP BUILDERS and OWNERS to their Large and Varied STOCK of

ASSORTED STORES FOR MARINE PURPOSES.

They keep a Large Stock of Goods, of their own Manufacture and from the Best Makers, constantly on view; so that by a visit to their Works or Depôt, much valuable time may be saved by Managers, Engineers, and other Gentlemen who may require suc Stores, together with a further saving in the cost of such Articles.

DEPOT, 116 FENCHURCH STREET, E.C.,

(OPPOSITE MARK LANE.)

MANUFACTORY, 12 & 13 BERMONDSEY WALL, S.E.

LONDON. (15)

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IMPROVED MACHINERY FOR AGRICULTURISTS.

RICHARD GARRETT & SONS,

LEISTON WORKS, SAXMUNDHAM, SUFFOLK,

(ESTABLISHED A.D. 1778),

EARNESTLY solicit the continued support of their numerous Friends, Agriculturists, Shippers, and others; the additions made to their Works during the present year, in the erection of new sets of Workshops, fitted with the best mechanical appliances for producing Machinery of the most improved construction, expeditiously and economically, justifies their soliciting increased support, while their leading reputation as Inventors and Manufacturers of FIRST CLASS Agricultural Machinery, is a sufficient guarantee that every Machine supplied from Leiston Works will prove to the entire satisfaction of the purchaser.

R. G. & S. are now manufacturing the following Machines and Implements, which they guarantee to be thoroughly efficient in every respect:—

PORTABLE AND FIXED STEAM ENGINES. } From 4 to 40 Horse Power, suited for every kind of work
SELF-PROPELLING AND TRACTION ENGINES. } to which Steam Power is applied.
STONE GRINDING MILLS.
MORTAR AND PUG MILLS.
MILLWRIGHTS' WORK of all kinds.
SAWING MACHINERY, from 4 to 20 Horse Power.
BRICK AND TILE MACHINES.

IMPROVED SETS OF FARM MACHINERY, for Large Occupations.
PORTABLE AND FIXED MACHINERY, for Thrashing and Dressing Corn.
THE PRIZE BOLTING AND OPEN-DRUM HORSE-POWER THRASHING MACHINES.
CORN DRESSING MACHINES, for Hand, Horse, Water, and Steam Power.
BARLEY AVELLING MACHINES.
CHAFF CUTTERS, for Hand, Horse, Water, and Steam Power.
PATENT TURNIP CUTTING AND PULPING MACHINES.

THE PRIZE CORN AND SEED DRILLS.
PRIZE CORN AND SEED DRILLS WITH MANURE APPARATUS.
PRIZE SEED AND MANURE DRILLS.
LIQUID, SEED, AND MANURE DROP DRILLS.
CHAMBER'S PATENT BROADCAST MANURE DISTRIBUTOR.
GARRETT'S PATENT HORSE HOE for all Crops.
PATENT REVOLVING HOES for Root Crops.
IMPROVED PLOUGHS AND REAPING MACHINES.
&c. &c. &c.

Of which full detailed particulars will be found in R. G. & SONS' ILLUSTRATED CATALOGUE, sent postage free to any address, in English, French, or German; and any of the above Machines will be shown in operation at R. G. & Sons' Farm, near the Works, on their receiving a few days' notice.

A Copy of R. G. & SONS' new COLONIAL LIST will be forwarded free to any of the Colonies, and Shippers will be supplied with these lists, with their names and addresses printed on, free of charge, by making application for the same.

ADDRESS—R. GARRETT & SONS, LEISTON WORKS, SAXMUNDHAM, SUFFOLK. (161)

CLAYTON, SHUTTLEWORTH, AND CO.,

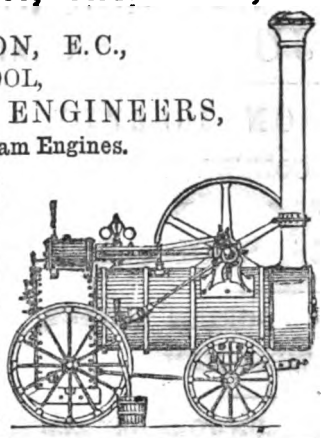
OF LINCOLN,

78 LOMBARD STREET, LONDON, E.C.,

AND 36 DALE STREET, LIVERPOOL,

AGRICULTURAL AND GENERAL ENGINEERS,

And Manufacturers of Portable and Fixed Steam Engines.



Combined Threshing Machines, which dress the corn ready for market at one operation. Grinding Mills, Saw Benches, Pumps for Irrigation and Mining purposes, with all necessary gearing for being driven by steam power. Full particulars and estimates given on application to the above address.

C. S. and Co.'s PORTABLE STEAM ENGINES are adapted for every purpose to which steam-power can be applied. When intended for winding, they are fitted with reversible link motion and winding gear. They are easy of removal, as may be seen by the engraving, and can be set to work immediately on arrival.

C. S. and Co. are now doing an extensive foreign and colonial business, and are prepared to send off engines and machinery of the before-mentioned kinds in a few days from the date of order. They would also call attention to the important *reduction in prices* made for the new year.

For Exportation.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (23)

TO STEAM SHIP OWNERS, ENGINEERS, AND OTHERS.

How's Patent Steam Engine Counters, can be read at sight.

These Counters register the number of revolutions made by an engine or other mechanism. They may be used for ascertaining the duty of Pumping Engines and Water-wheels; the revolutions on board a steam-vessel; to calculate the slip of the propeller; and in a locomotive to test the slip of the wheels.

How's Patent Salinometer, for Steam Boilers using Salt Water.

By these, the density of the water in the Boiler is at all times accurately shown, and a saving of boiler and fuel is effected. They are adopted by the Admiralty, the Honorable Trinity Corporation, and others. Copies of Testimonials from Messrs. Penn, Messrs. Maudslay, and others, will be forwarded on application.

How's Engine-Room Telegraph, for communicating between Captain and Engineer. Society of Arts Prize Medal, 1855.

is a Mechanical Telegraph, and by its peculiar construction, error or misunderstanding is rendered impossible. It now extensively adopted, and gives great satisfaction.

How's Patent Fresh Water Apparatus for Ships' Use.

This apparatus is designed for the distillation of Fresh from Salt Water; and on long voyages, and where the supply of water is scanty, it will be found invaluable. Testimonials may be seen.

Patent Steam Pump and Fire-Engine for Ships' Use.

This Steam-pump occupies but a small space; works perfectly noiselessly, and throws an immense volume of water. An Illustrated Circular of Fresh Water Apparatus and Steam-pump combined, free on application.

How's Patent Machine for Cutting Bolts, Rods, Spindles, Wire, &c.

Simple in construction, inexpensive, occupies but little space, and will not easily get out of order.

A Pamphlet Illustrative of the above, sent free by post, on application to

A. P. HOW, ENGINEER,

81 MARK LANE, LONDON.

EVERY DESCRIPTION OF ENGINEERS' TOOLS, ENGINE ROOM STORES, &c., &c., SUPPLIED. (89)

IMPORTANT TO MANUFACTURERS, MILL OWNERS, &c.

GUTTA PERCHA MILL BANDS.

THE GUTTA PERCHA COMPANY beg to state that the increasing demand for the Gutta Percha Strapping for Driving-bands, Lathe-straps, &c., fully justifies the strong recommendations they have everywhere received.

Their durability and strength—permanent contractability and uniformity of substance—their non-susceptibility of injury from contact with oils, grease, acids, alkalies, or water—and the facility with which the only joint required can be made in bands of from 200 to 300 feet long—render them superior to leather for almost all working purposes, and decidedly more economical.

TESTIMONIALS.

IMPORTANT ANNUAL SAVING.

From TRUMAN, HANBURY, BUXTON, & Co., Brewery, London.

"In reply to your inquiry, we have much pleasure in bearing our testimony to the advantages, both as regards economy and saving of time, effected by the use of your Patent Gutta Percha Bands in lieu of Leather Straps. The stoppage of one portion of our works through the failing of the leather strap used to be of daily occurrence—but with this annoyance we are now never troubled. We have had these straps in operation for nearly three years, and are assured by our Engineer that *they effect a saving to us of at least* THIRTY POUNDS *a year*."

From JAMES ABERNETHY & Co., Fury Hill Foundry Aberdeen.

"We have now had Gutta Percha Bands working here *for three years*. One of them has been driving the fan blast for our smith's shop for all that time, and for anything we see, may drive it as long again. The speed of the fan is but 1,200 per minute. We have used them with complete satisfaction, driving circular saws, and in some cases where leather bands would have been quite inapplicable from damp. We have uniformly endeavoured to have the drums and pulleys so proportioned to the strain, as that there is no chance of the band slipping; and with this precaution, and taking care in using *cross bands that they do not rub*, we are quite satisfied that they are superior in every respect to leather—stronger at the same weight, and keeping quite straight in working—requiring no lacings, and very seldom any repairs."

WATER POISONED BY LEADEN PIPES.

The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight.

POISONED WATER PREVENTABLE

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

From Dr. MURRAY, Hull.

"It is impossible to conceive of anything more injurious or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha Tubing. Nothing can be better. I have also recommended it to others, who have adopted the expedient."

A variety of Gutta Percha Articles, such as Mill Bands, Tubing, Sheet, Soles, Pump Buckets, Bosses, Union Joints, Bottles, Bowls, Flasks, Curtain and Cornice Rings, Solid Frames, Galvanic Batteries, &c., &c.

MANUFACTURED BY THE

Gutta Percha Company, Patentees,

18 WHARF ROAD, CITY ROAD, LONDON,

AND SOLD BY THEIR

WHOLESALE DEALERS IN TOWN AND COUNTRY. (29)

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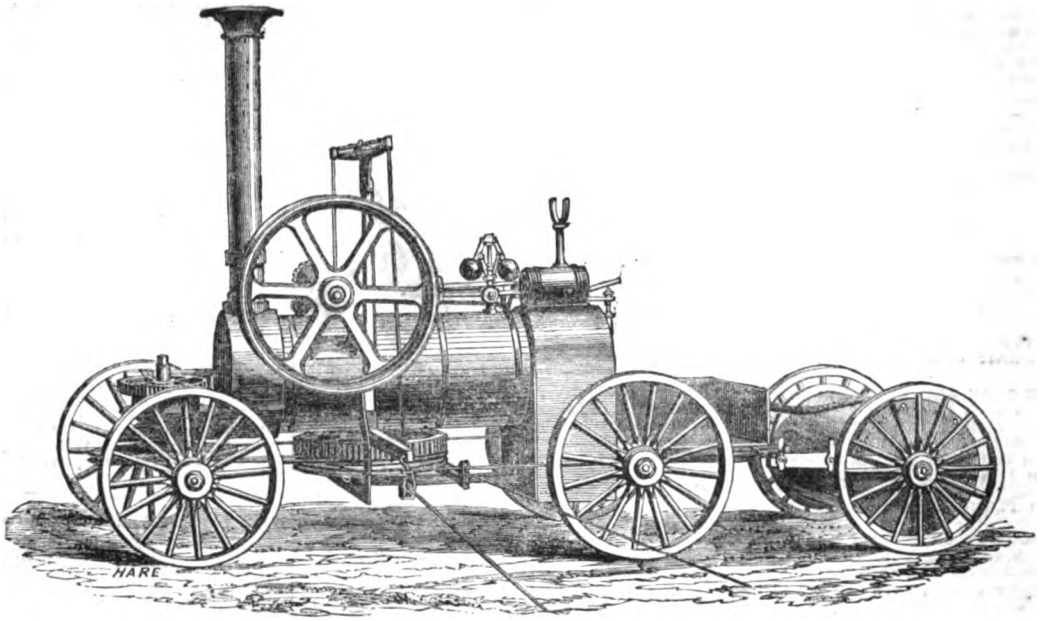
FOWLER'S PATENT STEAM PLOUGH.

THIS IMPLEMENT HAS GAINED THE FOLLOWING PRIZES:—

At STIRLING, 1857 - - - - - £260
At CHESTER, 1858 - - - - - £500
At NORTHALLERTON, 1858 - - - - £50



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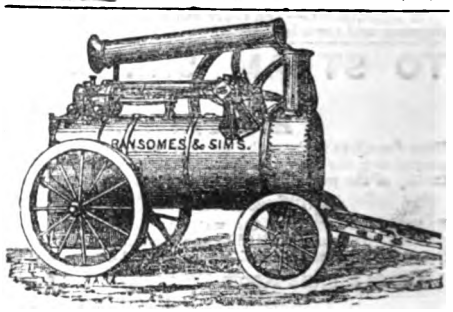

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Published by RICHARD ARCHIBALD BROOMAN, at the MECHANICS' MAGAZINE Office, 166 Fleet-street, in the Parish of St. Dunstan's-in-the-West, in the County of Middlesex; and printed by JAMES JUDD, of 14 Holford-square, Pentonville, in the County of Middlesex, and HENRY ALEXANDER GLASS, at their Office, 26A New Bridge-street, in the Parish of St Anne's Blackfriars, in the City of London.—Friday, June 3 1859.

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AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 24.
[NEW SERIES.]

LONDON: FRIDAY EVENING, JUNE 10, 1859.

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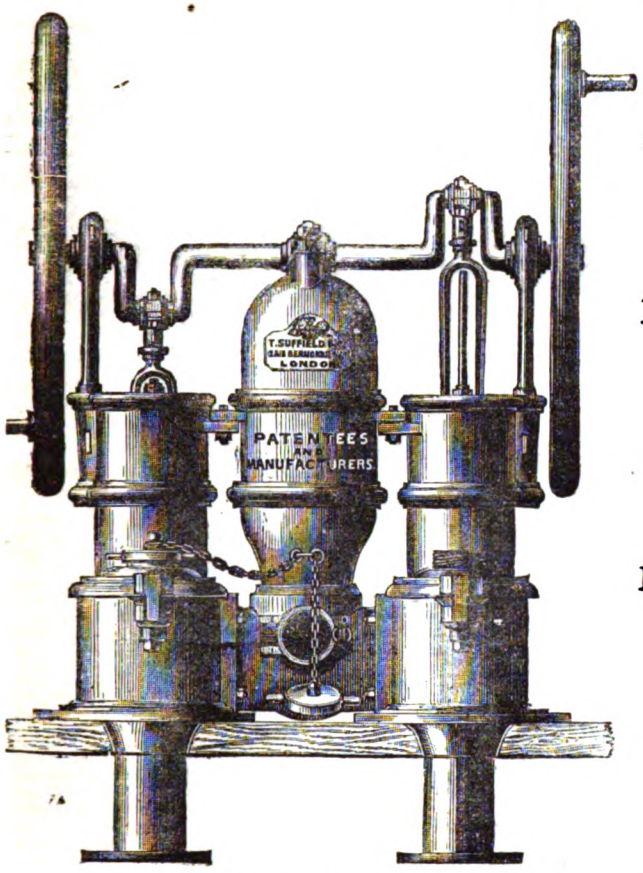

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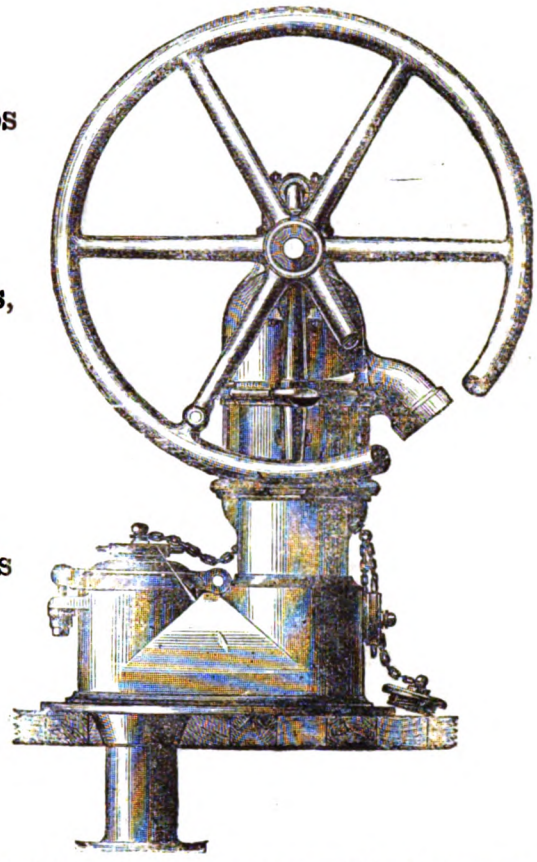

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LIST OF PRIZE SUBJECTS FOR SESSION 1859–60.

THE ROYAL SCOTTISH SOCIETY OF ARTS proposes to award PRIZES of different values, of THIRTY SOVEREIGNS and under, in GOLD or SILVER MEDALS, SILVER PLATE, or MONEY, for approved Communications *primarily* submitted to the Society, relative to INVENTIONS, DISCOVERIES, and IMPROVEMENTS in the *Mechanical* and *Chemical* Arts in general, and in their relation to the Fine Arts, and also to means by which the *Natural Productions* of the Country may be made more available. The Society suggests the following as a few of the many subjects that may be attended to, viz.:—

I. INVENTIONS, DISCOVERIES, or IMPROVEMENTS in the Useful Arts.

1. *Mechanical Arts.*

Inventions or Improvements in applying the Motive Power of Men and Animals,—in Wind and Water Prime Movers,—in Steam and other heat Engines and their various applications,—in Pumping, Blowing, Rolling, Sawing, Agricultural, and other Engines and Machines, —in Cotton and other Textile Manufacturing Mills,—in Shipbuilding, Wood, Iron, and Steel,—in Lighthouses,—in Marine Propellers,—in Railways, Plant, and Signals —in Electro-Magnetic Motive Power,—in Electric and other Telegraphic Apparatus, Submarine and Aerial,—in Photographic Apparatus,—in Fire-Proof Buildings,—in Water Supply,—in Paving,—Sewerage,—in Economical Appliances for increasing the Sanitary Condition of Towns,—in Smoke Consumption and Extinguishing Fires,—in Gas Works,—in Canals and Inland Navigation, —in Tools, Implements, and Apparatus for the various Trades,—in Bricks, Encaustic Tiles, Cements, and Mortars,—in Printing Machines, Cases, and Rollers,—in Stereotyping,—in Cranes,—in the Machinery for Collieries,—in preserving Timber and Metals in Marine Works,—in Optical Apparatus for Astronomy, Surveying, and Levelling,—in Manufacture of Paper, &c.

2. *Chemical Arts.*

INVENTIONS or IMPROVEMENTS in New and Useful Applications of Gutta Percha and Vulcanised India Rubber, or similar Gums,—in the Economical Extraction of Chemical Principles or Useful Substances, as Paraffine, &c., from Coal, Porcelain, Clay from Granite or Felt-par, and Metals generally from their Ores and Oxides.—in Dyes, in Paints,—in Paper,—in Glass, especially for Lenses,—in methods of rendering the Electric Light available in practice; &c.

3. *Relative to the Fine Arts.*

INVENTIONS or IMPROVEMENTS in Photographic Processes, in "Carbon" Printing, and in Methods of Printing Photographs from their Impressions on Steel or Copper Plates, or Lithographic Stones,—in Electrotype Processes,—in Die-sinking,—in Methods of Illustrating Books, to be Printed with the Letterpress,—in Paper-Hangings,—in Articles of Porcelain, Common Clay, or Metal,—in Glass-Staining, in Engraving on Stone,—in Chromo-Lithography,—in "Nature" Printing.

4. *Natural Productions.*

Discovery of Plumbago Mines,—of Slate Pencil of good quality,—Whet-stones,—of Wood suitable for Engraving.

II. EXPERIMENTS applicable to the Useful Arts.

III. COMMUNICATIONS of Processes in the Useful Arts practised in this or other Countries, but not generally known.

IV. PRACTICAL DETAILS of Public or other Undertakings of National importance, already executed, but not previously published; or valuable Suggestions for originating such undertakings.

KEITH PRIZE, value Thirty Sovereigns.

For some important "Invention, Improvement, or Discovery, in the Useful Arts, which shall be primarily submitted to the Society" during the Session.

MAKDOUGAL BRISBANE BIENNIAL PRIZE, Value £10.

"To the Authors or Inventors of Communications of Merit, which shall be approved of by the Society, or its Committee, and judged by them deserving of such distinction."

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GENERAL OBSERVATIONS.

Communications lodged *in competition for Prizes* shall not have been patented, nor previously published, nor read before any other Society, but Patented Articles may be exhibited and described. The descriptions of the various inventions, &c., must be *full* and *distinct*; and be written on *Foolscap* paper, with binding margins. The relative Drawings to be on *Imperial* Drawing-paper, and in *bold* lines, or *strongly coloured*, so as to be easily seen at about the distance of thirty feet when hung up in the Hall. The Society shall be at liberty to publish in their Transactions the papers submitted to them, or abstracts thereof. Models, &c., for which Prizes are given, to be held the property of the Society; the Value of the Models, &c., being separately allowed for.

Communications to be sent free to the SECRETARY, Chambers, 5 Hill Street, Edinburgh, on *or before 1st November*, 1859, in order to ensure their being read and reported on during the Session, the ordinary Meetings of which commence in November 1859, and end in April 1860; but *those which cannot be lodged earlier* will be received up to 1st April, 1860, although they may possibly not be read or reported on till the following Session.

By order,

JOHN BEATSON BELL, Secretary.

Edinburgh, June, 1859. (287)

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PRICES CURRENT OF METALS.

London, 10th June, 1859.

		£ s. d.		£ s. d.	Dis.
IRON, Rails in Wales and N. of England ..... pr ton		6 0 0	to	6 5 0	nett
Welsh Bars, in Wales ..	„	5 15 0		6 0 0	3
Staf. Bars at the Works	„	7 0 0	„	7 10 0	2½
„ Hoops	„	8 0 0	„	8 10 0	„
„ Sheets, Singles ..	„	8 15 0	„	9 0 0	„
„ Nail Rods	„	7 0 0	„	7 10 0	„
„ Boiler Plates	„	8 10 0	„	9 0 0	„
Scotch Pig, M.-Nos. Warranta, at Glasgow.....	„	2 8 0			nett
Do. No. 1, Good Brands	„	2 9 0	„	2 11 0	„
Scotch Bars	„	7 5 0	„	8 0 0	3
Swedish Bars, in London	„	13 10 0	„	15 0 0	2½
COPPER, Sheet and Sheathing per lb.		0 1 0			3
Tough Cake and Tile	„ ton	107 10 0			„
Best Selected.....	„	110 10 0			„
Australian	„				„
South American					„
Yellow Metal Sheathing.....per lb.		0 0 10			„
STEEL, Swedish Keg .....pr. ton		19 10 0	„	20 0 0	2½
„ Faggot	„	21 10 0	„	22 0 0	„
TIN, English, Block .....pr. cwt.		6 9 0			2½
„ Bar.....	„	6 10 0			
Foreign, Banca	„	6 14 0			nett
„ Straits.....	„	6 10 0			„
TINPLATES, Charcoal, I.C. ..pr. box		1 11 0	„	1 12 0	3
Coke, I.C.	„	1 5 6	„	1 6 6	„
LEAD, Pig, English .....pr. ton		23 0 0	„	23 10 0	2½
„ Spanish	„	22 0 0	„	22 10 0	„
Sheet	„	23 10 0		24 0 0	„
SPELTER, on the spot .....pr. ton		19 0 0			nett
for arrival.....	„	19 0 0			„
ZINC, English, Sheet	„	26 0 0	„	28 0 0	1½
QUICKSILVER .....per btl.		7 0 0			1½

REMARKS. — The Metal Market continues quiet, with little change.

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LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

NEW AISLE, *Sudbury*.—Drawings, &c., Mr. G. Scott, 20 Spring Gardens. Tenders, to the Vestry, June 18.

GAS WORKS, *Callander*.—Drawings and specifications, W. Buchanan, Callander, Scotland. Tenders, June 20.

COAST GUARD STATION, *Stonehouse, Devon*.—Drawings, the Watch Room, Stonehouse Point, or at the Admiralty Coast Guard Office, 18 Spring Gardens, London. Tenders, 20th June.

RAILWAY, *Caledonian*.—Dalmarnoch branch, extending from the Clydesdale junction to the south embankment of the river Clyde. Plans, &c., Mr. G. Graham, Buchanan-street, Glasgow. Tenders to June 7th.

SEWERS, *Dundee*.—Plans, Mr. Tawn, Surveyor. Tenders, June 27.

WORKHOUSE, *Swansea*.—Drawings, Office Mr. William Richards, Brunswick Place, Swansea. Tenders, June 30.

HOUSE, SHOP, AND WAREHOUSE, *Tamworth*.—Plans, Peel Arms, Tamworth. Tenders, Mr. B. Jennings, architect, Atherstone.

OFFICERS' MESS KITCHEN, SCULLERY, &c., *Manchester*.—Plans, Royal Engineer Office, Manchester. Tenders to June 25th.

PRISON ENTRANCE LODGE, *Maidstone*.—Plans, Offices of Messrs. Whicheord and Blandford, Architects, Maidstone. Tenders, June 23rd.

POLICE STATION, MAGISTRATES' ROOM, &c., *Great Malvern*.—Drawings, Offices of Mr. H. Rowe, County Surveyor, 17 Foregate-street, Worcester. Tenders, June 17th.

STATION HOUSE, OR LOCK-UP, *Seabrook, near Hythe, Kent*.—Plans, Office of the County Surveyor, Maidstone. Tenders, June 23rd.

VILLA RESIDENCE, *near Shrewsbury*.—Plans, Office of Messrs. Wall, solicitors, Shrewsbury. Tenders to June 15th.

RESIDENCE, *Newcastle-under-Lyme*.—Plans, Office of Mr. C. Trubshaw, architect, The Hollies, Stafford. Tenders, June 13th.

FARMHOUSE BUILDINGS AND PREMISES.—At Great Brickhill, within four miles of Bletchley station. Plans, Mr. Thos. Wood, Brickhill Manor Farm.

GASHOLDER, *Hampton Court*.—15 ft. by 20 ft. single lift, and a brick tank. Plans, Gas Works, Hampton Wick. Tenders, June 15th.

CHAPEL AND SCHOOLROOM, *Ripon*.—Plans, Rev. T. W. Ridley, Bondgate Green, Ripon. Tenders, June 15th.

BRIDGE, *Durham*.—Widening and improving Framwellgate Bridge, over the River Wear. Drawings, Mr. Howson, county architect, Durham. Tenders, June 25th.

BATHS AND LAUNDRIES, *Manchester*.—Plans, &c., Offices, Mr. Worthington, architect.

SCHOOLS, *Durham*.—For the erection of St. Margaret's. Drawings, Mr. G. Kyle, architect, 26 North Bailey, Durham. Tenders, June 13th.

ROADS, *Metropolis*.—For cleansing and stopping portions. Particulars, at the Office, 32 Whitehall-place. Tenders June 21st.

PLANS FOR DRAMATIC COLLEGE.—Gratuitous competition invited. Central Hall and ten houses. Particulars, Royal Dramatic College, 15 Bedford-street, Covent-garden, W.C. Mr. W. Cullenford, secretary.

PLANS AND SPECIFICATIONS FOR GAS WORKS.—For a small town, requiring 400 lights. Particulars, Gas Committee, Narborth, Pembroke. £5 for the plan and specifications approved.

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WAREHOUSE, *Lancashire, Yorkshire, and East Lancashire Railways*.—At the Salford Goods Station. Plans, Company's Offices, Hunt's Bank, Manchester. Tenders, June 19.

POLICE STATION, *Egham*.—Plans, &c., Police Station, Chertsey. Tenders, June 24, to Clerk of Peace, Record Office, North Street, Lambeth.

SCHOOLS AND RESIDENCE, *Salop*.—At Cledbury Mortimer. Plans, &c., Riott Kemp, Free School, Cledbury. Tenders, Mr. G. E. Street, 33 Montague Place, London, June 14.

WELL SINKING, *Wallersley*.—For the supply of materials and the sinking of a pure water well, for the Board of Health, in the county of Chester. Drawings, &c., for 5s., from T. Lea, resident engineer, or at the offices of Mr. Rawlinson, 34 Parliament-street, Westminster. Tenders June 20.

SEWER WORK, *St. James's Vestry, Westminster*.—General work and repairs. Specifications and forms, 5s., 14 Marshall-street, Golden-square. Tenders June 15.

RAILWAY STORES, *Lancashire and Yorkshire*.—For the ensuing half-year. Particulars and forms, Mr. R. J. Budge, the Company's storekeeper, at the office, Miles Platting, on the 16th. Tenders, June 23.

RAILWAY STORES, *Eastern Counties*.—For a year. Forms, &c., on application in writing to Mr. J. Bullivant, storekeeper, Stratford, where patterns. Tenders, the Secretary, Bishopsgate-street, June 14.

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ENGINEER AND CONTRACTOR,

PATENTEE OF VARIOUS IMPROVEMENTS IN THE CONSTRUCTION OF

IRON BUILDINGS, BRIDGES, ROOFS, AND FLOORS,

IRON BUILDING AND ROOFING WORKS,

GAS STREET, BIRMINGHAM.

RAILWAY, SHIP, AND BUILDERS' IRONWORK OF ALL KINDS.

Roofs and Bodies of Luggage Vans, Trucks, and Coal Waggons.
Cast and Wrought Iron Columns, Stanchions, and Girders.
Ties, Straps, King-heads, Shoes, &c.
Iron Punts for Sugar Estates, &c., &c.
Tanks, Casks, and Barrels.
Iron Wheelbarrows, Cart Bodies, &c.
Hay Racks, Mangers, Sheep Cribs, and Cattle Troughs.
Rick Stands, and Sliding Roofs of Wrought Iron.

SUBJECTS ILLUSTRATED IN LITHOGRAPHED SKETCHES.

The application of Corrugated Iron Roofing Plates to Roofs of Timber Framing, particularly suitable for the Colonies, Railway Carriage Sheds, and Station Roofs; Iron Sheds for Sugar and Coffee Estates, for Manufactories, Weaving Sheds, &c.; Iron Roofs for Churches, Farm Buildings, Gasworks, &c.

Iron Buildings, viz.—Warehouses, Sugar Refineries, Market Houses, Railway Stations, Stores, Dwellings, &c., erected in this country, in the East and West Indies, Egypt, China, the Cape of Good Hope, South America, and Australia.

Plans and Estimates will be furnished on Application.

LONDON OFFICE—33 NICHOLAS LANE, CITY, E.C. (272)

THE RAILWAY CARRIAGE COMPANY,

OLDBURY, NEAR BIRMINGHAM.

LONDON OFFICE---34 GREAT GEORGE STREET, WESTMINSTER

Manufacturers of every Description of

RAILWAY PLANT AND IRONWORK.

NEW and SECOND-HAND RAILWAY WAGGONS always in Stock for SALE or HIRE. (273)

THE IMPERIAL IRON TUBE COMPANY,

(SUCCESSORS TO GEORGE B. LLOYD & CO.)

GAS STREET AND BERKLEY STREET,

BIRMINGHAM,

Manufacturers of Wrought Iron Tubes & Fittings,

FOR GAS, STEAM, AND WATER.

PATENT GLASS ENAMELLED AND GALVANIZED TUBES,

AND

LAP-WELDED IRON BOILER TUBES. (193)

STEAM CULTIVATION.

CHANDLER AND OLIVER

HAVE much pleasure in being able to state that they are now prepared to execute orders for their PATENT STEAM WINDING ENGINES AND PLOUGHS, for Cultivating Land by Steam.

The WINDING TACKLE can be fitted to Engines of any maker, and the Plough can be made to take any kind of apparatus necessary for Cultivating the Soil, such as Scarrifier Tines or Broad Shares, &c. Any Engine now used by Farmers can be fitted with the Tackle. It is light and simple, and an ordinary Farm Labourer can work it.

The Engine can be used for Thrashing without taking the Ploughing Tackle off, not requiring more than three or four horses to take it from place to place.

These Engines are very useful for Pile Driving or Drawing Ballast up inclined planes; at the same time they can be used for Pumping. Farmers will find them most useful for all purposes.

Messrs. CHANDLER and OLIVER are prepared to receive orders for separate Windlasses, which are light and simple, and generally useful.

For further Information apply to

ROBERT CHANDLER, ENGINEER, BOW, NEAR LONDON,

Or Mr. OLIVER, Farmer, Hatfield, Herts.

ILLUSTRATED CATALOGUES WITH PRICES, WILL BE READY SHORTLY. (215)

CAUTION.

TO ARCHITECTS AND BUILDERS.—In consequence of numerous complaints, the Patentee begs to inform the above, that all genuine

SMITH'S PATENT DOOR SPRINGS.

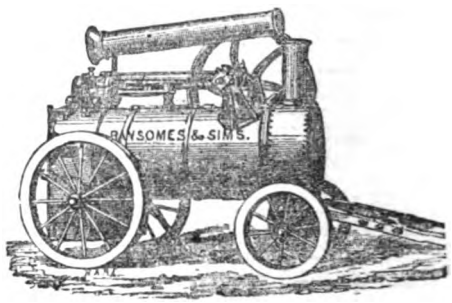
For Swing Doors, are stamped with Name and Address, thus—

SMITH, PATENTEE, 69 PRINCES STREET, LEICESTER SQUARE, LONDON,

and that Springs thus marked are warranted.

SMITH'S PATENT WEATHER-TIGHT CASEMENT FASTENING AND SILL-BARS

are admitted by all to be the most perfect invention for the purpose. Diagrams and List of Prices on application. (195)



RANSOMES AND SIMS,

IPSWICH,

AGRICULTURAL & GENERAL ENGINEERS

AND

IRONFOUNDERS.

LONDON OFFICE: 31 ESSEX STREET, STRAND, W.C. (165)

Important to every man who keeps

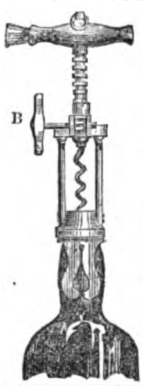
THORLEY'S FOOD FOR CATTLE,

77, NEWGATE STREET, LONDON

Price 50s. per Cask, containing 448 Feeds

Carriage paid to any Station.

A Pamphlet, Post-free on application. (133)



NO ADJUSTMENT REQUIRED.—You have only to place one of

LUND'S

LONDON RACK CORK

SCREWS

on the neck of a bottle, and it is ready for use. Some of these Cork Screws are fitted with Patent Spring Ends to embrace the neck of the bottle, and so direct the worm through the centre of the cork.

Sold by the Patentee at 56 and 57 Cornhill, and 23 and 24 Fleet-street, London; and may be had at all Cutlers' and Ironmongers'. (254)

C. F. QUINTIN'S

PATENT BREAD MACHINE.

The Journeyman Baker's and Servant's Friend. It lightens their labour and makes our daily Food clean and pure.

Highly commended at the Royal Agricultural Show, Chester, 1858, the Royal Agricultural Show, Dublin, 13th and 14th April, 1859, and the Society of Arts, Adelphi, London.

C. F. QUINTIN'S Machines are constructed in various sizes, from Half-a-Peck to Ten Bushels.

Prices from 30s. to £20.

A SACK OF FLOUR MADE INTO DOUGH IN SIX MINUTES.

Manufactory—

1 ST. JAMES'S SQUARE, CHELTENHAM.

Numerous Testimonials can be seen. (246)

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IMPROVED MACHINERY FOR AGRICULTURISTS.

RICHARD GARRETT & SONS,

LEISTON WORKS, SAXMUNDHAM, SUFFOLK,

(ESTABLISHED A.D. 1778),

EARNESTLY solicit the continued support of their numerous Friends, Agriculturists, Shippers, and others; the additions made to their Works during the present year, in the erection of new sets of Workshops, fitted with the best mechanical appliances for producing Machinery of the most improved construction, expeditiously and economically, justifies their soliciting increased support, while their leading reputation as Inventors and Manufacturers of FIRST CLASS Agricultural Machinery, is a sufficient guarantee that every Machine supplied from Leiston Works will prove to the entire satisfaction of the purchaser.

R. G. & S. are now manufacturing the following Machines and Implements, which they guarantee to be thoroughly efficient in every respect:—

PORTABLE AND FIXED STEAM ENGINES. } From 4 to 40 Horse Power, suited for every kind of work
SELF-PROPELLING AND TRACTION ENGINES. } to which Steam Power is applied.
STONE GRINDING MILLS.
MORTAR AND PUG MILLS.
MILLWRIGHTS' WORK of all kinds.
SAWING MACHINERY, from 4 to 20 Horse Power.
BRICK AND TILE MACHINES.

IMPROVED SETS OF FARM MACHINERY, for Large Occupations.
PORTABLE AND FIXED MACHINERY, for Thrashing and Dressing Corn.
THE PRIZE BOLTING AND OPEN-DRUM HORSE-POWER THRASHING MACHINES.
CORN DRESSING MACHINES, for Hand, Horse, Water, and Steam Power.
BARLEY AWELLING MACHINES.
CHAFF CUTTERS, for Hand, Horse, Water, and Steam Power.
PATENT TURNIP CUTTING AND PULPING MACHINES.

THE PRIZE CORN AND SEED DRILLS.
PRIZE CORN AND SEED DRILLS WITH MANURE APPARATUS.
PRIZE SEED AND MANURE DRILLS.
LIQUID, SEED, AND MANURE DROP DRILLS.
CHAMBER'S PATENT BROADCAST MANURE DISTRIBUTOR.
GARRETT'S PATENT HORSE HOE for all Crops.
PATENT REVOLVING HOES for Root Crops.
IMPROVED PLOUGHS AND REAPING MACHINES.
&c. &c. &c.

Of which full detailed particulars will be found in R. G. & SONS' ILLUSTRATED CATALOGUE, sent postage free to any address, in English, French, or German; and any of the above Machines will be shown in operation at R. G. & Sons' Farm, near the Works, on their receiving a few days' notice.

A Copy of R. G. & SONS' new COLONIAL LIST will be forwarded free to any of the Colonies, and Shippers will be supplied with these lists, with their names and addresses printed on, free of charge, by making application for the same.

ADDRESS—R. GARRETT & SONS, LEISTON WORKS, SAXMUNDHAM, SUFFOLK. (161)

CLAYTON, SHUTTLEWORTH, AND CO.,

OF LINCOLN,

78 LOMBARD STREET, LONDON, E.C.,

AND 36 DALE STREET, LIVERPOOL,

AGRICULTURAL AND GENERAL ENGINEERS,

And Manufacturers of Portable and Fixed Steam Engines.

Combined Threshing Machines, which dress the corn ready for market at one operation. Grinding Mills, Saw Benches, Pumps for Irrigation and Mining purposes, with all necessary gearing for being driven by steam power. Full particulars and estimates given on application to the above address.

C. S. and Co.'s PORTABLE STEAM ENGINES are adapted for every purpose to which steam-power can be applied. When intended for winding, they are fitted with reversible link motion and winding gear. They are easy of removal, as may be seen by the engraving, and can be set to work immediately on arrival.

C. S. and Co. are now doing an extensive foreign and colonial business, and are prepared to send off engines and machinery of the before-mentioned kinds in a few days from the date of order. They would also call attention to the important *reduction in prices* made for the new year.

For Exportation.—The above can be obtained through British Merchants, Shippers, and Colonial Agents. (23)

TO STEAM SHIP OWNERS, ENGINEERS, AND OTHERS.

How's Patent Steam Engine Counters, can be read at sight.

These Counters register the number of revolutions made by an engine or other mechanism. They may be used for ascertaining the duty of Pumping Engines and Water-wheels; the revolutions on board a steam-vessel; to calculate the slip of the propeller; and in a locomotive to test the slip of the wheels.

How's Patent Salinometer, for Steam Boilers using Salt Water.

By these, the density of the water in the Boiler is at all times accurately shown, and a saving of boiler and fuel is effected. They are adopted by the Admiralty, the Honorable Trinity Corporation, and others. Copies of Testimonials from Messrs. Penn, Messrs. Maudslay, and others, will be forwarded on application.

How's Engine-Room Telegraph, for communicating between Captain and Engineer. Society of Arts Prize Medal, 1855.

is a Mechanical Telegraph, and by its peculiar construction, error or misunderstanding is rendered impossible. It now extensively adopted, and gives great satisfaction.

How's Patent Fresh Water Apparatus for Ships' Use.

This apparatus is designed for the distillation of Fresh from Salt Water; and on long voyages, and where the supply of water is scanty, it will be found invaluable. Testimonials may be seen.

Patent Steam Pump and Fire-Engine for Ships' Use.

This Steam-pump occupies but a small space; works perfectly noiselessly, and throws an immense volume of water. An Illustrated Circular of Fresh Water Apparatus and Steam-pump combined, free on application.

How's Patent Machine for Cutting Bolts, Rods, Spindles, Wire, &c.

Simple in construction, inexpensive, occupies but little space, and will not easily get out of order.

A Pamphlet Illustrative of the above, sent free by post, on application to

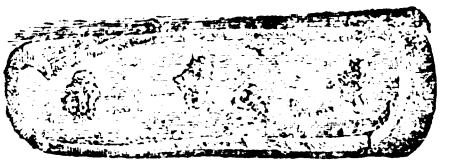
A. P. HOW, ENGINEER,

81 MARK LANE, LONDON.

EVERY DESCRIPTION OF ENGINEERS' TOOLS, ENGINE ROOM STORES, &c., &c., SUPPLIED.

(89)

WATER POISONED BY LEADEN PIPES.



"The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight. The water has cut these deep pits almost through the pipe, and not only upon the portion which we have illustrated, but has formed similar chasms throughout the entire length."—*Expositor.*

Poisoned Water Preventable.

BY THE USE OF GUTTA PERCHA TUBING.

The Gutta Percha Company have been favoured with the following letter,

From Dr. MURRAY, Hull.

"It is impossible to conceive of anything more injurious, or destructive to the health of the community than the use of *leaden pipes* for the conveyance of water. The poisonous salts of lead thereby communicated are most insidious and subtle. I hail with gratitude the substitution of Gutta Percha Tubing. I have had the leaden pipe of my own house removed, and its place supplied with one of Gutta Percha. Nothing can be better. I have also recommended it to others, who have adopted the expedient.

Resistance for Frost.

The Gutta Percha Company have been favoured with the following Letters in reference to the non-conducting properties of Gutta Percha Tubing, in the resistance of Frost.

From J. ARMSTRONG, Esq., M.D., Gravesend.

"My private house, which was supplied with your Gutta Percha Tubing some five or six years ago, has never required the slightest attention; and previously, there was no winter passed that we were not deluged in consequence of the bursting of the leaden pipes."

From HENRY BROWN and SONS, Western Works, 108 Rockingham-street, Sheffield.

"We have now a positive proof of the frost-resisting properties of the Gutta Percha Piping. On our premises we have a leaden Pipe and a Gutta Percha one lying side by side. The leaden one has been completely frozen up at least ten days, and the Gutta Percha one is still unaffected.

Every Variety for Gutta Percha Article.

SUCH AS

Mill-bands,	Flasks,
Tubing for Watering Gardens, &c., &c.,	Bowls,
Soles,	Chamber-vessels,
Sheet,	Galvanic Batteries,
Pump-buckets,	Toilet-trays,
Fire-buckets,	Sponge-bags,
Bottles,	Curtain-rings,
Bosses,	Talbotype-trays,
Union-joints,	Photographic Baths, &c., &c.

MANUFACTURED BY THE

GUTTA PERCHA COMPANY,

And Sold by their

WHOLESALE DEALERS IN TOWN AND COUNTRY.

Submarine and Subterranean Telegraph Wires Insulated with Gutta Percha.

The Gutta Percha Company, Patentees,

18 WHARF-ROAD, CITY-ROAD, LONDON.

51)

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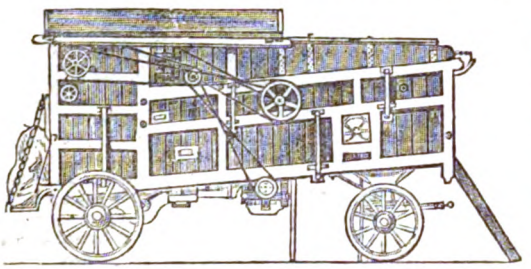
RUSTON, PROCTOR, AND CO.,

LINCOLN; AND KENNET WHARF, 67 UPPER THAMES STREET, LONDON;

AGRICULTURAL ENGINEERS AND MILLWRIGHTS.

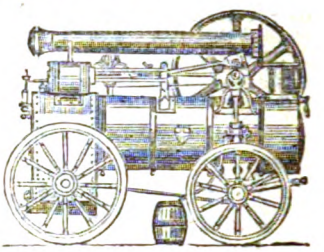


MANUFACTURE

PRIZE PORTABLE and FIXED STEAM ENGINES,
SMITH'S PATENT STEAM PLOUGHS,
PATENT PRIZE COMBINED THRASHING MACHINES, containing R. P. and Co.'s NEW PATENT CORN CLEANER,
SAWING MACHINERY, CIRCULAR and VERTICAL of all Sizes,
MILLS of all Kinds, FIXED and PORTABLE, for Grinding Bones, Flour, Linseed, Mortar, Clay, &c.
PUMPS, CRANES, CRABS, SCREW-JACKS, &c.

Illustrated Catalogues, with full Particulars and Testimonials, may be had by applying as above.

(34)



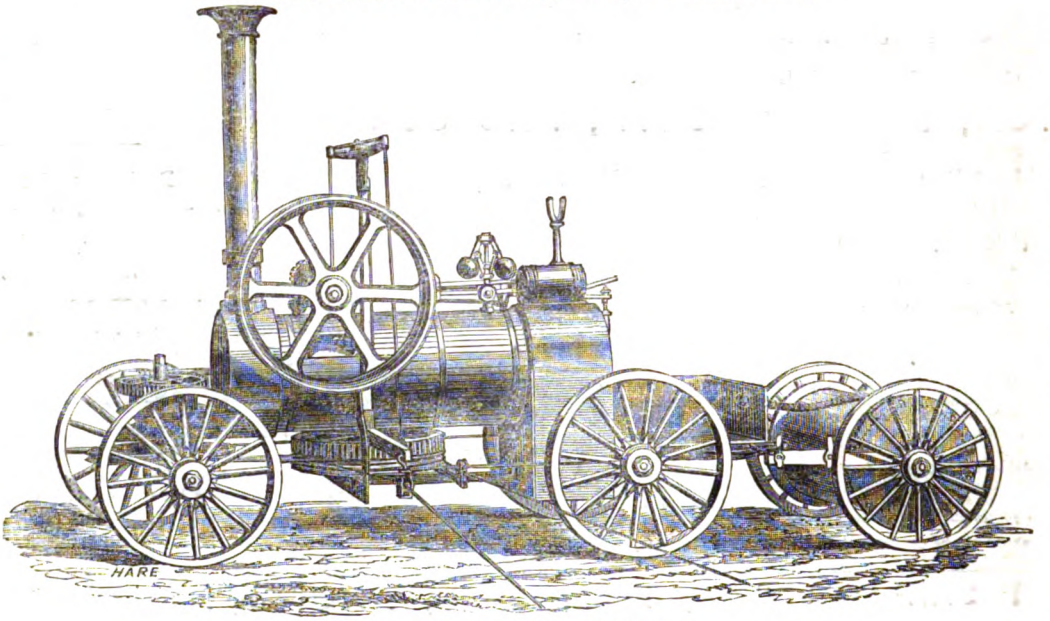
FOWLER'S PATENT STEAM PLOUGH

SEEN AT WORK.

Standard Sets of Fowler's Steam Ploughing Tackle can be seen in operation on 1st July next, at the Show of

SUFFOLK AGRICULTURAL ASSOCIATION, AT IPSWICH;
SOUTH YORKSHIRE AND NORTH DERBYSHIRE AGRICULTURAL SOCIETY, AT SHEFFIELD;
SUSSEX AGRICULTURAL SOCIETY, AT HAILSHAM.

At STIRLING, 1857 - - - - £200
At CHESTER, 1858 - - - - £500
At NORTHALLERTON, 1858 - - - £50



At NORTHALLERTON (Lord Bolton's Prize), 1858 £25
At LONDONDERRY, 1858 - - - £50
At STIRLING, 1858 - - - - £50

FOR FURTHER PARTICULARS APPLY TO

JOHN FOWLER, JUN., 28 CORNHILL, LONDON, E.C. (261

SCOTT'S
PATENT GRASS SEED SEPARATOR,

which entirely extracts the Seeds of "COUCH," "TWITCH," "SPEAR," or "HAIR" GRASS and other impurities from

PERENNIAL AND ITALIAN RYE-GRASS, &c.,

AND

SCOTT'S PATENT CARROT SEED BEARDING

AND

CLOVER AND TREFOIL MILLING OR DRAWING MACHINE,

which effectually removes the beard from Carrot Seed, rendering it fit for sowing with facility by drill or otherwise, and by the separation of abortive or diseased grains vastly increases its vegetative per centage. By a slight modification it is applicable to the other purposes before mentioned.

These Machines were admittedly the most novel, and, at the same time, the most useful and important to the Farmer of any exhibited at the late SMITHFIELD CLUB SHOW.

They may be seen at work at the Establishment of the Manufacturer,

Mr. T. MIDDLETON, Engineer, Southwark.

Communications to be sent to the Patentee, J. SCOTT, 111 Drummond Street, Euston Square, London, N.W. (18)

CONDY'S PATENT FLUID, or NATURAL DISINFECTANT,

Not only Deoderizes but Disinfects perfectly, and DESTROYS FOR EVER the cause of infection.

Is not poisonous, as it may be used to purify water. Evolves no noxious or unpleasant gas. Cannot be mistaken for any other fluid, thereby preventing death and disease; and is therefore the best, safest, cheapest, and most pleasant disinfectant ever introduced.

This fluid has been examined and reported upon by the Board of Health, all the most eminent Men and Chemists of the day, in all cases in the most satisfactory manne possible.

The Public are recommended to use this Fluid, properl diluted with water, frequently and habitually in larders, sculleries, dairies, musty cakes, sick rooms, close places, &c., as it has numerous advantages, and can be used with certain immediate success and perfect safety.

Sold in Quart Bottles, 4s.; Pints, 2s.; Half-pints, 1s; and in bulk, 10s. per Gallon.

Free to Railway on receipt of Order or Stamps. (238)

Published by RICHARD ARCHIBALD BROOMAN, at the MECHANICS' MAGAZINE Office, 166 Fleet-street, in the Parish of St. Dunstan's-in-the-West, in the County of Middlesex; and printed by JAMES JUDD, of 14 Holford-square, Pentonville, in the County of Middlesex, and HENRY ALEXANDER GLAES, at their Office, 38A New Bridge-street, in the Parish of St Anne's Blackfriars, in the City of London—Friday, June 10 1859.

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 25. [NEW SERIES.]

LONDON: FRIDAY EVENING, JUNE 17, 1859.

PRICE, FOURPENCE. BY POST 5d.

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ROYAL POLYTECHNIC INSTITUTION. Patron, H.R.H. the PRINCE CONSORT.—Open daily as usual from Twelve to Five; Evenings, Seven to Ten. (290)

GREAT REDUCTION IN THE COST OF STEAM POWER.

THE temperature of the products of burnt fuel escaping into the Smoke-boxes of Locomotive and Portable Engines is upwards of 800°. DUNCAN, GWYNNE, and C. WYE WILLIAM'S PATENT HEAT DIFFUSERS, placed in the Tubes, will utilize about 400° of the heat, convert it into an equivalent of working steam, and reduce the temperature to about 350° or 400°.

The Patentees are prepared to accept for Royalty a part of the value of the fuel saved by the use of their simple appliances.

Every information may be had on application to the Manufacturers, GWYNNE & CO., Engineers, Essex-street Wharves, Strand, W.C., London. (251)

ENGINEERS' TOOLS FOR SALE.—A Superior SELF-ACTING SLIDE and SCREW-CUTTING LATHE, 7 in. centre and 7 ft. bed. A Ditto, 7 in. centre and 9 ft. bed. A PUNCHING and SHEARING MACHINE, for ¾ in. plates. Two Ditto for ½ in. plates, and Two Ditto for ⅜ in. plates. VERTICAL DRILLING MACHINE; PILLAR and BENCH DRILLS; HALEY'S and other LIFTING JACKS; RACHET BRACES, &c.

Apply to PAGE and CAMERON, 64 Old Broad-st., E.C., London. (285)

HORIZONTAL HIGH-PRESSURE STEAM ENGINES FOR SALE.

One of 8-horse power, 8in. cylinder, and 18in. stroke.
One of 10-horse power, 10in. cylinder, and 24in. stroke.
Two of 12-horse power, 12in. cylinder, and 24in. stroke.
One of 14-horse power, 12in. cylinder, and 36in. stroke.
Two of 14-horse power, 14in. cylinder, and 24in. stroke.
One of 16-horse power, 14in. cylinder, and 36in. stroke.
Two of 30-horse power, 20in. cylinder, and 36in. stroke.

The above Engines are quite new, of superior manufacture and finish, and are to be sold at very low prices.

Apply to PAGE and CAMERON, 64 Old Broad-street, London, E.C. (284)

PATENT LEVER BREAKS for RAILWAY WAGGONS, doing away with the objectionable Break Rack. Can be applied to existing stock at a trifling expense. Royalty moderate.

Models can be seen at 34 Great George-street, Westminster, and the Breaks in action at the Works of the Railway Carriage Company at the Peterborough Station, on the Eastern Counties Railway; the Rugby Station, London and North-Western Railway; the Cardiff Docks Station, Taff Vale Railway; and at the Works, Oldbury, near Birmingham, where all communications are requested to be sent. (275)

TO SHIPBUILDERS, SHIPOWNERS, CAPTAINS, &c.

THE ANCHOR COMMITTEE AFFIRM "TROTMAN'S PATENT ANCHOR" to be superior to all others, possessing Thirty-Five Per Cent. more Holding Power than either Porter's or Roger's, and equivalent in all respects to ordinary Anchors of 28 per cent. greater weight.

"This appeared to the Committee of vast importance to the Shipping Interests, &c."

(Vide their Official Report, 1853, "On the relative merits of different descriptions of Anchors," sanctioned and approved by the Admiralty.)

THE ANCHOR COMMITTEE

Nominated by the Lords Commissioners of the Admiralty "to investigate and determine the relative merits of Anchors," in compliance with a requisition from the principal Shipowners, Underwriters, &c., of the United Kingdom.

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Captain George Rodney Munday, R.N., Her Majesty's Ship "Nile."

Jonathan Aylen, Esq., R.N., Master Attendant, Her Majesty's Dockyard, Sheerness.

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Anthony Ridley, Esq., Vice-Chairman of Mercantile Marine Board; Member of the Committee of "Lloyd's Register" of Shipping, &c.

William Drew, Esq., Member of the Mercantile Marine Board; Member of the Committee of "Lloyd's Register" of Shipping, &c.

William Phillips, Esq., Member of the Committee of "Lloyd's Register" of Shipping; General Shipowners' Society, &c.

George Marshall, Esq., Member of the Committee of "Lloyd's Register" of Shipping; General Shipowners' Society, &c.

THE INTERNATIONAL JURY AT PARIS

Also awarded this Invention the First Class Medal, 1855.

Licensed Makers of Trotman's Improved Anchors:—

Messrs. Hawks, Crawshay, and Sons, Newcastle-on-Tyne,
" John Abbott and Co., Park Works, Gateshead, Durham,
" J. and E. Lumsden, Strand Iron Works, Sunderland,
" N. Hingley and Sons, Cradley and Netherton Iron Works,
" Proctor and Taylor, Milbank Forge, Hartlepool,
" Henry Wood and Co., Goree Piazzas, Liverpool,
" Wood Brothers, Chester, Wolverhampton, and Stourbridge,
" R. Wight and Sons, Iron Works, Sunderland and Seaham,
" Pow and Fawcus, 49 Lr. Shadwell, London, and North Shields,
" John Gilbert, Cradley Heath, Staffordshire.

DEPÔTS,

GEORGE WOOD & CO., 14 Fore-st., Limehouse, London, and at 4 Goree Piazza, Liverpool.

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PATENTEE, 42 CORNHILL, LONDON. (249)

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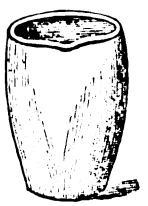

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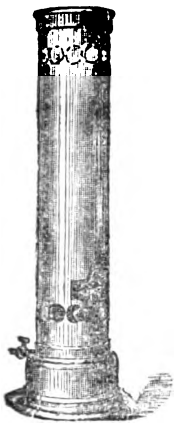

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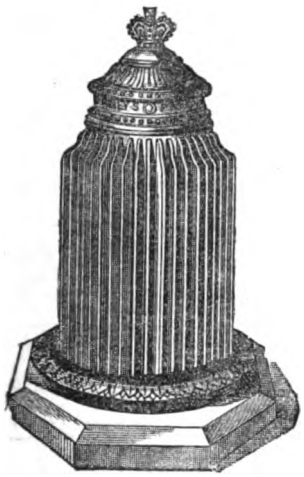

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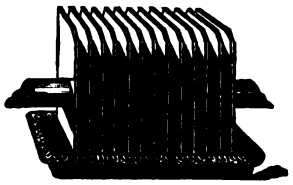

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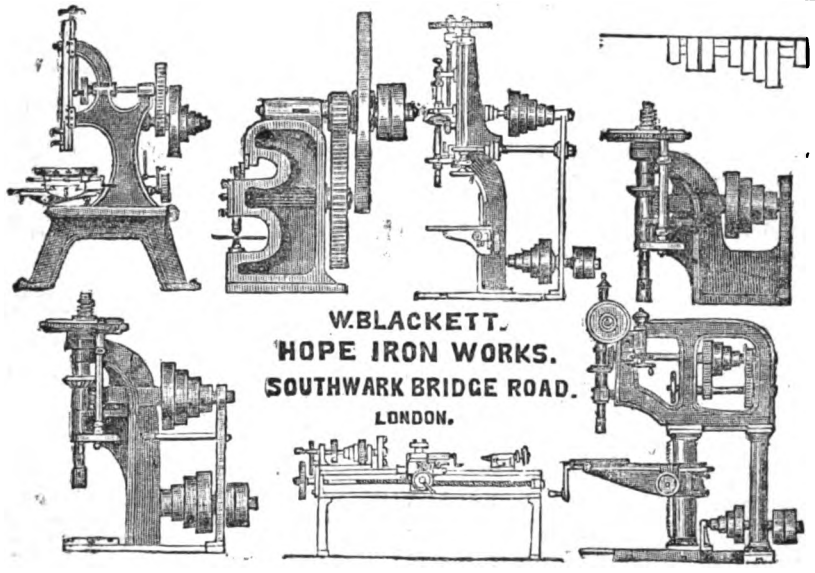

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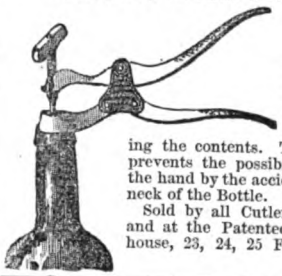

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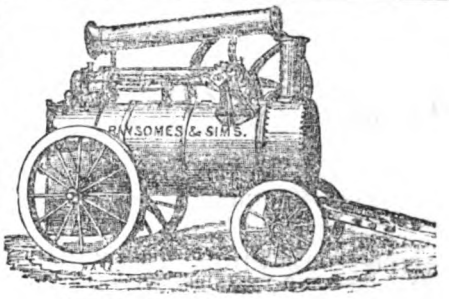

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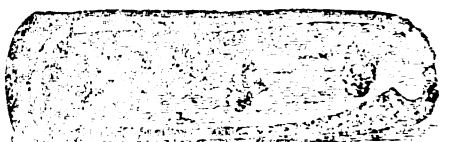

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LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

IRON WORKS, *East India Railway.*—For waggon iron, hollow spikes, and iron permanent way, viz., 81 sets of iron work for open-sided goods' waggons; 12,000 hollow wrought-iron spikes; one mile of iron permanent way, according to specifications and drawings with D. J. Noad, sec., East India Railway House, Alderman's-walk, New Broad-street, London. Tenders, June 21.

PATENT SLIP AND GRAVING DOCK, *Dundalk Harbour.*—The commissioners invite tenders for erecting a patent slip for repairing vessels of 300 tons register; also for building a graving dock, to take in vessels of 400 tons register. Further particulars, Mr. R. Needham, engineer to the commissioners. Tenders addressed to the chairman and seal to Mr. T. J. Pooler, sec. office, Quay-street, Dundalk, June 27.

RAILWAY STATION, *Wigan.*—Large passenger station for Lancashire and Yorkshire Railway Company at Wigan. Drawings, &c., at the Company's offices, Hunt's Bank, Manchester. Tenders to Mr. W. S. Lawn, sec., June 25.

GASHOLDER, *Keighley Local Board of health.*—Erection of a single-lift gasholder, 70 ft. diam. and 16 ft. deep. Plans, &c., Mr. R. Asquith, gas office, Keighley, Yorkshire. Tenders to the chairman, June 21.

LUNATIC ASYLUM, *Abergavenny.*—For a new detached wing, &c., to the Joint Counties' Lunatic Asylum. Plans and tenders at the Asylum, June 25.

CHAPEL, *Bodmin.*—Plans, &c., Messrs. Demant and Reid, 22 Courtnay-street, Plymouth, or at offices of Superintendent of Cornwall Lunatic Asylum. Tenders June 27.

CHAPEL AND SCHOOLS, *Holme.*—In Chapman-street, Boston-street, for the Wesleyan Reformers. Plans, &c., Mr. Acres, 77A Market-street. Tenders to Mr. J. T. Chadborn, Secretary, 1 Mayfield-grove, Embden-street.

NATIONAL SCHOOLS, *Scarboro'.*—Plans with the master of the boys' school, Granby-place. Tenders Mr. Christian, 10 Whitehall-place, London, June 27.

POLICE STATION, *Loughborough.*—Specifications, Magistrates' Clerks' Office, Town-hall. Bills of quantities, &c., Messrs. Bellamy and Hardy, Lincoln. Tenders, 5 P.M., June 24.

HOUSES AND FARMSTEADS.—On the Counthorpe Estate, between the Corby and Little Bytham Stations, on the Great Northern Railway. Plans, &c., Mr. E. Browning Architect, Stamford. Tenders to 6 P.M. June 21.

HOUSE, COTTAGE, AND TWO FARMSTEADS, *South Hyme.*—Near the Sleaford and Boston Railway. Plans, &c., Mr. E. Browning, Stamford. Tenders 6 P.M., June 21.

MALT HOUSE, &c., *Leeds.*—Large malt house and kiln, with engine house and chimney. Plans, &c., Messrs. J. Child and Son, architects, 23 Park-row, Leeds. Tenders, June 21.

HOUSE WORK, *Barnsbury.*—For the painters', glaziers', and plumbers' work in eight houses, Roman-road, Barnsbury. Specifications, Albert Wharf, New Wharf-road, Caledonian-road.

LODGE, *Maidstone.*—Alterations and additions, at the County Prison. Plans, &c., Messrs Whicheord and Blandford, architects, Maidstone. Tenders, June 23.

RE-BUILDING HOUSES, *Southwark.*—Taking down and rebuilding several. Plans, &c., Messrs. Waring and Blake, 42 Parliament-street, Westminster; to whom tenders, June 27. Quantities not supplied.

DRAINING, *Scotland.*—Contractor wanted to trench and drain 15 acres of natural rough pasture ground in a northern county and of easy access from Edinburgh. Apply to No. 321 *North British Advertiser* office, Edinburgh, where particulars and specifications.

MEMEL SLEEPERS, *Eastern Counties.*—100,000 rectangular, to be delivered at the Port of Lowestoft. Forms and information, the engineer, London. Tenders to the sec., June 21.

MEMEL TIMBER, *Eastern Counties Railway.*—For the supply of 1,000 loads, at the Port of Lowestoft. Forms of tender and information, the engineer, at Stratford, London. Tenders to the sec., June 21.

GRANITE, *Fulham Union.*—For supplying 800 tons of blue Guernsey granite, to be delivered at the stone yard of the Union, Fulham-fields, by 30th Sep. next. Tenders to the board-room, June 23.

LIME, *Manchester Corporation Gas Works.*—For the supply of the lime required in the next twelve months. Particulars and forms of Mr. Peacock, York-chambers, King-street.

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TO ENGINEERS AND DRAUGHTSMEN.—A young man wanted who is accustomed to surveying, drawing and colouring plans. One conversant with the details of wrought-iron bridges and girders preferred. Address, stating experience and weekly salary required, to C. A., Messrs. Hooner and Cull, 13 Lombard-street, E.C.

ASSISTANT RAILWAY STOREKEEPER, *East India.*—For the Bombay, Baroda, and Central India Company. Applications June 23. Offices, 10 Liverpool-street, New Broad-street, London. Must produce certificates of experience in the charge of stores for the construction and working of lines. Salary £350 per annum. To proceed to India at once.

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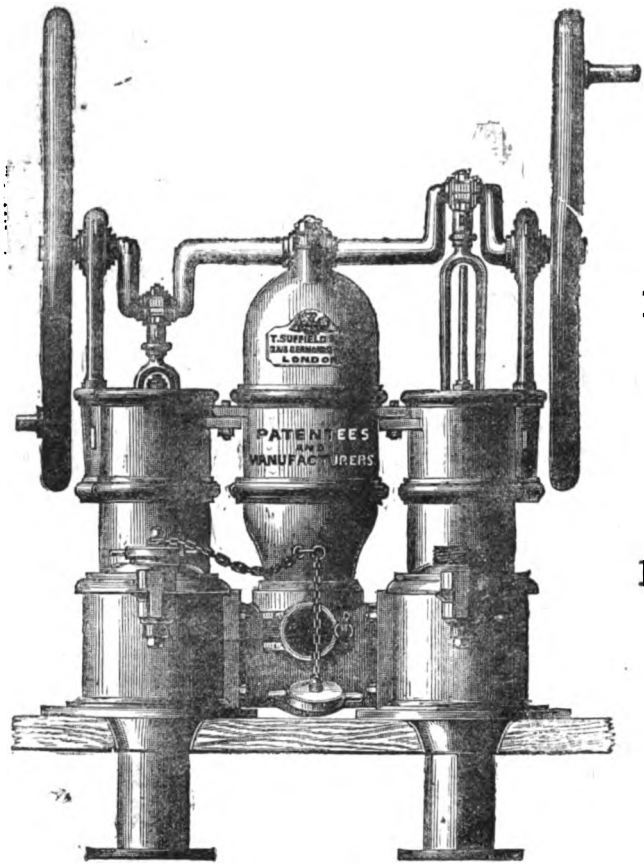

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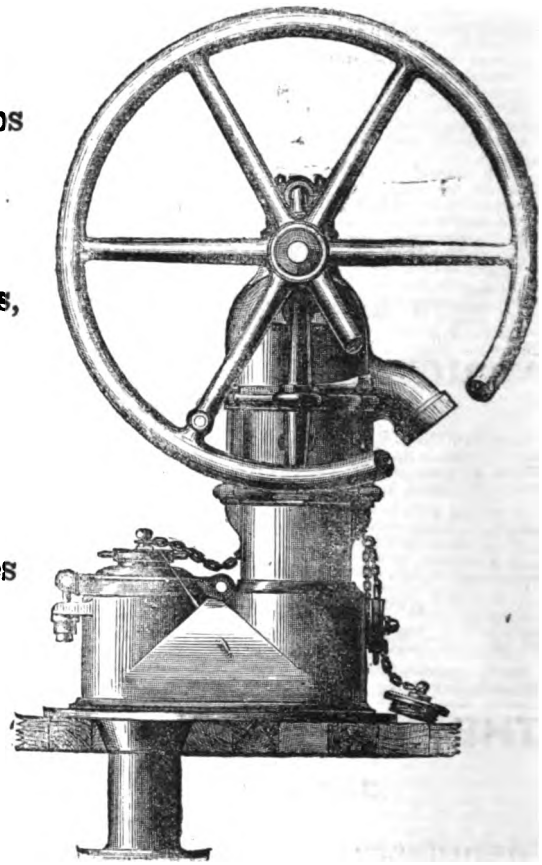

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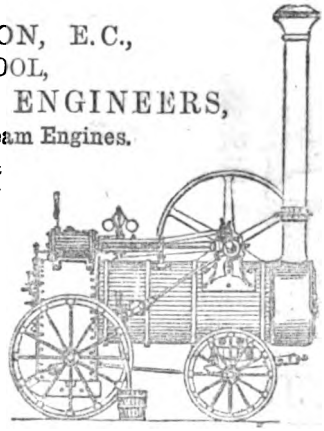

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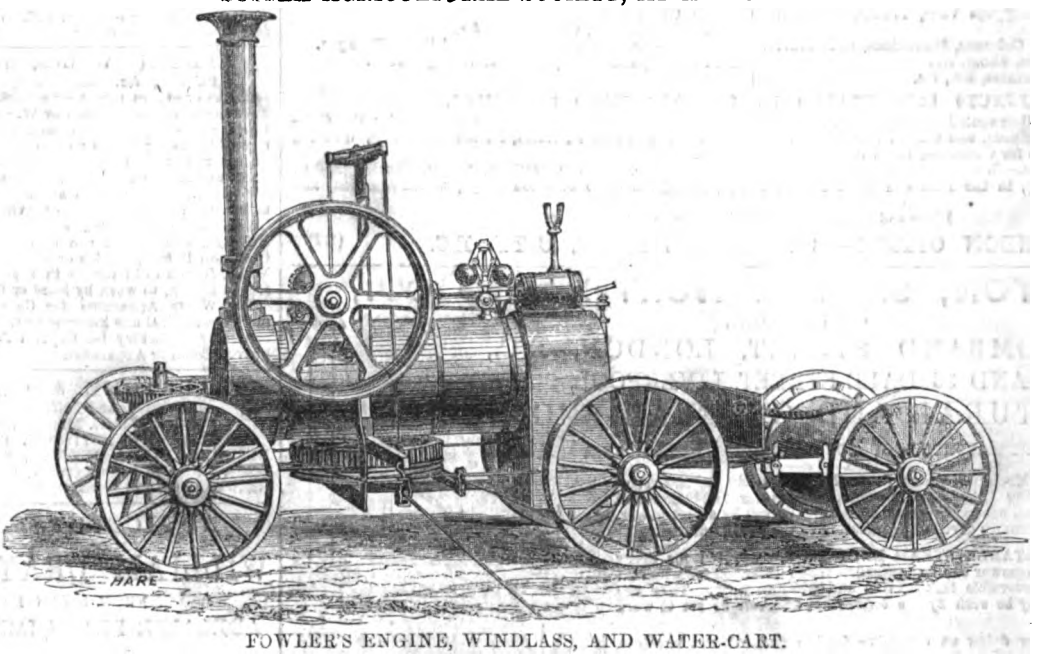

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THE MECHANICS' MAGAZINE

AND

Journal of Engineering, Agricultural Machinery, Manufactures, and Shipbuilding.

(Registered for transmission abroad.)

[EDITED BY R. A. BROOMAN AND E. J. REED.]

VOL. 1.—NO. 26. [NEW SERIES.]

LONDON: FRIDAY EVENING, JUNE 24, 1859.

PRICE, FOURPENCE. BY POST 5d.

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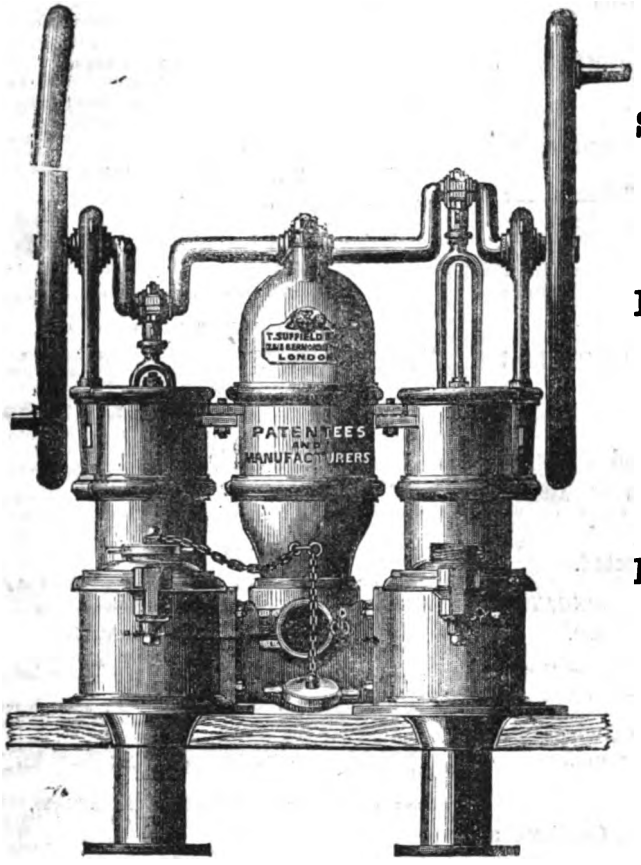

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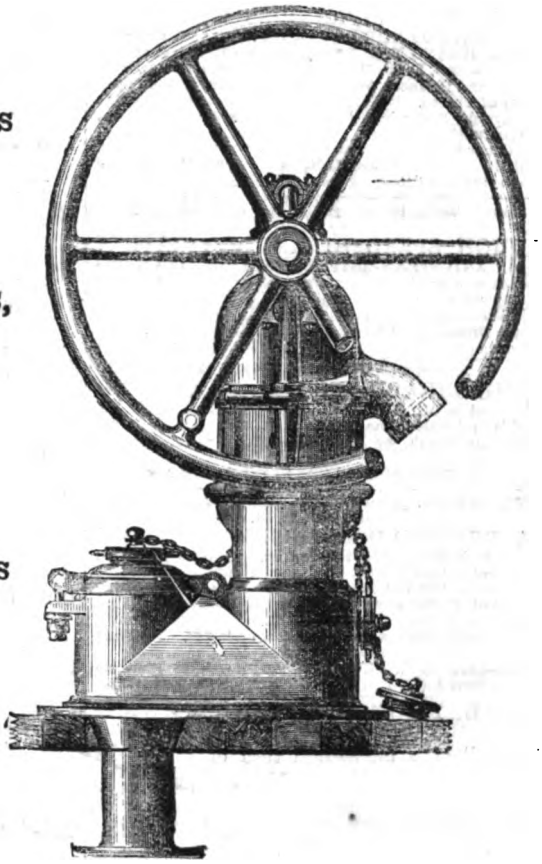

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Cambridge: DEIGHTON, BELL, AND Co. London: BELL AND DALDY. 1859. (298)

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London: E. and F. N. SPON, 16 Bucklersbury. (291)

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"The above engraving represents accurately a section of a leaden pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight. The water has cut these deep pits almost through the pipe, and not only upon the portion which we have illustrated, but has formed similar chasms throughout the entire length."—*Expositor.*

Poisoned Water Preventable.

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Every Variety of Gutta Percha Article.

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Mill-bands,	Flasks,
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PRICES CURRENT OF METALS.

London, 24th June, 1859.

	£ s. d.		£ s. d.	Dis. p. ct.
IRON, Rails in Wales and N. of England ..... pr. ton	6 0 0	to	6 5 0	nett
Welsh Bars, in Wales .. "	5 15 0		6 0 0	5
Staf. Bars at the Works "	7 0 0	"	7 10 0	2½
" Hoops ..... "	8 0 0	"	8 10 0	"
" Sheets, Singles .. "	8 15 0	"	9 0 0	"
" Nail Rods ..... "	7 0 0	"	7 10 0	"
" Boiler Plates .... "	8 10 0	"	9 0 0	"
Scotch Pig, M.-Nos. Warrants, at Glasgow..... "	2 7 9		2 8 0	nett
Do. No. 1, Good Brands "	2 8 6	"	2 10 0	"
Scotch Bars ..... "	7 5 0	"	8 0 0	5
Swedish Bars, in London "	13 10 0	"	15 0 0	2½
COPPER, Sheet and Sheathing per lb.	0 1 0			3
Tough Cake and Tile " ton	107 10 0			"
Best Selected..... "	110 10 0			"
Australian ..... "	105 10 0			"
South American				"
Yellow Metal Sheathing..... per lb.	0 0 10			"
STEEL, Swedish Keg ..... pr. ton	19 10 0	"	20 0 0	2½
" Faggot ..... "	21 10 0	"	22 0 0	"
TIN, English, Block ..... pr. cwt.	6 9 0			2½
" Bar..... "	6 10 0			
Foreign, Banca ..... "	6 13 0			nett
" Straits..... "	6 8 0			"
TINPLATES, Charcoal, I.C. .. pr. box	1 11 0	"	1 12 0	3
Coke, I.C. ..... "	1 5 6	"	1 6 6	"
LEAD, Pig, English ..... pr. ton	23 0 0	"	23 10 0	2½
" Spanish ..... "	22 0 0	"	22 10 0	"
Sheet ..... "	24 0 0		24 10 0	"
SPELTER, on the spot ..... pr. ton	19 0 0			nett
for arrival..... "	19 0 0			"
ZINC, English, Sheet ..... "	26 0 0	"	28 0 0	1½
QUICKSILVER ..... per btl.	7 0 0			1½

REMARKS.—The Metal Market continues very flat, with a limited amount of business.

LAWRIE AND HAGGER, Metal Brokers.

33 Lombard-street, E.C.

LIST OF MISCELLANEOUS TENDERS INVITED, AND ENGAGEMENTS OPEN.

The tenders and vacancies which appear in this weekly list are not repeated in succeeding numbers.

LIME AND CANNEL, *Middleton Gas Works.*—Lime for 12 months, from July 1; and from 1,000 to 1,500 tons of cannel for 12 months; also for a supply of coal for the same period. Tenders, June 30, the chairman of the company, Middleton.

RESERVOIR, &c., *Newsham.*—Particulars, Mr. J. F. Tone, 10 Market-street, Newcastle-upon-Tyne. Tenders to secretary of Blyth and Tyne Railway, Neville-hall, Newcastle-upon-Tyne.

EXCAVATIONS, *Manchester.*—In connection with the Assize Courts. Drawings, &c., Mr. A. Waterhouse, architect, Cross-street-chambers, Manchester. Tenders, June 30, to Mr. F. Hulton, clerk to the Assize Court Committee, Manchester.

PIPE-LAYING, *Dukinfield.*—Taking up and laying 3,500 yards for the Dukinfield Gas Company. Specifications, Mr. Dore, at the works. No date given.

NEW BUILDINGS, *Oldham.*—Taking down old building adjoining the town-hall and erecting a new building as an addition to the town-hall. Plans, &c., Messrs. Haley and Son, Cross-street, Manchester. Tenders, July 4, to Mr. J. Summerscales, town clerk, Manchester.

HOTEL, *Tunstall.*—Alterations and additions, Sneyd Arms Hotel. Plans, &c., Mr. R. Dain, architect, Liverpool-road, Burslem. Tenders, June 30.

WORKHOUSE, *Penistone, Yorkshire.*—New workhouse, near Sheffield. Plans, &c., Messrs. Lockwood and Mawson, architects, Post-office-buildings, Bradford. Tenders, June 28.

WORKHOUSE IMPROVEMENTS, *Wem.* — Sanitary improvements. Plans, Mr. W. Owen, clerk to the guardians, Shrubbery, Wem, June 29.

PUBLIC-HOUSE, *Northampton.* — Public-house assembly-room. Plans, &c., Mr. W. Hall, architect, St. Giles'-street, Northampton. Tenders, June 27.

BOUNDARY WALLS, &c., *Brighton.*—Boundary walls, gates, and earthwork to the Diocesan Training Schools. Drawings, &c., Mr. W. G. Habersham, 38 Bloomsbury-square. No date given.

SHEDS, PENS, &c., *Hull.*—For the show-yard of the society, on the 3rd and 4th of August next. Particulars, Mr. J. Hannan, secretary to the Yorkshire Agricultural Society, Kirk Deighton, Wetherby. Tenders, July 1.

STEAM COAL, *East India Company.*—3,000 tons for Madras. Tenders, India office, July 1.

RAILWAY, *Spain.*—For the Tudela and Bilbao Railway, comprising a distance of nearly 91 kilometers from Arrancundiaga, at 16 kilometres from Bilbao, to the right bank of the Ebro. Plans, &c., companies' offices, Calle de Bidebarrieta, No. 20 Bilbao. General information Mr. C. Vignolles, engineer-in-chief, 21 Duke-street, Westminster.

GAS WORS, *Aspatria, Cumberland.*—For the whole of the building and ironworks separately. Plans, &c., Mr. J. Bill, wine merchant, Aspatria; or Messrs. T. Richards and Son, consulting engineers, Whitehaven. Tenders, June 27.

PAVING, *Burton-upon-Trent.*—For 6,500 square yards of brick paving; 3,300 lineal yards of stone kerbing; and 350 square yards of granite paving; with other works connected. Plans, &c., the town surveyor, 26 Union-street, Burton-upon-Trent. Tenders by 4 p.m., June 30, to Mr. W. Coxon, clerk to the commissioners.

CONGREGATIONAL CHURCH AND SCHOOLS, *Derby.*—Particulars on application by letter to Messrs. Hine and Evans, architects, Nottingham.

CHURCH WORK, *Somerset.*—Repairing nave and rebuilding chancel, Parish Church, Freshford. Specification, Mr. C. E. Davis, F.S.A., 3 Westgate Buildings, Bath. Tenders, June 27.

CEMETERY, *Banbury.*—Two chapels, with sexton's lodge, for the burial-ground in the Banbury district. Drawings, &c., Mr. T. Pain, Bridge-street, Banbury; and Mr. C. H. Edwards, 4 St. James's-terrace, Camden-road, Regent's-park. Tenders, July 5.

SEWERAGE, &c., *Leamington.*—About 4,250 yards of brick sewers, the construction of works for the defication and deodorisation of the sewerage therefrom, the improvement of the river Leam, between the Adelaide-bridge at Leamington and the river Avon at Emscote, in the borough of Warwick; the construction of a weir across said river, &c. Plans, bills, &c., Mr. Anthony Morgan, surveyor to local board, Town-hall, Leamington, for 10s. Tenders, July 11. One contract.

PLANS FOR CEMETERY, *Barnsley.*—For enclosing and laying out the ground and erecting two chapels and entrance lodge, the cost for the whole not to exceed £4,000. Premium of £30 for the best and £10 for the second best designs, to Clerk of the Board, July 23.

PARROT COALS, *Greenock Gas Works.*—From 5,000 to 6,000 in monthly instalments. Tenders to state the price per ton and the quantity that can be delivered monthly, the manager of the works, July 9.

TO TAKE OUT QUANTITIES.—Also to prepare estimates of railway carriages and waggons. X. Z., care of Messrs. Weaklin and Flint, stationers, 91 Farringdon-st., E.C.

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BUILDINGS' INSPECTOR.—To take charge of the erection of an extensive building in Glasgow. To a thoroughly qualified person, a liberal remuneration. Applications, with references, No. 53, *North British Advertiser* office, Glasgow.

IRON WORKS' MANAGER.—For a bar-iron works, near Edinburgh, and qualified to conduct correspondence. Applications, to state salary, *North British Advertiser* office, Glasgow.

INFIRMARY, *Ashton-under-Lyne.* — At Chamber Hills. Plans on the 20th inst. with Mr. Lindley, Architect, Market-avenue, Ashton-under-Lyne. Tenders to Mr. H. T. Darnton, Hon. Sec., 88 Old-street, Ashton-under-Lyne, July 4.

WORKHOUSE, *Machynlleth.*—Drawings, &c., at the Board-room, Machynlleth. Bills of quantities, Mr. J. E. Oates, York. Tenders, July 6.

HOUSE, *Leicestershire.*—Taking down one and putting up another in the village of Bitteswell. Plans, &c., at the Law offices of Messrs. Woodstock and Twist, Bailey-lane, Coventry. Tenders July 17.

PUMPING MACHINERY.

GWYNNE AND Co., Engineers, London, manufacture and supply the following Machinery, of the most approved construction and with all the latest improvements:—Portable and Fixed Steam-Engines and Boilers of every description; Waterwheels, Windmills, Horse and Hand-power Machines; Pumping Machinery for the Supply of Towns, Cities, and Districts, and for the Irrigation of Coffee, Cotton, Indigo, Sugar-cane, and Rice Estates, for pumping out Coffer-dams, Canals, Dry Docks, Reservoirs, &c. They also manufacture and supply the Pumping and other Machinery for Paper, Pulp, and Fulling Mills, Breweries, Distilleries, Tanneries, Starch Works, Bleaching, Dyeing, and Calico Printing Works, Chemical Works, Silk, Cotton, and Flax Mills, and Manufactories in general. All Letters not paid will be refused. Illustrated Price Lists forwarded on receipt of Six Postage Stamps. —GWYNNE AND Co., Hydraulic and Mechanical Engineers, Essex-wharf, Strand, London.

For Exportation.—The above can be obtained throug British Merchants, Shippers, and Colonial Agents. (24)

TO BRASS-FOUNDERS, ENGINEERS, &c.

THE PATENT PLUMBAGO CRUCIBLE COMPANY having completed the enlargement of their premises, beg to call the attention of all users and shippers of Melting Pots to the great superiority of the PATENT CRUCIBLES, which have been used during the last three years by some of the largest melters in England and abroad. In addition to their capabilities of melting an average of from thirty-five to forty pourings, they are unaffected by change of temperature, never crack, but can be used till worn out, requiring only one annealing for several days' work, and become heated much more rapidly than ordinary pots, effecting thereby a saving of more than fifty per cent. in time, labour, fuel, and waste. The Patent Plumbago Crucible Company also manufacture and import clay crucibles, muffles, portable furnaces, sublimate pans and covers, glass-pots, all descriptions of fire- standing goods, and every requisite for the assayer and dentists. For Lists, Testimonials, &c., apply to Battersea Works, London, &c. 43

MALLET'S PATENT BUCKLED PLATES.—MR. ROBERT MALLET, C.E., Inventor and Patentee of these Plates (now being laid for the Floor of the New Bridge, Westminster, and applicable to Bridge, Wharf, and Fire-proof flooring, and to a variety of other important purposes) gives notice that he has withdrawn from this date all Licences whatsoever to manufacture or vend his Patent Plates, and taken the management of the Patent exclusively into his own hands. Applications for the Plates to be made to the Patentee, who has arranged for their prompt supply, at his offices, 11 Bridge-street, Westminster, S.W., and 97 Capel-street, Dublin.

18th May, 1859. (264)

RAILWAY SLEEPERS, &c.

WE are prepared to sell, by Private Contract, about 100,000 Scotch Fir Sleepers, of the various dimensions in use.

Also, any quantity of Larch, and Scoth Fir Poles, Planks, Deals, Staves, and Pitwood.

Early applications will meet the best attention of

REID and FORBES.

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SCOTT'S

PATENT GRASS SEED SEPARATOR,

which entirely extracts the Seeds of "COUCH," "TWITCH," "SPEAR," or "HAIR" GRASS and other impurities from

PERENNIAL AND ITALIAN RYE-GRASS, &c.,

AND

SCOTT'S PATENT CARROT SEED BEARDING

AND

CLOVER AND TREFOIL MILLING OR DRAWING MACHINE,

which effectually removes the beard from Carrot Seed, rendering it fit for sowing with facility by drill or otherwise, and by the separation of abortive or diseased grains vastly increases its vegetative per centage. By a slight modification it is applicable to the other purposes before mentioned.

These Machines were admittedly the most novel, and, at the same time, the most useful and important to the Farmer of any exhibited at the late SMITHFIELD CLUB SHOW.

They may be seen at work at the Establishment of the Manufacturer,

Mr. T. MIDDLETON, Engineer, Southwark.

Communications to be sent to the Patentee, J. SCOTT, 111 Drummond Street, Euston Square, London, N.W. (48)

THE RAILWAY CARRIAGE COMPANY,

OLDBURY, NEAR BIRMINGHAM.

LONDON OFFICE—34 GREAT GEORGE STREET, WESTMINSTER,

Manufacturers of every Description of

RAILWAY PLANT AND IRONWORK.

NEW and SECOND-HAND RAILWAY WAGGONS always in Stock for SALE or HIRE. (273)

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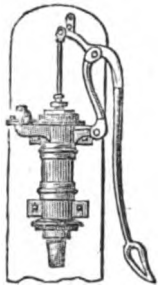
JOHN WARNER AND SONS,

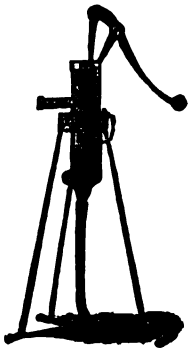
8 CRESCENT, JEWIN STREET, LONDON.

HYDRAULIC ENGINEERS, BRASS AND BELL FOUNDERS,

PATENTEES OF IMPROVEMENTS IN PUMPS.

Patent Vibrating Standard Lift and Force Pumps.





PATENT CAST-IRON PUMP fitted with J. Warner and Sons' Patent Bucket and Sucker, which cannot clog in action, for Farms, Cottages, and Wells, not exceeding 28 feet.

Dia.	Height.	£	s.
2½ in. short	1 ft. 7 in.	1	10
2½ in. long	3 ,, 3 ,,	1	14
3 ,,	6 ,, 6 ,,	2	8
3½ ,,	3 ,, 6 ,,	3	3
4 ,,	3 ,, 6 ,,	3	3
2½ ,,	3 ,, 6 ,,	3	3
2½ in. short, with 15 feet of Lead Pipe attached, ready for fixing		2	14
2½ in. long. do. do.		2	18

PATENT BRASS LIFT AND FORCE PUMP, on Plank, for House purposes, supply of Cisterns, &c.

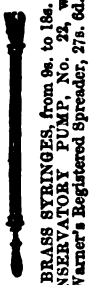
	£	s.
2½ inch	6	0
3 ,,	7	5
3½ ,,	8	0

A lighter Pump of 3 inches diameter, can be supplied if required 5 15

IMPROVED LIQUID MANURE, OR GENERAL PORTABLE PUMP.

These Pumps are fitted with J. Warner and Son's Patent Bucket and Sucker, and cannot clog in action. The Barrel is of Galvanized Iron, not likely to corrode, and can be raised or lowered at pleasure. The legs will fold together, and the whole may be carried on shoulder to any pond or tank required.

4½ in. Liquid Manure Pumps, with legs, £3 3s.; 1¼ in. Gutta Percha Suction Pipe, 1s. 11d. per foot; 2 in. Flexible Rubber and Canvass Suction Pipe, on Wires, 3s. 3d. per foot. The Barrel is 27½ inches long, and the legs are 5 feet high. Larger sizes of the above if required.



BRASS SYRINGES, from 9s. to 18s.
CONSERVATORY PUMP, No. 22, with Warner's Registered Spreader, 27s. 6d.

Galvanized Iron Tub GARDEN ENGINE, with Warner's Registered Spreader, is strongly recommended for durability and low price, viz., £2 19s., to hold Ten Gallons. Larger sizes, in either wood or iron.

WARNER'S SWING WATER-BARROW.
(To hold Thirty Gallons), £3 3s.,

is intended for all large Establishments where much watering is done by the watering-pot. By its use much time and labour of the Gardener are saved, particularly where the Tank, Pond, or Pump is at a distance from the garden.

MUSICAL SHEEP BELLS, with Straps, in sets of 6, 19s.; ditto, in sets of 8, 25s.; ditto, in sets of 12, 38s.

WARNER'S CATTLE AND SHEEP BELLS, in sets of 6, with Straps, 13s. per set.

Bells for Churches, Chapels, Colleges, Schools, Turret Clocks, &c., cast for any size, note, or weight, singly or in peals. Tuned by machinery. Stocked and wheeled ready for fixing. Old Bells re-cast or taken in exchange.

The great 16-ton Bell, for the Houses of Parliament, was made by JOHN WARNER and SONS, 1856, under their Patent.

May be obtained of any Ironmonger or Plumber, in town and Country; or of the Patentees and Manufacturers, as above. (30

STEAM CULTIVATION.

CHANDLER AND OLIVER

HAVE much pleasure in being able to state that they are now prepared to execute orders for their PATENT STEAM WINDING ENGINES AND PLOUGHS, for Cultivating Land by Steam.

The WINDING TACKLE can be fitted to Engines of any maker, and the Plough can be made to take any kind of apparatus necessary for Cultivating the Soil, such as Scarrifier Tines or Broad Shares, &c. Any Engine now used by Farmers can be fitted with the Tackle. It is light and simple, and an ordinary Farm Labourer can work it.

The Engine can be used for Thrashing without taking the Ploughing Tackle off, not requiring more than three or four horses to take it from place to place.

These Engines are very useful for Pile Driving or Drawing Ballast up inclined planes; at the same time they can be used for Pumping. Farmers will find them most useful for all purposes.

Messrs. CHANDLER and OLIVER are prepared to receive orders for separate Windlasses, which are light and simple, and generally useful.

For further Information apply to

ROBERT CHANDLER, ENGINEER, BOW, NEAR LONDON,

Or Mr. OLIVER, Farmer, Hatfield, Herts.

ILLUSTRATED CATALOGUES WITH PRICES, WILL BE READY SHORTLY. (215)

A NEW DISCOVERY IN WASHING HOUSEHOLD LINEN.

NO FAMILY SHOULD BE WITHOUT HANCOCK'S UNIVERSAL WASHING MACHINE. It effectually cleanses the Crevices of Baby-linen, Collars, Wristbands, &c., without the possibility of injuring the Linen or Collars. Received 500 Testimonials.

PRICES.

No. 2 Washes 9 Shirts in from 3 to 10 minutes; or 4 Sheets in 5 minutes	£5 5
No. 3 Washes 12 Shirts in from 3 to 10 minutes; or 6 Sheets in 5 minutes	7 11
o. 4 Washes 18 Shirts in from 3 to 10 minutes or 12 Sheets in 5 minutes	12 12

And all other Articles in proportion.

J. L. HANCOCK, Sole Manufacturer and Patentee, 62 Pentonville-road, London. (37)

CHADBURN BROTHERS' PATENT METALLIC STEAM GAUGES.

THESE GAUGES have been in use more than three years, and have given general satisfaction. Those first fixed are now in as good working condition as ever. Testimonials, &c., may be seen at CHADBURN BROS.' Works, Sheffield.

The Gauges may be had of Messrs. Elliott Bros., Strand; Mr. Fenn, Newgate-street; Messrs. Dring and Fage, Tooley-street; Messrs. Nigretti and Zambra, Holborn. (285)

Important to every man who keeps

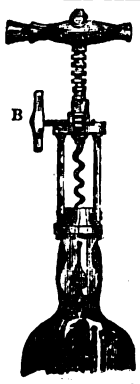
THORLEY'S FOOD FOR CATTLE,

77, NEWGATE STREET, LONDON

Price 50s. per Cask, containing 448 Feeds

Carriage paid to any Station.

A Pamphlet, Post-free on application. (133)



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LUND'S

LONDON RACK CORK SCREWS

on the neck of a bottle, and it is ready for use. Some of these Cork Screws are fitted with Patent Spring Ends to embrace the neck of the bottle, and so direct the worm through the centre of the cork.

Sold by the Patentee at 56 and 57 Cornhill, and 23 and 24 Fleet-street, London; and may be had at all Cutlers' and Ironmongers'. (254)

YORKSHIRE TYRE & AXLE WORKS, ROTHERHAM.

LOCOMOTIVE TYRE-BARS of every description for Engines, Carriages, and Railway Waggon Wheels.

STEEL-IRON for Springs. MERCHANT and other Irons manufactured. WM. F. HOYLE, Proprietor. (274)

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MEDALS AWARDED TO
THOMAS GLOVER'S PATENT DRY GAS-METERS.
VIZ.:

GREAT EXHIBITION, LONDON, 1851. | NEW YORK EXHIBITION, 1855.
AND PARIS UNIVERSAL EXHIBITION, 1855.

LONDON, March 25, 1859.

THOMAS GLOVER takes this opportunity of thanking Gas Companies and his other Customers for the very liberal support and patronage he has received during the past year, which has far exceeded his most sanguine anticipations, having sold a greater number of his PATENT DRY GAS-METERS since the dissolution of his partnership with Mr. Croll than he was ever previously enabled to do in any one year.

THOMAS GLOVER confines his sole attention to the business of Gas-Meter Making. The propriety of his doing so is satisfactorily proved by his success; and, without the practice of any quackery, or any attempt to delude the public by an absurd exhibition of "Old and New Valves," his Meters are in general use by the Metropolitan Gas and other Companies in this Country and abroad. For example, one Metropolitan Company have now in use above **12,500** of his Patent Dry Gas-Meters; some of these Meters have been fixed for Fourteen Years, and are still in working order, without complaint from either the Company or the Consumer.

THOMAS GLOVER thinks it necessary to put Gas Companies on their guard against parties selling Patent Dry Gas-Meters constructed in imitation of his, but unskilfully made on erroneous principles, and with improper and unsuitable materials.

THOMAS GLOVER'S Workshops are now the most extensive in this or any other country, and he is thereby enabled promptly to execute orders to any extent required. Purchasers may at any time inspect his Works and the Materials of which his Meters are constructed. He is ready to enter into Contracts with Gas Companies and others to uphold their Stock of his Meters for Twenty Years at an annual charge varying from 2½ to 5 per cent., and to leave always in the hands of Gas Companies Three Years' charge for upholding, as a guarantee for the fulfilment of the Contract.

THOMAS GLOVER,
PATENT DRY GAS-METER MANUFACTURER,
SUFFOLK STREET, CLERKENWELL GREEN, AND
ALLEN STREET, GOSWELL STREET, E.C. (293)

D. HULETT & CO.,
55 and 56 HIGH HOLBORN, LONDON,
Patentees and Manufacturers of the only good Mercurial Gas Regulator,
INVITE the attention of Gas Companies and the Trade generally to their Improved GAS-METERS, which they warrant equal to any in Quality, Workmanship, and Simplicity of Construction, and the only Meters from which Gas cannot be obtained without being duly registered.

Manufacturers of
GAS CHANDELIERS, GLASS LUSTRES, HALL LANTERNS, VESTIBULES, BRACKETS, PENDANTS;
Double Cone, Albert, Shadowless, and every description of Burner, Union Jets, Batswings, &c.;
IMPROVED FULL-WAY CARTER'S VALVES (much approved of);
GAS-STOVES, and every article connected with Gas-Apparatus.
CAST AND WROUGHT-IRON PIPE, BLACK AND GALVANISED. COPPER, TIN, BRASS, AND COMPOSITION TUBING.

D. HULETT'S IMPROVED SERVICE CLEANSER,
for clearing out Mains, Services, and Interior Fittings—60s. net.
BOYLE'S PATENT SILVERED GLASS COMBINATION REFLECTORS AND OUTSIDE LANTERNS.
Sole Manufacturers of CHURCH & MANN'S PHOTOMETER.
Large Pattern Books, with every description of Gas-Fittings, Chandeliers, &c., with complete Book of Prices, 12s. (294)

THE IMPERIAL IRON TUBE COMPANY,
(SUCCESSORS TO GEORGE R. LLOYD & CO.)
GAS STREET AND BERKLEY STREET,
BIRMINGHAM,
Manufacturers of Wrought Iron Tubes & Fittings,
FOR GAS, STEAM, AND WATER.
PATENT GLASS ENAMELLED AND GALVANIZED TUBES,
AND
LAP-WELDED IRON BOILER TUBES.
(193)

TO STEAM SHIP OWNERS, ENGINEERS, AND OTHERS.
How's Patent Steam Engine Counters, can be read at sight.
These Counters register the number of revolutions made by an engine or other mechanism. They may be used for ascertaining the duty of Pumping Engines and Water-wheels; the revolutions on board a steam-vessel; to calculate the slip of the propeller; and in a locomotive to test the slip of the wheels.

How's Patent Salinometer, for Steam Boilers using Salt Water.
By these, the density of the water in the Boiler is at all times accurately shown, and a saving of boiler and fuel is effected. They are adopted by the Admiralty, the Honorable Trinity Corporation, and others. Copies of Testimonials from Messrs. Penn, Maudslay, and others, will be forwarded on application.

How's Engine-Room Telegraph, for communicating between Captain and Engineer. Society of Arts Prize Medal, 1855.
is a Mechanical Telegraph, and by its peculiar construction, error or misunderstanding is rendered impossible. It now extensively adopted, and gives great satisfaction.

How's Patent Fresh Water Apparatus for Ships' Use.
This apparatus is designed for the distillation of Fresh from Salt Water; and on long voyages, and where the supply of water is scanty, it will be found invaluable. Testimonials may be seen.

Patent Steam Pump and Fire-Engine for Ships' Use.
This Steam-pump occupies but a small space; works perfectly noiselessly, and throws an immense volume of water. An Illustrated Circular of Fresh Water Apparatus and Steam-pump combined, free on application.

How's Patent Machine for Cutting Bolts, Rods, Spindles, Wire, &c.
Simple in construction, inexpensive, occupies but little space, and will not easily get out of order.

A Pamphlet Illustrative of the above, sent free by post, on application to

A. P. HOW, ENGINEER,
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EVERY DESCRIPTION OF ENGINEERS' TOOLS, ENGINE ROOM STORES, &c. &c., SUPPLIED. (89)

VINEGAR.—Patronised by Her Majesty's Government.
CONDY'S PATENT PURE CONCENTRATED MALT VINEGAR.
Families, by using this delicious VINEGAR, insure purity and effect a saving of 50 per cent. See "Report of Dr. Letheby, City Officer of Health, Dr. Hassall, of the 'Lancet' Commission, and others." Sold by the Trade, in Bottles, labelled and capsuled. Wholesale—63 King William-street, London-bridge, E.C. Six Quart Samples sent free to any Railway for 3s. 6d. (216)

ARTESIAN WELLS, BORING TOOLS, PUMPS, &c. Engineers, Architects, Surveyors, Builders or others requiring a good supply of Water may have any quantity procured by W. SPELLER, 14 York-street Blackfriars'-road, London, where may be had any quantity of Tools for Sinking or Boring, from 2 to 20 inches diameter, and from 100 to 2,000 feet depth; also Men and Tools to bore for Railroads, Minerals, &c., in any part of the world. Boring Tools and suitable Pipes for exportation, with full instructions for their use.

Builders, Contractors, Brickmakers, Barge and Ship Builders, and others, can be supplied with Wrought or Cast Iron Pumps, Double or Single, for excavation of Deep Wells, from 3 to 14 inches in the bore, and from 6 to 150 feet in length, to work by hand or Steam Power.

Hot-Water Apparatus for Conservatories, &c., on the most economical and improved principles.

Also Manufactory for Captain John Grant's much improved Cooking Apparatus. (44)

GLADSTONE & Co., CONTRACTORS and ENGINEERS.
2 John-Street, Minories, London, E.C.,
Are prepared to ESTIMATE FOR and CONSTRUCT BRIDGES, PIERS, JETTIES, &c., in Iron, Wood, or Stone. Also to supply Cranes, Girders, Turntables, and Railway Work and Plant generally. (199)

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FROM SWAN LANE TO
ADELAIDE PLACE, LONDON BRIDGE.
(227)

SPIRAL TUBE BRUSHES made with Wire or Whalebone for Tubes of
1½ 1¾ 2 2¼ 2½ 2¾ 3 3½ 4 4½ 5 ins. diam.
24/, 25/, 26/, 28/, 30/, 32/, 35/, 38/, 42/, 46/, 50/ per doz
Quantities of Two Dozen and upwards delivered in London.
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Hot-Water Apparatus Manufacturers.
Plans and Estimates forwarded on Application. (149)

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GLENFIELD PATENT STARCH,
USED IN THE ROYAL LAUNDRY,
AND PRONOUNCED BY HER MAJESTY'S LAUNDRESS TO BE THE FINEST STARCH SHE EVER USED.
WHEN YOU ASK FOR
GLENFIELD PATENT STARCH,
SEE THAT YOU GET IT,
as inferior kinds are often substituted.
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THE
SILVERTOWN INDIA-RUBBER WORKS
OPPOSITE
H. M. DOCKYARD, WOOLWICH.
INDIA-RUBBER MANUFACTURES
WITH ALL
RECENT IMPROVEMENTS.
Warehouses, 3 and 4 Bishopsgate Within, E.C. (145)

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ENGINEERS, AND RAILWAY WAGGON BUILDERS.
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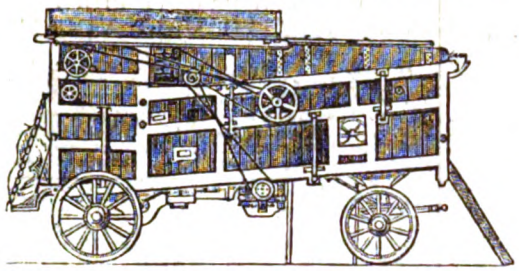

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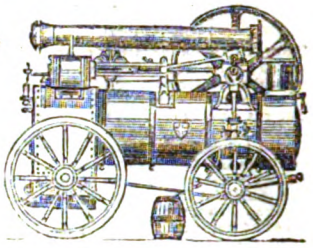
PRIZE PORTABLE and FIXED STEAM ENGINES,
SMITH'S PATENT STEAM PLOUGHS,
PATENT PRIZE COMBINED THRASHING MACHINES, containing R. P. and Co.'s NEW PATENT CORN CLEANER,
SAWING MACHINERY, CIRCULAR and VERTICAL of all Sizes,
MILLS of all Kinds, FIXED and PORTABLE, for Grinding Bones, Flour, Linseed, Mortar, Clay, &c.
PUMPS, CRANES, CRABS, SCREW-JACKS, &c.



Illustrated Catalogues, with full Particulars and Testimonials, may be had by applying as above. (34)

FOWLER'S PATENT STEAM PLOUGH

SEEN AT WORK.

Standard Sets of Fowler's Steam Ploughing Tackle can be seen in operation on 1st July next, at the Show of
SUFFOLK AGRICULTURAL ASSOCIATION, AT IPSWICH;
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SUSSEX AGRICULTURAL SOCIETY, AT HAILSHAM,
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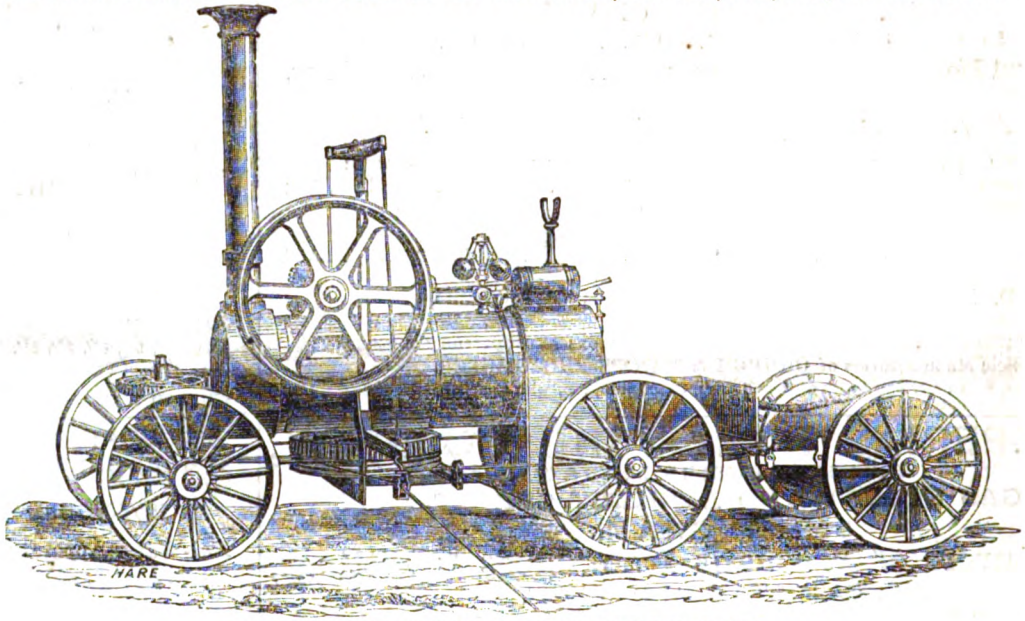

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FOWLER'S ENGINE, WINDLASS, AND WATER-CART.

FOR FURTHER PARTICULARS APPLY TO

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DRAUGHTSMAN & ENGRAVER ON WOOD,
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TO BRASS FOUNDERS.

TO BE SOLD, the Patent-right of a New and Highly-approved EQUILIBRIUM WATER COCK or VALVE, suitable for Steam Boiler Feed Pipes, or any cases where the valve is required to be opened against pressure.

Address H., MECHANICS' MAGAZINE Office, 166 Fleet-st., where a Drawing may be seen. (151)

A VALUABLE PATENT to be DISPOSED OF.—The Patentee will either dispose of the Patent or grant Licences to any party wishing to manufacture, or would join a person with capital to carry out the Patent.

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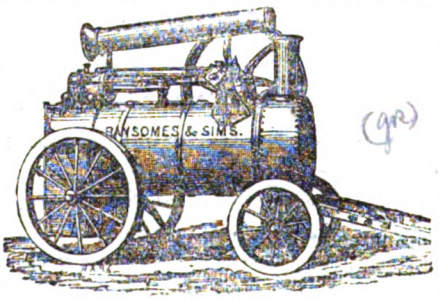

RANSOMES AND SIMS,
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AGRICULTURAL & GENERAL ENGINEERS
AND
IRONFOUNDERS.
LONDON OFFICE: 31 ESSEX STREET, STRAND, W.C. (165)

BIRMINGHAM WAGGON COMPANY (LIMITED) has RAILWAY WAGGONS for HIRE. Apply to the Secretary, 3 Newhall-street, Birmingham. (276)

CONDY'S PATENT FLUID, or NATURAL DISINFECTANT,

Not only Deoderizes but Disinfects perfectly, and DESTROYS FOR EVER the cause of infection.

Is not poisonous, as it may be used to purify water. Evolves no noxious or unpleasant gas. Cannot be mistaken for any other fluid, thereby preventing death and disease; and is therefore the best, safest, cheapest, and most pleasant disinfectant ever introduced.

This fluid has been examined and reported upon by the Board of Health, all the most eminent Men and Chemists of the day, in all cases in the most satisfactory manne possible.

The Public are recommended to use this Fluid, properl diluted with water, frequently and habitually in larders, sculleries, dairies, musty cakes, sick rooms, close places, &c., as it has numerous advantages, and can be used with certain immediate success and perfect safety.

Sold in Quart Bottles, 4s.; Pints, 2s.; Half-pints, 1s.; and in bulk, 10s. per Gallon.

Free to Railway on receipt of Order or Stamps. (238)

Published by RICHARD ARCHIBALD BROOMAN, at the MECHANICS' MAGAZINE Office, 166 Fleet-street, in the Parish of St. Dunstan's-in-the-West, in the County of Middlesex; and printed by JAMES JUDD, of 14 Holford-square, Pentonville, in the County of Middlesex, and HENRY ALEXANDER GLASS, at their Office, 38A New Bridge-street, in the Parish of St. Anne's Blackfriar in the City of London.—Friday, June 24 1859.

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